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Test Report: 2007 0510794 HD Remote FCC

Project number: 26-794-SMKR1

Applicant: SMK
1055 Tierra del Rey
Chula Vista, CA 91910


Equipment Under Test (EUT): Remote Control for Shutters and Windows

Model: HD Remote

In Accordance With: FCC Part 15 Subpart C, 15.231

FCC ID# UXURC4U

Tested By: Nemko USA Inc.
11696 Sorrento Valley Road, Suite F
San Diego, CA 92121

Authorized By: 
Michael T. Krumweide, EMC Supervisor

Date: JUNE 11, 2007

Total Number of Pages: 25

Section 1. Summary of Test Results

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. 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.

The assessment summary is as follows:

Apparatus Assessed: Remote Control for Shutters and Windows Model HD Remote

Specification: FCC Part 15 Subpart C, 15.231

Compliance Status: Complies

Exclusions: None

Non-compliances: None

Report Release History:

REVISION	DATE	COMMENTS
-	June 11, 2007	Prepared By: Ferdinand S. Custodio
-	June 11, 2007	Initial Release: Mike T. Krumweide

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.

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TESTED BY: 
Ferdinand S. Custodio, EMC Test Engineer

Date: June 11, 2007

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Section 2: Equipment Under Test

2.1 Product Identification

The Equipment Under Test was identified as follows:

HD Remote Remote Control for Shutters and Windows

Production sample, serial number not available during assessment



2.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
HD Remote	Remote Control for Shutters and Windows	NA

2.3 Theory of Operation

The HD Remote is a Remote Control for Shutters and Windows. The EUT was exercised by activating the “up” button causing it to transmit continuously. The EUT will transmit on three (3) channels simultaneously and the intended receiver will select one channel that works the best for proper operation.

2.4 Technical Specifications of the EUT

Manufacturer:	SMK
Operating Frequency:	2452, 2433 and 2471 MHz in the 2400 - 2483.5 MHz Band
Rated Power:	873.21 μ W
Modulation:	GFSK
Antenna Connector:	Integral
Power Source:	3VDC from 2 (two) AAA alkaline batteries

Section 3: Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.231

Periodic operation in the band 40.66-40.77 MHz and above 70MHz.

3.2 Deviations From Laboratory Test Procedures

No deviations from Laboratory Test Procedure

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	28 °C - 31 °C
Humidity range	:	12 %-27%
Pressure range	:	86 - 106 kPa

3.4 Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
114	Antenna, Bicon	EMCO	3104	2997	12/20/2006	12/20/07
110	Antenna, LPA	Electrometrics	LPA-25	1217	12/18/2006	12/18/07
877	Antenna, DRG Horn, .7-18GHz	AH Systems	SAS-571	688	6/20/06	6/20/07
842	Preamp	NA	Nemko	NA	Verified 5/7/07	
915	EMI Test Receiver 20 Hz-26.5	Rohde & Schwarz	1088.7490.26	837491/0002	2/6/2007	02/06/08
899	RF Filter Section	HP	85460A	3448A00288	1/18/07	1/18/08
898	EMI Receiver	HP	8546A	3625A00348	1/18/07	1/18/08

Section 4: Observations

4.1 Modifications Performed During Assessment

No modifications 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 Test Deleted

No Tests were deleted from this assessment.

4.5 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: Test Results

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 FCC Part 15 Subpart C § 15.231: Test Results

Clause	Test/Requirement Description	Results
§ 15.231 (b)	Radiated Emissions	Complies
§ 15.231 (c)	Occupied Bandwidth	Complies
§ 15.231 (a)	Transmission requirements	Complies
§ 15.231 (a)(1)	Manual activation requirement	Complies
§ 15.231 (a)(2)	Automatic activation requirement	Not Applicable ¹
§ 15.231 (a)(3)	Predetermined, polling or supervisory transmissions	Not Applicable ²
§ 15.231 (a)(4)	Alarm device requirement	Not Applicable ³
§ 15.231 (a)(5)	Security systems requirement	Not Applicable ²
§ 15.207	Powerline Conducted Emissions	Not Applicable ⁴

Footnotes:

1. The device utilize manual activation.
2. The device is not used in security or safety applications.
3. The EUT is a non-alarm device.
4. The device is battery powered.

