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REMOTE TECHNOLOGIES INC.

Application
For Certification
TheaterTouch System Controller

(FCC ID: MMURTI0100)

February 28, 2000

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1.0 GENERAL DESCRIPTION

1.1 Related Submittals Grants

This is single application of the TheaterTouch System Controller for Certification under Part 15.231 There are no other simultaneous applications.

1.2 Product Description

Purpose of the *TheaterTouch*

The intended use of the *TheaterTouch* unit is to transmit IR, (infrared) control signals to home electronic devices. These devices include VCRs, DVD players, TV cable boxes, audio surround decoders, satellite receivers, televisions, etc. The *TheaterTouch* is a custom programmable device that contains a touchscreen display and keypad buttons. The Touchscreen display and keypad are programmed with the user set of electronic equipment and the parameters that can be controlled. The user interface on the touchscreen display is also custom programmable. The *TheaterTouch* is then programmed with the IR controls for each electronic device that the user desires to use.

***TheaterTouch* Transmitter**

When the user interface for the electronic devices to be controlled and the IR control signals have been programmed into the *TheaterTouch* it is ready to use. When a user presses on the touchscreen or keypad to transmit, for example to start the play control on a VCR, the microprocessor, 80C320, senses the push via a PPI, 82C55. The IR control signal corresponding to that location on the touchscreen or keypad is then pulled from the FLASH memory. When the IR control signal is identified, the control signal is routed to the RF transmitter board. The control signal is modulated on the RF transmitter board and output.
All timing is derived from 24MHz and 418MHz oscillators.

***TheaterTouch* Antenna**

The antenna on the *TheaterTouch* is a grounded line SMD Planar (Splatch), soldered to the RF module, internal to the chassis and is not easily accessible.

Receiver

The receiver module demodulates the RF signal and combines the IR control signals carrier frequency to acquire the IR control signal. The IR control signal is then routed out to a connector on the receiver and is now available to the home electronic devices.

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1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All measurements were performed in Open Area Test Sites. Preliminary scans were performed in the Open Area Test Sites only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The test site facility used to collect the radiated and conducted measurement data is located at 7498 Hudson Blvd., Oakdale, Minnesota. This test facility has been fully described in a report dated on September 1996 submitted to your office. Please reference the site filing number: 31040/SIT 1300F2, dated December 26, 1996.

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2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was powered from 9 VDC Rechargeable Battery Pack. The EUT was set up as tabletop equipment.

2.2 EUT Exercising Software

The *TheaterTouch* Receiver and *TheaterTouch* Transmitter were tested in the continuous transmission mode.

2.3 Special Accessories

There are no special accessories necessary for compliance of these products.

2.4 Equipment Modification

No modifications were installed during the testing.

2.5 Support Equipment List and Description

N/A

2.6 Test Configuration Block Diagrams (see Attachments)

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3.0 EMISSION RESULTS

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs, data tables and graphical representations of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Peak reading on the EMI Receiver to the factors associated with preamplifiers (if any), antennas and cables. A sample calculation is included below.

FS = RA + AF + CF - AV

Where FS = Field Strength in dB V/m
RA = Receiver Amplitude (including preamplifier) in dB V
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AV = Average Factor

Assume a receiver reading of 47 dB V is obtained. The antenna factor of 19.5 dB and cable factor of 3.5 dB is added. The net field strength for comparison to the appropriate emission limit is 67 dB V/m. The average factor of 20dB is subtracted from the readings.

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3.2 Radiated Emission Data (see Exhibit II)

The fundamental output power and harmonic emissions limits are outlined in paragraph 15.231(b). The device was deactivated within 0.5 sec, limit is not more than 5 sec. 15.231(a)I.
The fundamental field strength allowed at the distance of 3 meters was calculated to be 80.3 dBµV/m. The harmonics emissions which lie in the forbidden bands of §15.205 are required to meet the general radiated emissions limits of 60.3 dBµV/m.

Calculation of the field strength of the fundamental frequency:
Limit = 20log (3750µV+(Fund. Freq.- 260 MHz)x(12500µV - 3750µV)/(470MHz – 260MHz)
Limit = 20log (3750µV+(418MHz.- 260 MHz)x(12500µV - 3750µV)/(470MHz – 260MHz)
Limit = 20 log (10333.3) = 80.3 dBµV/m

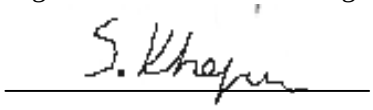
Calculation of the field strength of the spurious emissions:
limit = 20log (375µV+(Fund. Freq.- 260 MHz)x(1250µV - 375µV)/(470MHz – 260MHz)
limit = 20log (375µV+(418 MHz.- 260 MHz)x(1250µV - 375µV)/(470MHz – 260MHz)
limit = 20 log (1033.3) = 60.3 dBµV/m

The maximum level of the fundamental signal at 417.95 MHz was 77.8 dBµV/m, which is 2.5 dB margin below the FCC limit (80.3 dBµV/m). The worst case harmonic emission was 26.2 dB below the FCC limit.

Tested by:

Simon Khazon
EMC Project Engineer
Intertek Testing Services NA, Inc.

Agent for Remote Technologies, Inc.