Appendix A: Test Results

Clause 15.231 Periodic operation in the band 40.66-40.77 MHz and above 70MHz

(b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of harmonics (microvolts/meter)
40.66–40.70	2,250	225
70–130	1,250	125
130–174	11,250 to 3,750	1125 to 375
174–260	3,750	375
260–470	13,750 to 12,500	1375 to 1,250
Above 470	12,500	1,250

¹Linear interpolations.

Test Conditions:

Sample Number:	HD Remote	Temperature:	31°C
Date:	May 8, 2007	Humidity:	12%
Modification State:		Tester:	Ferdinand Custodio
		Laboratory:	SOATS

Test Results:

See Attached Plots.

Additional Observations:

- The Spectrum was searched from 30MHz to the 10th Harmonic.
- The EUT was loaded with fresh batteries for every axis measured.
- Measurements below 1GHz were performed at 3m with CISPR quasi-peak detector. Peak detector of 1MHz RBW/VBW was used above 1GHz. Average measurements for fundamental were computed using the formula $FS_{avg} = FS_{peak} - 20 \log(\text{duty cycle})$.
- No emissions detected below 1GHz.
- No other harmonics detected after the 3rd Harmonic.

“X” Axis Measurements



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Radiated Emissions Data

Job # : 26-794-SMKR1 Date : 5-07-07 Page 1 of 1
 NEX # : _____ Time : 11AM
 Staff : FSC

Client Name : SKM Electronics EUT Voltage : Battery
 EUT Name : HD remote control EUT Frequency : _____
 EUT Model # : HD Remote Phase: _____
 EUT Serial # : 2 NOATS _____
 EUT Config. : Horizontal (flat) SOATS X
 Duty Cycle Factor = -20 Distance: 3m

Specification : CFR47 Part 15, Subpart C, 15.231 and 15.205

Loop Ant. # : NA
 Bicon Ant.#: NA Temp. (°C) : 31
 Log Ant.#: NA Humidity (%) : 12
 DRG Ant. # 877 Spec An.#: 915
 Dipole Ant.#: NA Spec An. Display #: 915
 Cable LF#: SOATS QP #: NA
 Cable HF#: 40ft PreSelect#: NA
 Preamp LF#: NA
 Preamp HF# 842

Quasi-Peak	RBW: 120 kHz
	Video Bandwidth 300 kHz
Peak	RBW: 1 MHz
	Video Bandwidth 1 MHz
Average	RBW: 1 MHz
	Video Bandwidth 10 Hz

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 F/L/R/B	Ant. Height m	Max. Reading (dBuV)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
2452	55.4	52.86	P			35.42	67.9	82.0	-14.1	Pass	
2433	56.1	52.93	P			36.07	68.6	82.0	-13.4	Pass	
2471	55.3	52.5	P			35.28	67.8	82.0	-14.2	Pass	
4904	72.86	72.46	P			72.86	66.4	74.0	-7.6	Pass	
4904	72.86	72.46	P			52.86	46.4	54.0	-7.6	Pass	
4866	71.64	71.38	P			71.64	67.1	74.0	-6.9	Pass	
4866	71.64	71.38	P			51.64	47.1	54.0	-6.9	Pass	
4942	73.1	73.3	P			73.31	66.8	74.0	-7.2	Pass	
4942	73.1	73.3	P			53.31	46.8	54.0	-7.2	Pass	
7356	57.67	56.01	P			57.67	60.9	74.0	-13.1	Pass	
7356	57.67	56.01	P			37.67	40.9	54.0	-13.1	Pass	
7299	58.83	56.42	P			58.83	62.8	74.0	-11.2	Pass	
7299	58.83	56.42	P			38.83	42.8	54.0	-11.2	Pass	
7413	56.5	55.0	P			56.49	59.3	74.0	-14.7	Pass	
7413	56.5	55.0	P			36.49	39.3	54.0	-14.7	Pass	

Note: Please see following table for corrected reading computations details for both fundamental and harmonic frequencies.