Signature

Date:2/28/00

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3.3 TEST EQUIPMENT

Receivers/Spectrum Analyzers

DESCRIPTION	SERIAL NO.	LAST CAL DATE	CAL DUE	TICK IF USED
HP 85462A Receiver RF Section	3325A00106	05/99	05/00	X
HP 85460A RF Filter Section	3330A00109	05/99	05/00	X
Advantest R3271A	55050084	03/99	03/00	X
HP 83017A Microwave Amplifier	3123A00475	03/99	03/00	X

Antennas

DESCRIPTION	**SERIAL NO**	**LAST CAL DATE**	**CAL DUE**	**TICK IF USED**
Schaffner-Chase Bicono-Log Antenna	2468	09/99	09/00	
EMCO Horn antenna 3115	9507-4513	07/99	07/00	X
CDI Biconical Antenna B100	632	03/99	03/00	X
EMCO Log-Periodic Antenna	4515	01/99	01/00	X

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EXHIBIT I

TEST SET UP PHOTOS

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Radiated Emissions Test Configuration for Receiver

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Radiated Emissions Test Configuration for Receiver

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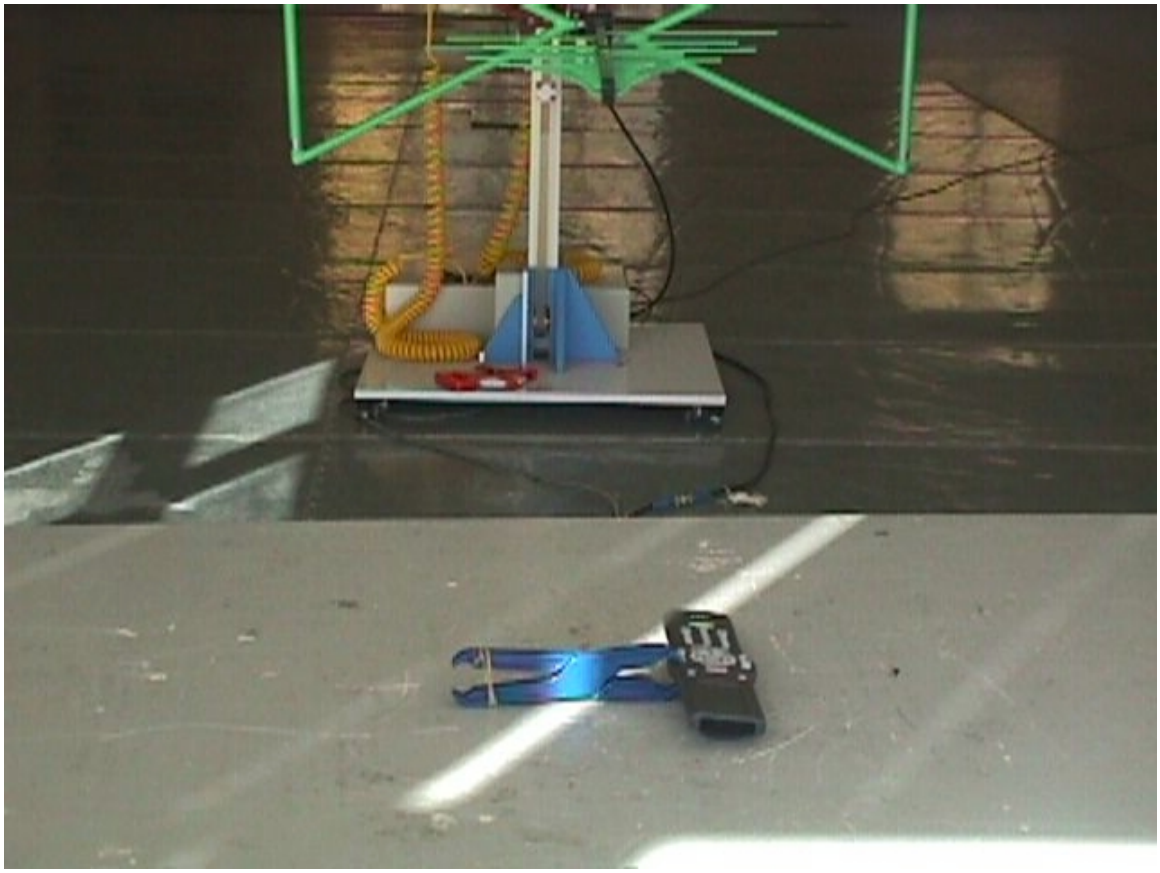

Radiated Emissions Test Configuration for Transmitter

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Radiated Emissions Test Configuration for Transmitter

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Line Conducted Emissions Test Configuration for Receiver

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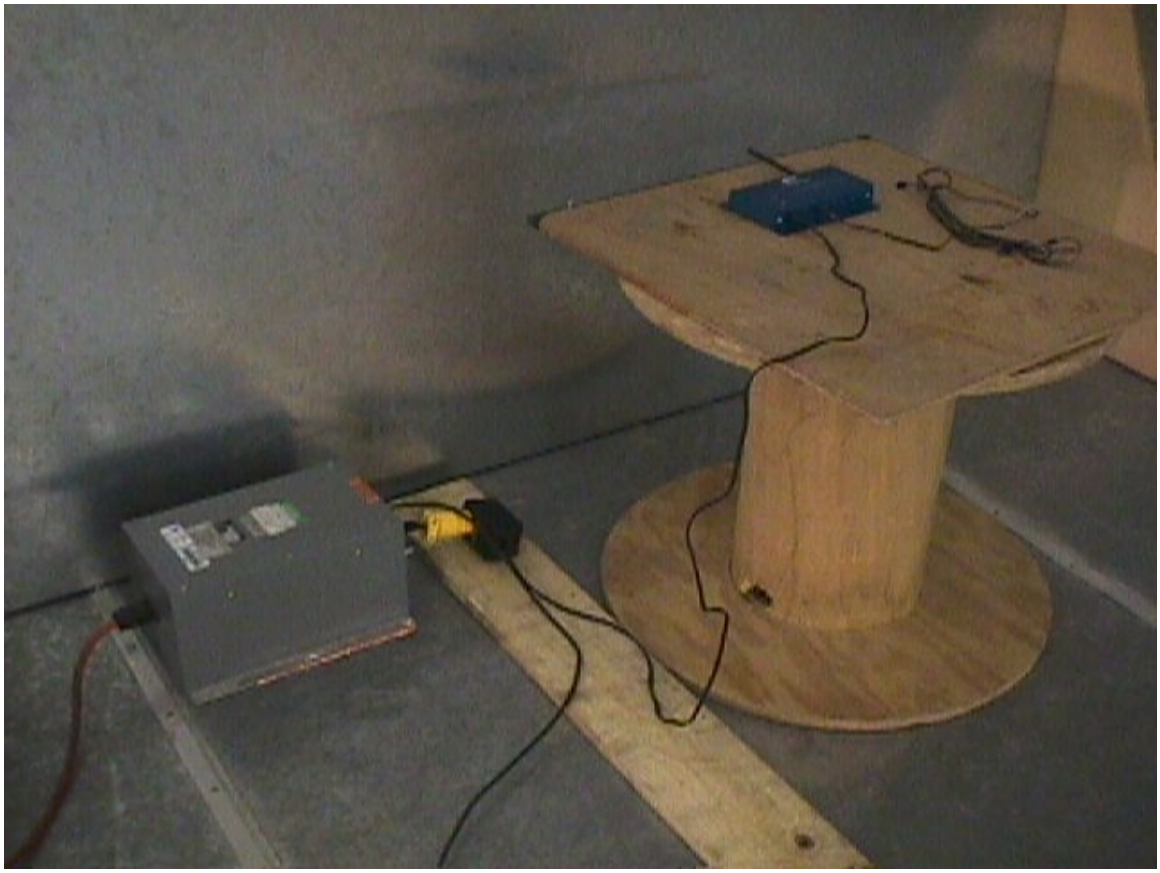

Line Conducted Emissions Test Configuration for Receiver

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EXHIBIT II

EMISSONS TEST DATA

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Radiated Emissions **Date:** 01-28-2000

Company: Remote Technologies Inc.
Model: TheaterTouch, Receiver
Test Engineer: Simon Khazon
Special Config. Info: RBW 100 kHz
Standard: FCC Part15.109, Class B
Note: The table shows the worst case radiated emissions
All measurements were taken using a CISPR Quasi-peak detector

Table # 1

Antenna Polarity	Antenna Hts (m)	Frequency MHz	QP Reading dBuV	Antenna Factor(dB/m)	Net at 3m. dBuV/m	Class B limit dBuV/m	Margin dB	Comments
V	1.0	39.99	24.1	12.0	36.1	40	-3.9	
V	1.0	50.01	13.7	12.0	25.7	40	-14.3	
V	1.0	60.01	15.6	10.0	25.6	40	-14.4	
V	1.0	69.99	13.8	8.0	21.8	40	-18.2	
V	1.2	79.99	15.4	9.0	24.4	40	-15.6	
V	1.0	89.99	15.6	10.0	25.6	40	-14.4	
V	1.0	120.00	23.1	14.0	37.1	44	-6.9	
V	1.0	174.01	6.2	19.0	25.2	44	-18.8	
V	1.0	240.03	4.9	14.0	18.9	46	-27.1	
V	1.0	280.01	3.1	16.0	19.1	46	-26.9	
H	1.5	320.04	3.7	18.0	21.7	46	-24.3	
H	1.8	360.00	4.1	18.0	22.1	46	-23.9	
H	2.2	400.04	1.1	19.0	20.1	46	-25.9	

Comments:

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Conducted Emissions **Date:** 01-28-00

Company: Remote Technologies Inc.
Model: TheaterTouch Receiver
Test Engineer: Simon Khazon
Special Config. Info:
Standard: FCC Part 15.107, Class B
Note: The table shows the worst case conducted emissions
All measurements were taken using a CISPR Quasi-peak detector

Table # 2

Frequency	Line 1	Line 2	Class B QP Limits	Margin
MHz	dBµV	dBµV	dBµV	dB
0.450	24.8	23.7	48.0	-23.2
0.477	21.0	19.9	48.0	-27.0
0.625	20.3	18.7	48.0	-27.7
0.738	17.4	18.0	48.0	-30.0
1.056	33.1	32.0	48.0	-14.9
11.662	4.6	5.4	48.0	-42.6
15.122	11.0	12.7	48.0	-35.3
19.443	13.3	13.8	48.0	-34.2
29.266	2.1	2.2	48.0	-45.8

Comments:

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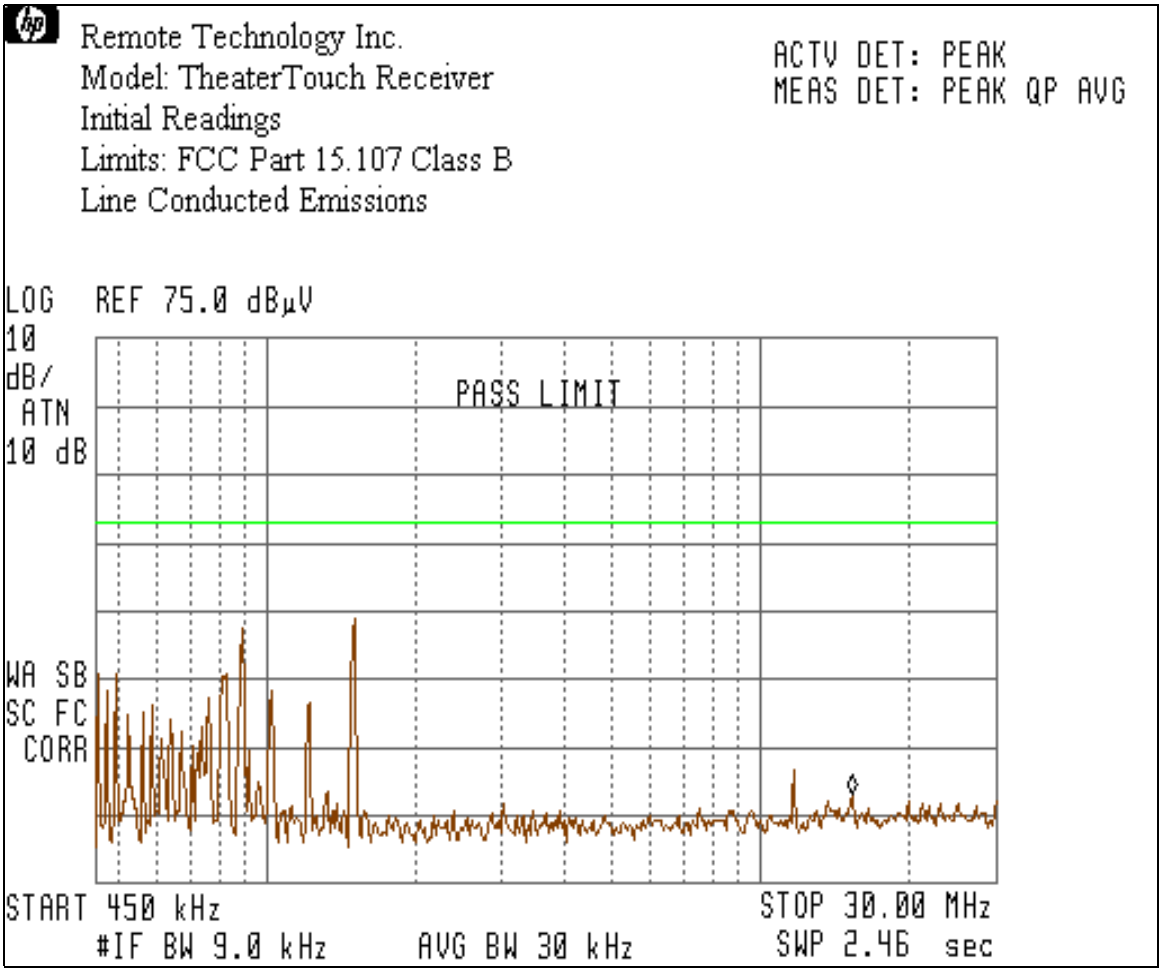
Graph #1 – Line Conducted Emissions