Meas. Freq. (MHz)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Attenuation (dB)
2452	28.5	4.0		
2433	28.5	4.0		
2471	28.5	4.0		
4904	33.9	6.0	46.4	
4904	33.9	6.0	46.4	
4866	33.9	6.0	44.4	
4866	33.9	6.0	44.4	
4942	33.9	6.0	46.4	
4942	33.9	6.0	46.4	
7356	36.8	9.6	43.2	
7356	36.8	9.6	43.2	
7299	36.8	9.6	42.4	
7299	36.8	9.6	42.4	
7413	36.8	9.6	43.6	
7413	36.8	9.6	43.6	

Max Reading for Fundamental Frequency = Meter Reading – Duty Cycle CF
 = 56.07 – 20
 = 36.07dB uV/m

Max Reading for Harmonic Frequency = Meter Reading (Peak)

Max Reading for Harmonic Frequency = Meter Reading – Duty Cycle CF (Average)
 = 56.07 – 20
 = 36.07dBuV/m

Corrected Reading (Fundamental) = Max.Reading+Antenna Factor+Cable Loss-RF Gain
 = 36.07 + 28.5 + 4 – 0
 = 68.6 dBuV/m

Corrected Reading (Harmonics) = Max.Reading+Antenna Factor+Cable Loss-RF Gain
 = 73.31+ 33.9 + 6 – 46.4
 = 66.8 dBuV/m

“Y” Axis Measurements



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Radiated Emissions Data

Job #: 26-794-SMKR1 Date: 5-07-07 Page 1 of 1
 NEX #: _____ Time: 11AM
 Staff: FSC

Client Name: SKM Electronics EUT Voltage: Battery
 EUT Name: HD remote control EUT Frequency: _____
 EUT Model #: HD Remote Phase: _____
 EUT Serial #: 2 NOATS: _____
 EUT Config.: Vertical on side SOATS: X
 Duty Cycle Factor = -20 Distance: 3m

Specification: CFR47 Part 15, Subpart C, 15.231 and 15.205

Loop Ant. #: NA
 Bicon Ant.#: NA Temp. (°C): 31
 Log Ant.#: NA Humidity (%): 12
 DRG Ant. #: 877 Spec An.#: 915
 Dipole Ant.#: NA Spec An. Display #: 915
 Cable LF#: SOATS QP #: NA
 Cable HF#: 40ft PreSelect#: NA
 Preamp LF#: NA
 Preamp HF#: 842

Quasi-Peak	RBW: 120 kHz
Video Bandwidth 300 kHz	
Peak	RBW: 1 MHz
Video Bandwidth 1 MHz	
Average	RBW: 1 MHz
Video Bandwidth 10 Hz	

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 F/L/R/B	Ant. Height m	Max. Reading (dBuV)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
2452	60.4	55.23	P			40.41	72.9	82.0	-9.1	Pass	
2433	60.4	54.57	P			40.43	72.9	82.0	-9.1	Pass	
2471	58.8	51.5	P			38.83	71.3	82.0	-10.7	Pass	
4904	79.17	71.68	P			79.17	72.7	74.0	-1.3	Pass	
4904	79.17	71.68	P			59.17	52.7	54.0	-1.3	Pass	
4866	78.06	71.81	P			78.06	73.6	74.0	-0.4	Pass	
4866	78.06	71.81	P			58.06	53.6	54.0	-0.4	Pass	
4942	79.0	71.6	P			79.03	72.5	74.0	-1.5	Pass	
4942	79.0	71.6	P			59.03	52.5	54.0	-1.5	Pass	
7356	56.96	58.32	P			58.32	61.5	74.0	-12.5	Pass	
7356	56.96	58.32	P			38.32	41.5	54.0	-12.5	Pass	
7299	57.7	58.09	P			58.09	62.1	74.0	-11.9	Pass	
7299	57.7	58.09	P			38.09	42.1	54.0	-11.9	Pass	
7413	57.2	55.1	P			57.24	60.0	74.0	-14.0	Pass	
7413	57.2	55.1	P			37.24	40.0	54.0	-14.0	Pass	

“Z” Axis Measurements



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Radiated Emissions Data

Job #: 26-794-SMKR1 Date: 5-07-07 Page 1 of 1
 NEX #: _____ Time: 11AM
 Staff: FSC

Client Name: SKM Electronics EUT Voltage: Battery
 EUT Name: HD remote control EUT Frequency: _____
 EUT Model #: HD Remote Phase: _____
 EUT Serial #: 2 NOATS: _____
 EUT Config.: Standing SOATS: X
 Duty Cycle Factor = -20 Distance: 3m

Specification: CFR47 Part 15, Subpart C, 15.231 and 15.205

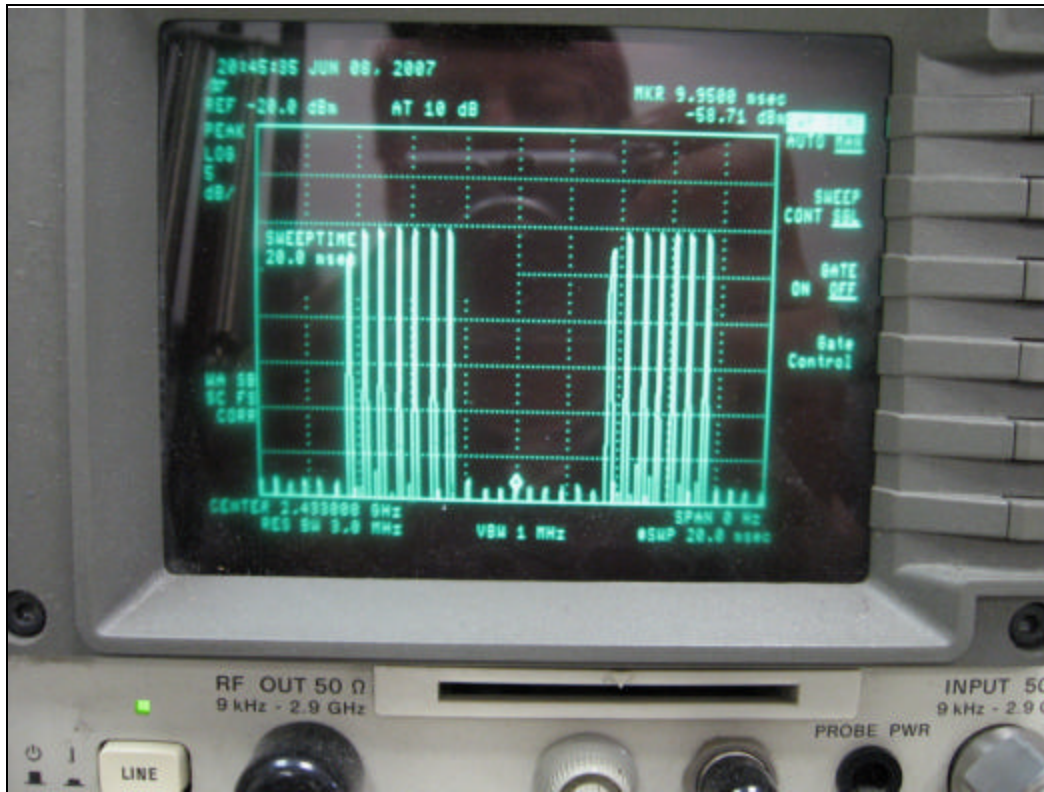
Loop Ant. #: NA
 Bicon Ant.#: NA Temp. (°C): 31
 Log Ant.#: NA Humidity (%): 12
 DRG Ant. #: 877 Spec An.#: 915
 Dipole Ant.#: NA Spec An. Display #: 915
 Cable LF#: SOATS QP #: NA
 Cable HF#: 40ft PreSelect#: NA
 Preamp LF#: NA
 Preamp HF#: 842