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Radiated Emissions

Date: 02/11/2000
Company: Remote Technologies Inc.
Model: TheaterTouch, Remote Control
Test Engineer: Simon Khazon
Special config.: RBW 100 kHz
Standard: FCC Part 15, Subpart B, 15.109, Class B
Note: The table shows the worst case radiated emissions
All measurements were taken using a CISPR Quasi-peak detector

Table # 3

Antenna Polarity	Antenna Hts (m)	Frequency MHz	QP Reading dBµV	Antenna Factor(dB/m)	Net at 3m. dBµV/m	Class B limit dBµV/m	Margin dB	Comments
V	1.0	38.41	12.9	11.8	24.7	40	-15.3	
V	1.0	56.72	13.9	10.5	24.4	40	-15.6	
V	1.0	85.33	18.2	8.6	26.8	40	-13.2	
V	1.0	93.81	4.7	10.6	15.3	44	-28.7	
V	1.0	101.77	17.8	12.0	29.8	44	-14.2	
V	1.0	118.10	12.5	13.1	25.6	44	-18.4	
V	1.0	134.35	8.8	12.4	21.2	44	-22.8	
V	1.0	173.10	11.8	17.6	29.4	44	-14.6	
H	1.5	235.21	7.2	13.8	21.0	46	-25.0	
H	2.5	366.54	15.2	18.0	33.2	46	-12.8	
H	1.1	378.11	21.1	18.2	39.3	46	-6.7	
H	1.3	384.11	21.8	18.4	40.2	46	-5.8	
H	2.0	390.13	19.4	18.5	37.9	46	-8.1	
H	2.2	396.22	16.8	18.6	35.4	46	-10.6	
H	2.1	401.64	10.3	18.7	29.0	46	-17.0	
H	1.9	408.12	16.0	18.9	34.9	46	-11.1	
H	2.0	414.12	13.4	19.1	32.5	46	-13.5	

Comments:

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Radiated Emissions **Date:**

Company: Remote Technology Inc.
Nmodel No.: TheaterTouch, Remote Control
Test Engineer: Simon Khazon
Special Config. Info: Fundamental Frequency 418.004 MHz
Standard: FCC Part 15, Subpart C, 15.231
Note: The table shows the worst case radiated emissions
All measurements were taken using a Quazi-Peak detector

Table # 4

Antenna Polarity, Hts	Frequency MHz	Reading dBuV	AF + CF dB	Amplifier Gain(dB)	Net at 3m. dBuV/m	Limit dBuV/m	Margin dB	Comments
V, 2.04	417.95	49.1	19.0	0.0	68.1	80.3	-12.2	
H, 2.18	417.95	58.8	19.0	0.0	77.8	80.3	-2.5	
V, 1.48	835.92	2.8	27.4	0.0	30.2	60.3	-30.1	
H, 1.00	835.92	6.7	27.4	0.0	34.1	60.3	-26.2	
V,1.00	1254.00	39.4	28.3	39.0	28.7	60.3	-31.6	
H,1.12	1254.00	40.0	28.5	39.0	29.5	60.3	-30.8	
V,2.75	1671.83	33.4	30.1	38.0	25.5	60.3	-34.8	1
H,1.00	1671.83	37.9	30.0	38.0	29.9	60.3	-30.4	1
V,1.20	2090.00	32.9	32.4	37.0	28.3	60.3	-32.0	
H,1.43	2090.00	32.7	32.3	37.0	28.0	60.3	-32.3	
V,2.77	2508.87	38.4	34.1	36.0	36.5	60.3	-23.8	
H,2.91	2508.87	33.4	34.2	36.0	31.6	60.3	-28.7	
V,1.33	2926.00	30.7	35.4	35.3	30.8	60.3	-29.5	
H,1.56	2926.00	30.4	35.2	35.3	30.3	60.3	-30.0	
V,1.17	3344.06	30.7	36.9	35.0	32.6	60.3	-27.7	
H,2.78	3344.06	30.8	36.7	35.0	32.5	60.3	-27.8	
V,1.45	3762.00	29.5	38.0	34.9	32.6	60.3	-27.7	1
H,1.73	3762.00	29.5	38.1	34.9	32.7	60.3	-27.6	1
V,1.98	4180.14	28.5	38.6	34.7	32.4	60.3	-27.9	1
H,1.33	4180.14	28.4	38.3	34.7	32.0	60.3	-28.3	1

Comments: 1. Measurements were taken in the frequency restriction band specified in FCC part 15.205.