Quasi-Peak	RBW: 120 kHz
	Video Bandwidth 300 kHz
Peak	RBW: 1 MHz
	Video Bandwidth 1 MHz
Average	RBW: 1 MHz
	Video Bandwidth 10 Hz

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 F/L/R/B	Ant. Height m	Max. Reading (dBuV)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
2452	58.8	61.36	P			41.36	73.9	82.0	-8.1	Pass	
2433	59.8	62.14	P			42.14	74.6	82.0	-7.4	Pass	
2471	57.8	61.9	P			41.89	74.4	82.0	-7.6	Pass	
4904	74.7	76.2	P			76.2	69.7	74.0	-4.3	Pass	
4904	74.7	76.2	P			56.2	49.7	54.0	-4.3	Pass	
4866	74.38	75.95	P			75.95	71.5	74.0	-2.5	Pass	
4866	74.38	75.95	P			55.95	51.5	54.0	-2.5	Pass	
4942	74.1	77.6	P			77.57	71.1	74.0	-2.9	Pass	
4942	74.1	77.6	P			57.57	51.1	54.0	-2.9	Pass	
7356	56.34	55.77	P			56.34	59.5	74.0	-14.5	Pass	
7356	56.34	55.77	P			36.34	39.5	54.0	-14.5	Pass	
7299	57.86	57.33	P			57.86	61.9	74.0	-12.1	Pass	
7299	57.86	57.33	P			37.86	41.9	54.0	-12.1	Pass	
7413	54.1	55.6	P			55.59	58.4	74.0	-15.6	Pass	
7413	54.1	55.6	P			35.59	38.4	54.0	-15.6	Pass	

Duty Cycle Calculations:



Duty Cycle = $92\mu\text{s} \times 14 \times 5$
= 6.4ms
= **6.4%**

Duty Cycle Correction Factor = $20 \log 0.064$
= -23.87
= **-20 (allowed)**

Band Edge Measurements:



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Radiated Emissions Data

Job #: 26-794-SMKR1 Date: 5-07-07 Page 1 of 1
 NEX #: _____ Time: 11AM
 Staff: FSC

Client Name: SMK Electronics EUT Voltage: Battery
 EUT Name: HD remote control EUT Frequency: _____
 EUT Model #: HD Remote Phase: _____
 EUT Serial #: 2 NOATS: _____
 EUT Config.: Standing SOATS: X
 Distance: 3m

Specification: CFR47 Part 15, Subpart B, Class B

Loop Ant. #: NA
 Bicon Ant. #: NA Temp. (°C): 31
 Log Ant. #: NA Humidity (%): 12
 DRG Ant. #: 877 Spec An. #: 915
 Dipole Ant. #: NA Spec An. Display #: 915
 Cable LF#: SOATS QP #: NA
 Cable HF#: 40ft PreSelect#: NA
 Preamp LF#: NA
 Preamp HF#: 842

Quasi-Peak	RBW: 120 kHz
Video Bandwidth 300 kHz	
Peak	RBW: 1 MHz
Video Bandwidth 1MHz	
Average	RBW: 1 MHz
Video Bandwidth 10 Hz	

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 F/L/R/B	Ant. Height m	Max. Reading (dBuV)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
2400	49.78	51.67	P			51.67	36.1	74.0	-37.9	Pass	
2400	37.6	37.61	A			37.61	22.0	54.0	-32.0	Pass	
2483.5	55.89	56.44	P			56.44	40.8	74.0	-33.2	Pass	
2483.5	41.89	41.91	A			41.91	26.3	54.0	-27.7	Pass	

Meas. Freq. (MHz)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Attenuation (dB)
2400	28.5	4.0	48.1	
2400	28.5	4.0	48.1	
2483.5	28.5	4.0	48.1	
2483.5	28.5	4.0	48.1	

Time of Occupancy Measurements:

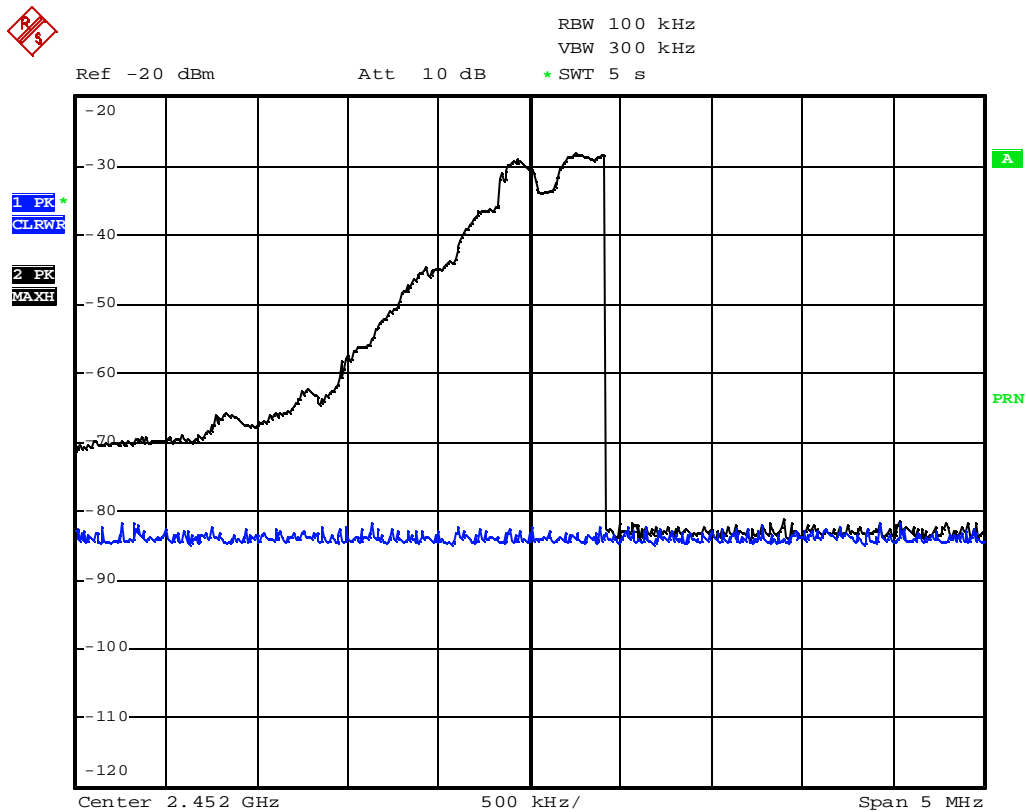
15.231(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Test Conditions:

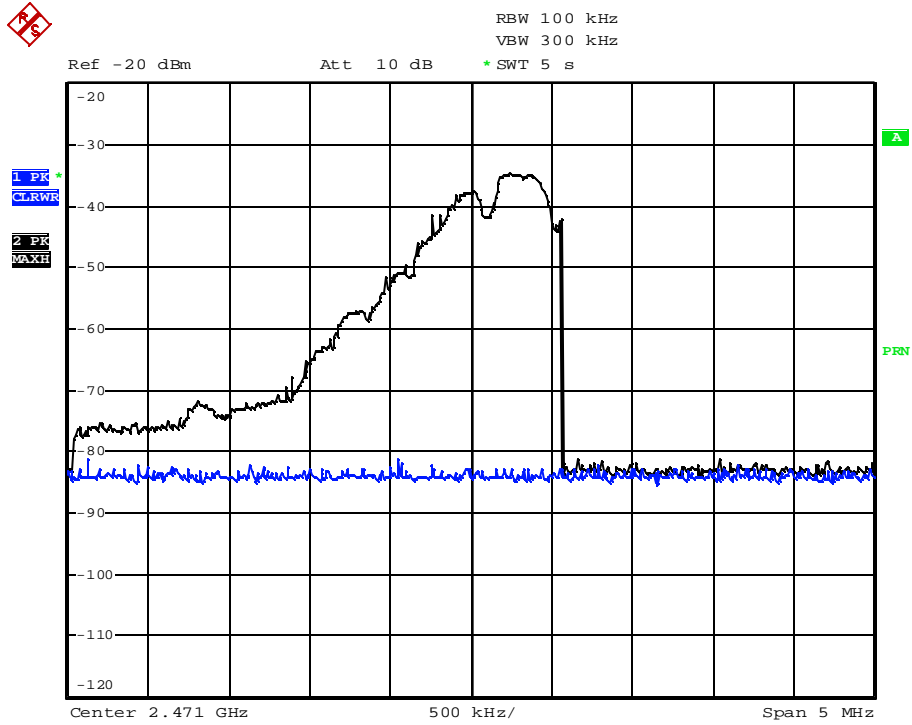
Sample Number:	HD Remote	Temperature:	27°C
Date:	June 1, 2007	Humidity:	28%
Modification State:		Tester:	Ferdinand Custodio
		Laboratory:	Shield Room # 2

Test Results:

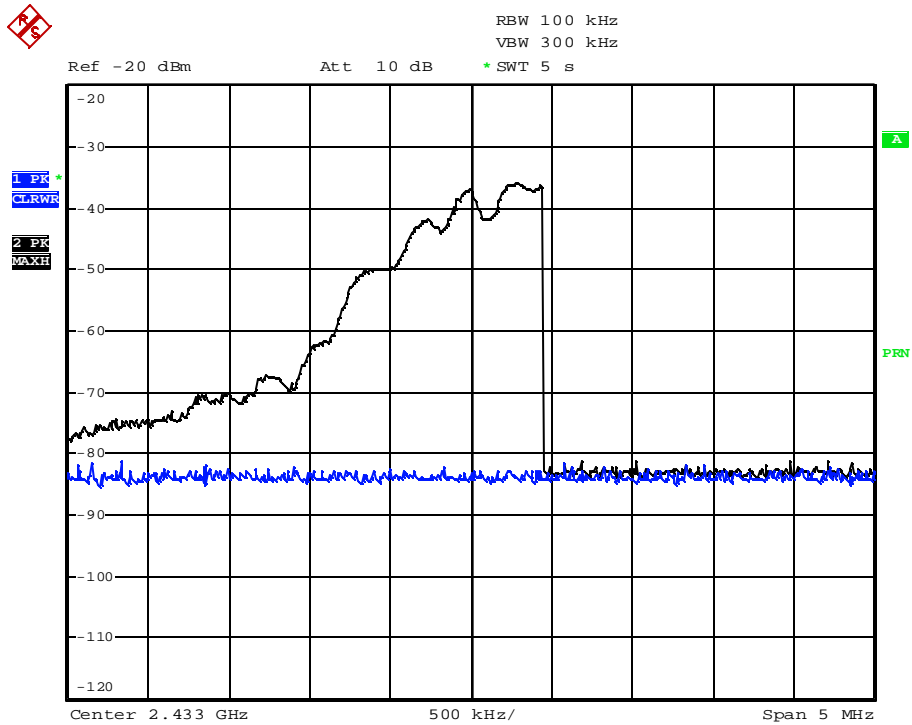
The spectrum analyzer was set to 5 seconds sweep capturing the deactivation time of the EUT. All three (3) fundamental frequencies were tested. The test was done with a new set of batteries. The EUT deactivates instantaneously.