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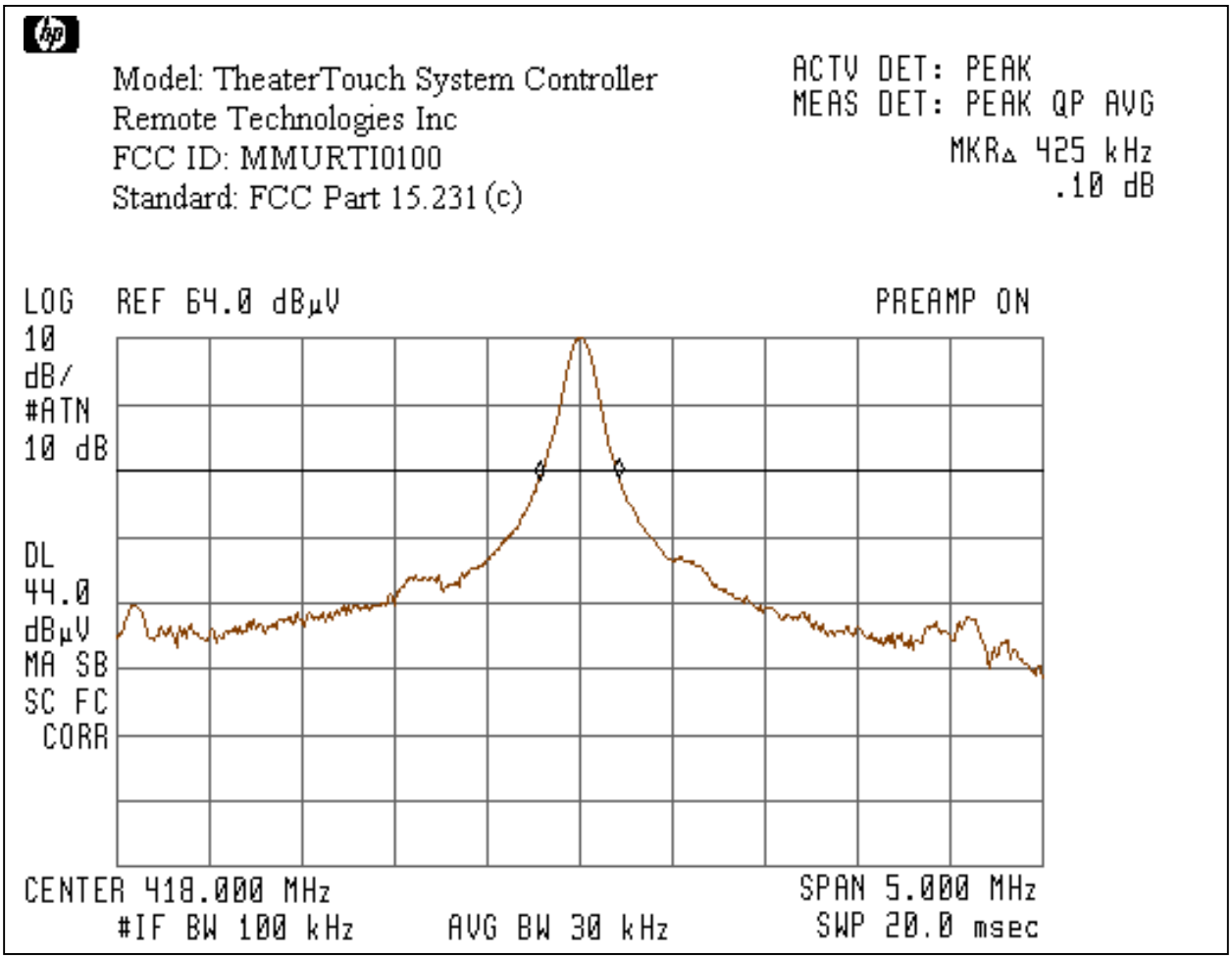
Graph #1 – Frequency 418.004 MHz
Bandwidth of the Fundamental Frequency



Limits Calculation:

ΔLimit = 0.25% x 418 MHz = 1.045 MHz

ΔMeasured = 0.425 MHz

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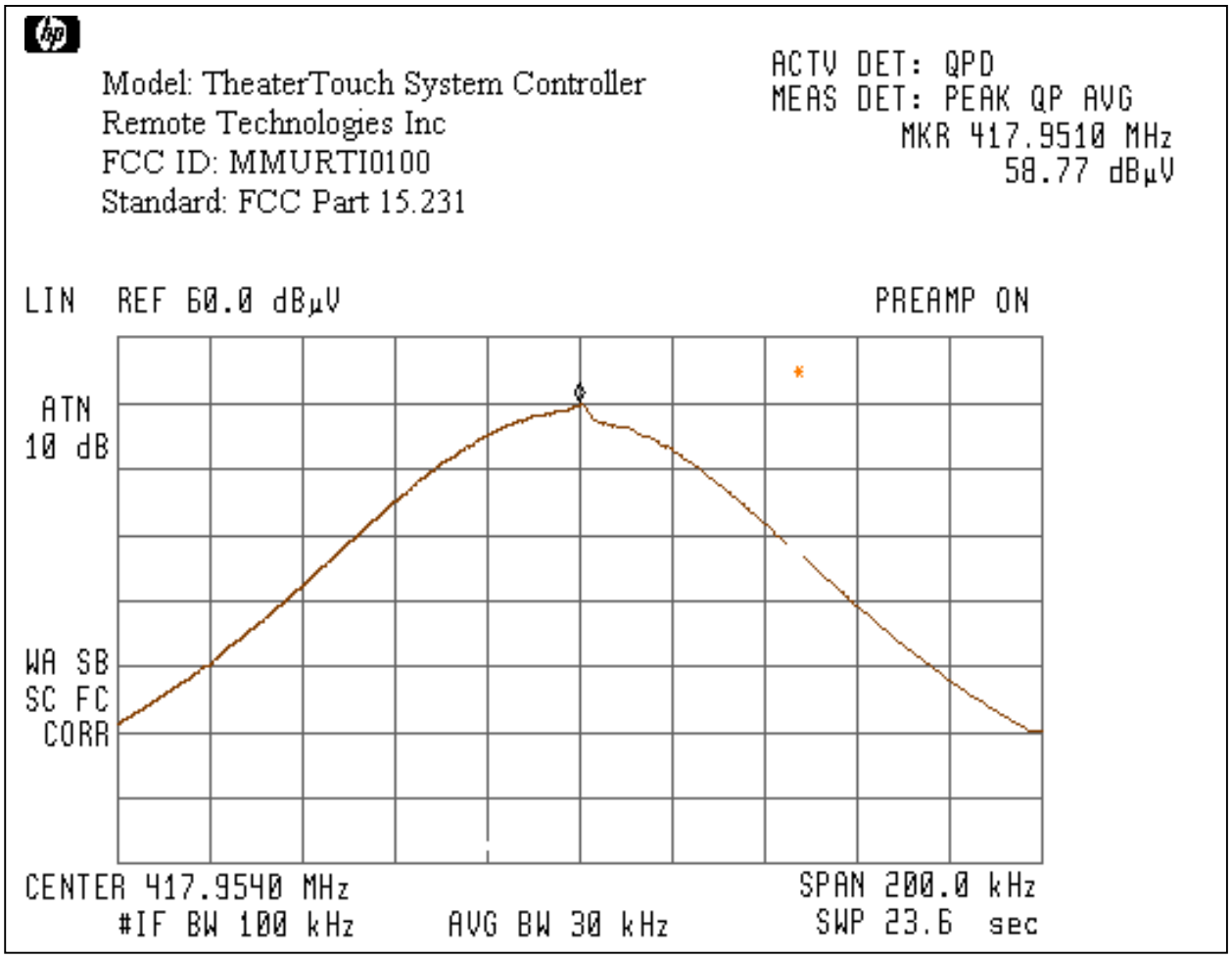
Graph #2 – Frequency 418.004 MHz
Fundamental Frequency



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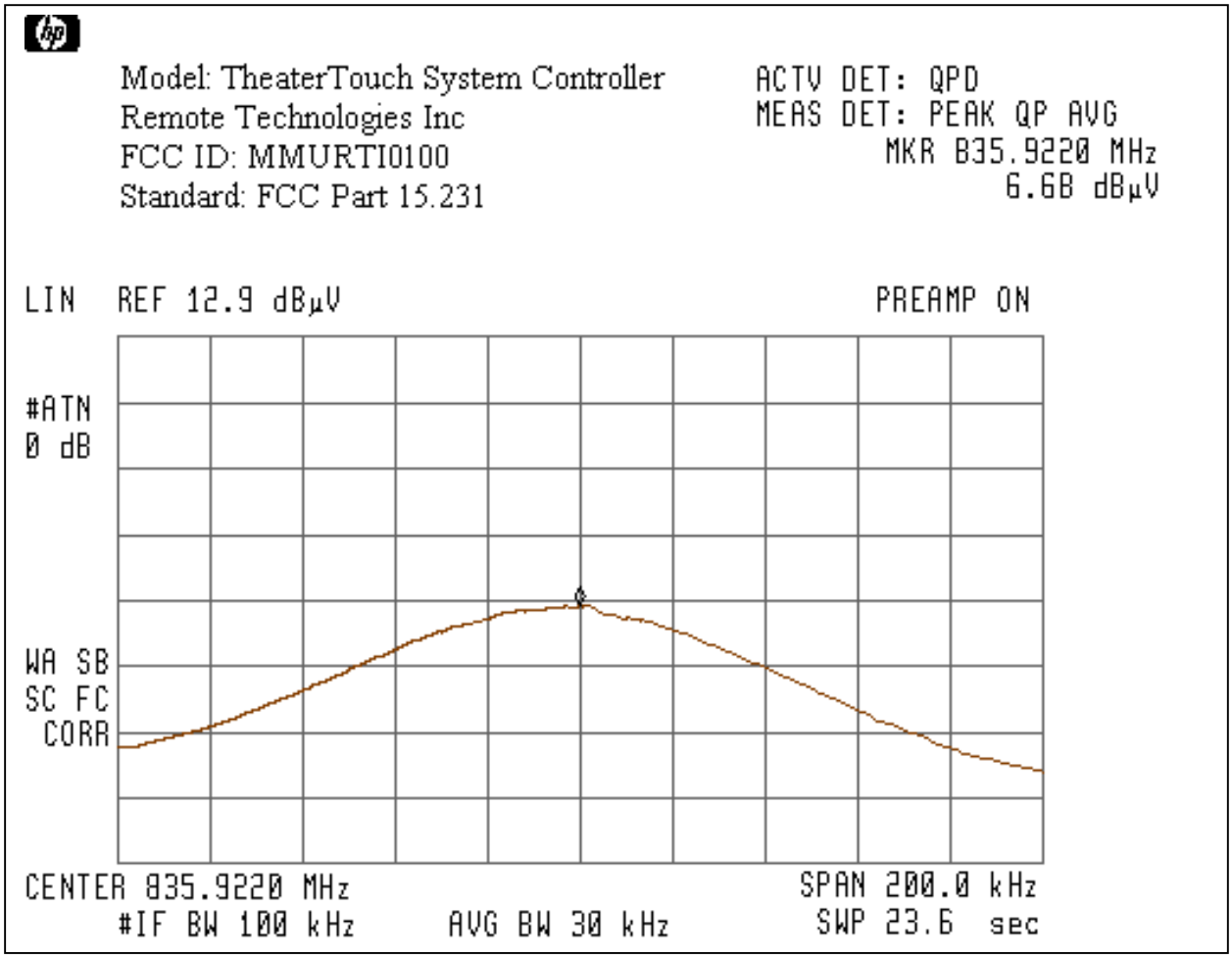
Graph #3 – Frequency 835.922 MHz
2nd Harmonic



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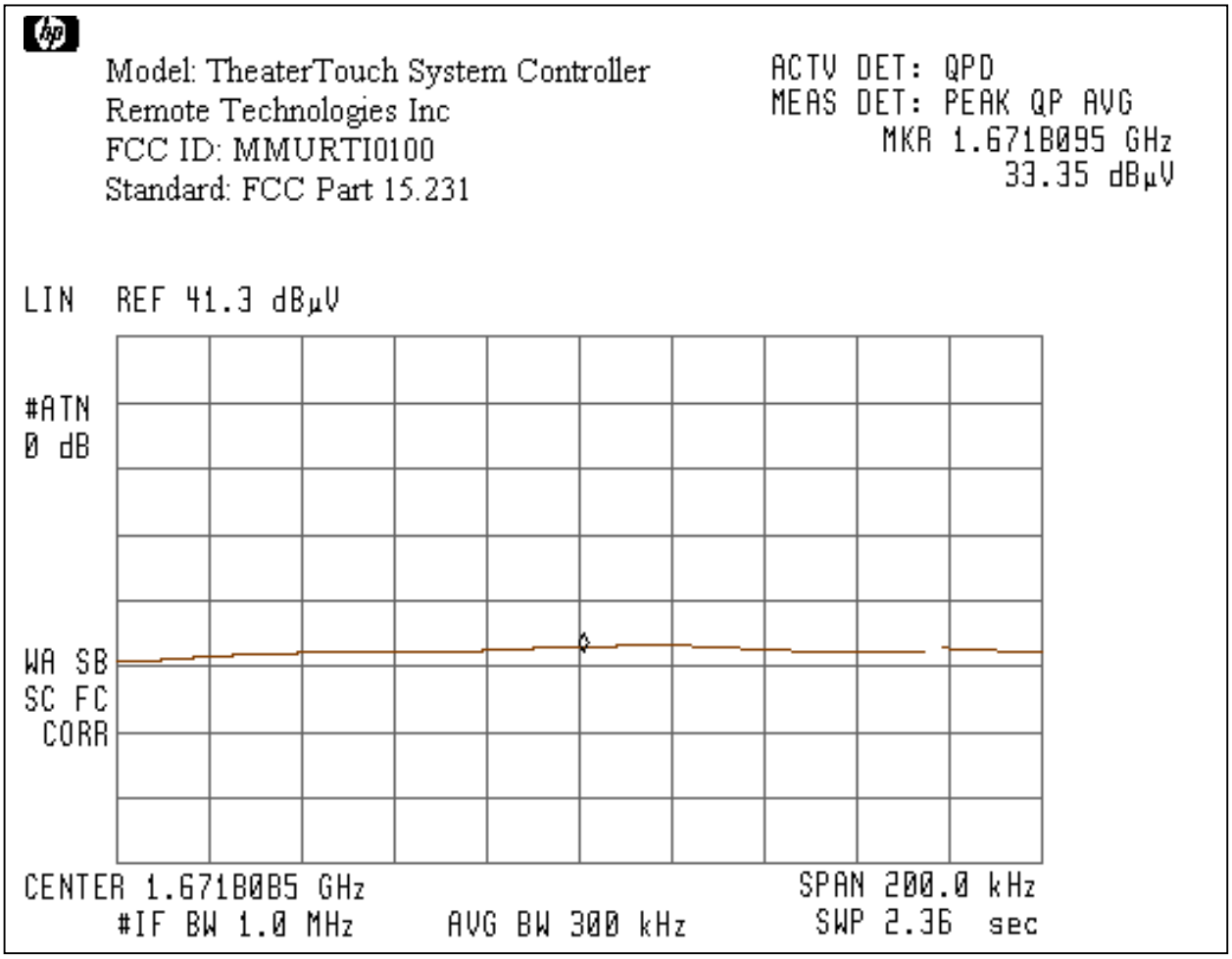
Graph #4 – Frequency 1671 MHz
4th Harmonic



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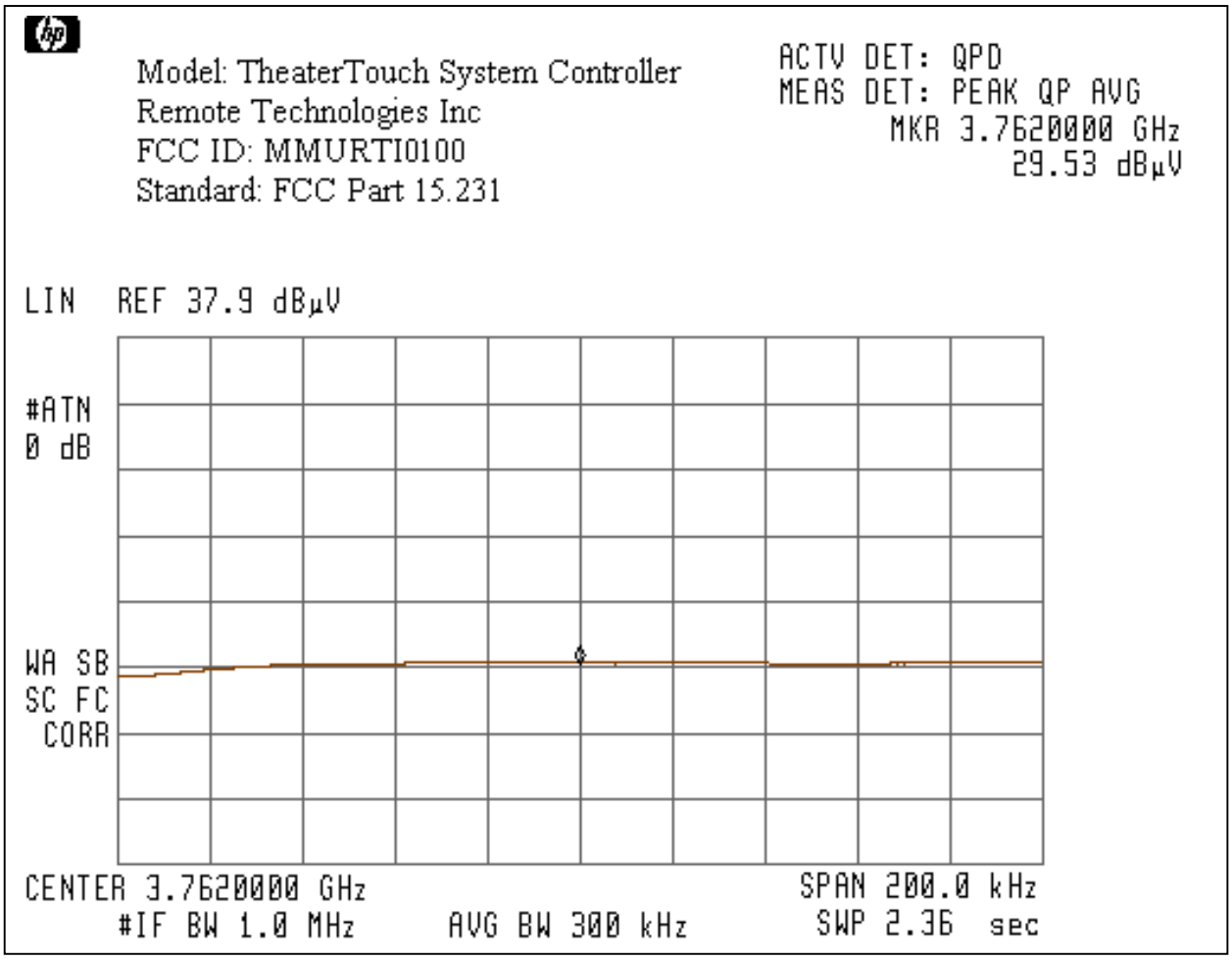
Graph #5 – Frequency 3762 MHz
9th Harmonic



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Graph #6 – Frequency 4180 MHz
10th Harmonic

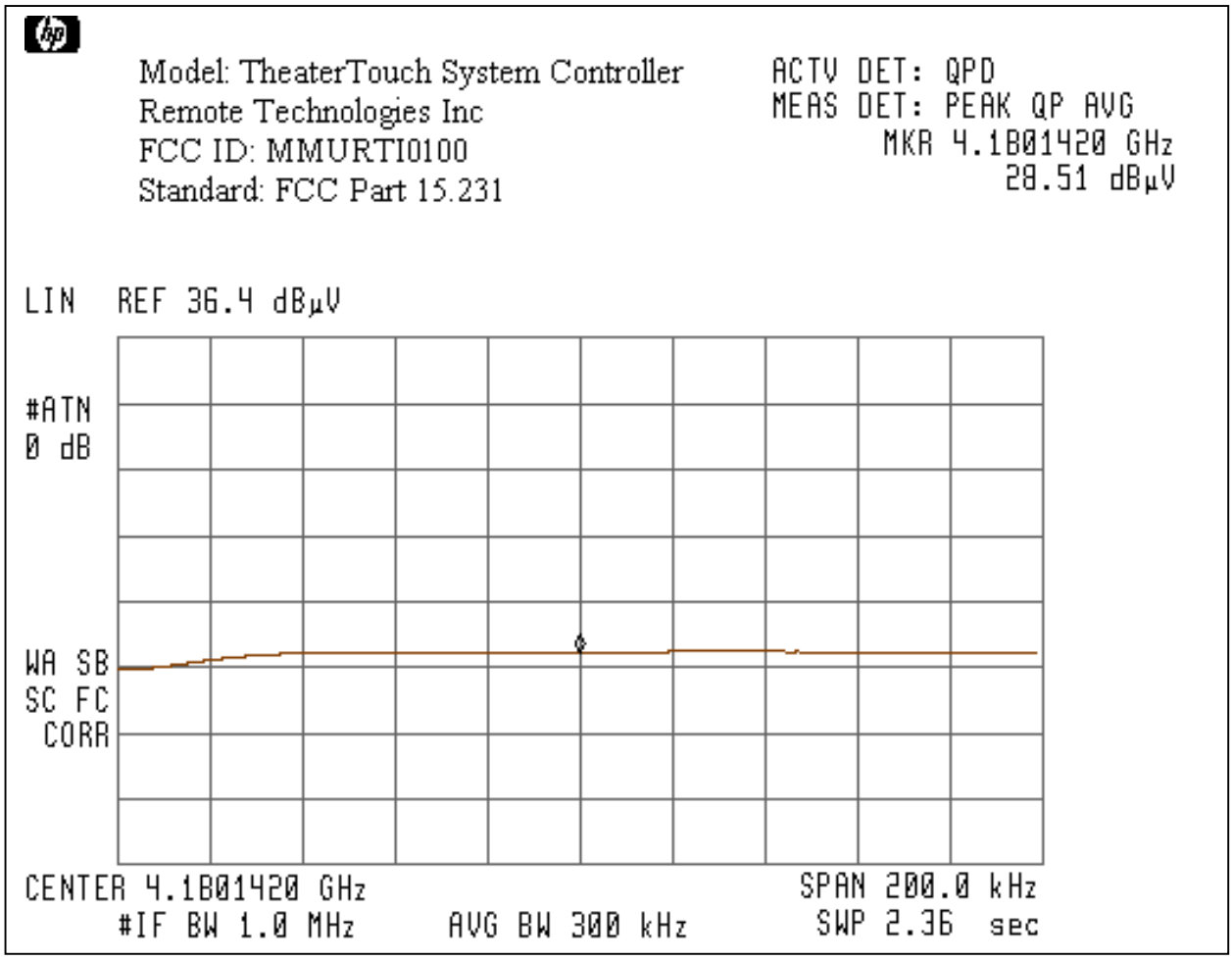

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EXHIBIT III

FCC ID LABEL LOCATION

(See ID Label/Location Info. Attachments)

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EXHIBIT IV

INTERNAL PHOTOS

(See Internal Photo Attachments)

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EXHIBIT V

ELECTRICAL SCHEMATICS AND BLOCK DIAGRAM

(See Block Diagram and Schematic Attachments)

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EXHIBIT VI

USER MANUAL AND OPERATIONAL DESCRIPTION

(See User Manual and Operational Description Attachments)