Date: 1.JUN.2007 09:55:14



Date: 1.JUN.2007 09:56:19



Date: 1.JUN.2007 09:50:41

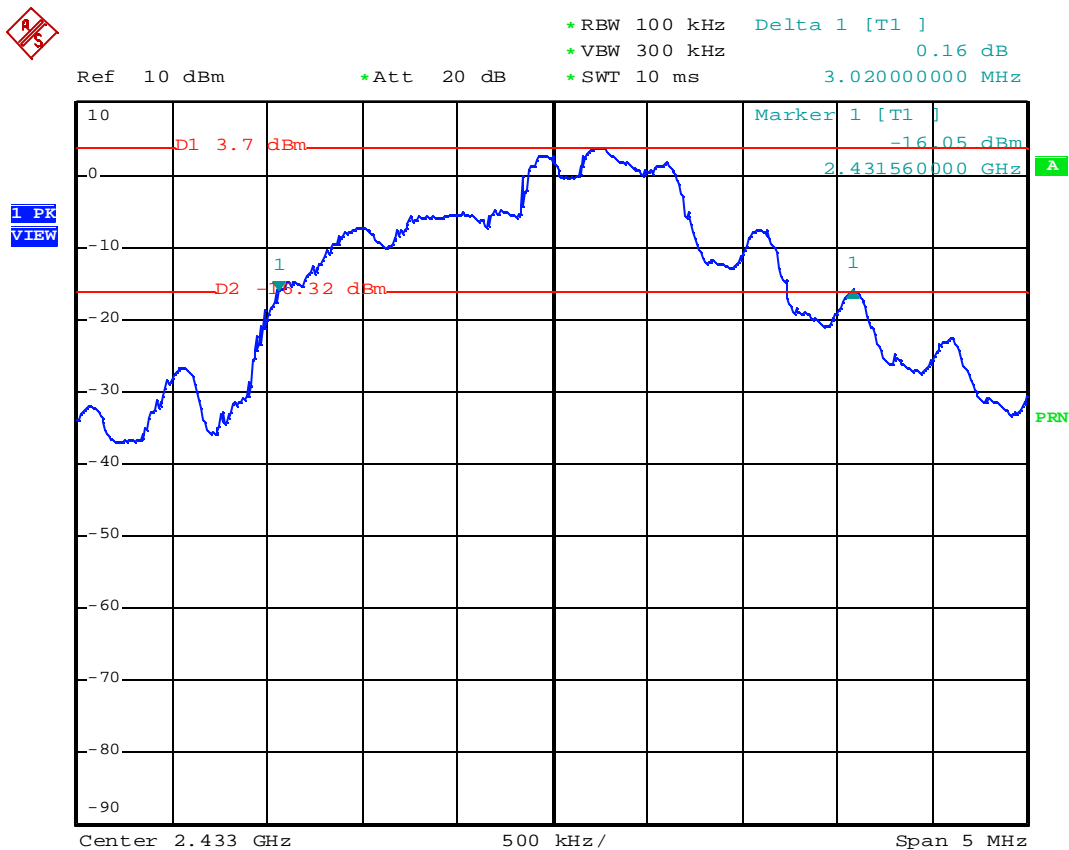
Bandwidth Measurements:

15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Conditions:

Sample Number:	HD Remote	Temperature:	31°C
Date:	May 7, 2007	Humidity:	12%
Modification State:		Tester:	Ferdinand Custodio
		Laboratory:	Nemko SD

Test Results:



Date: 7.MAY.2007 16:53:27

Limit = 0.5% of 2.433GHz = 12.165MHz
 Measured bandwidth at 20dB down from carrier is 3MHz

Appendix B: Setup Photographs

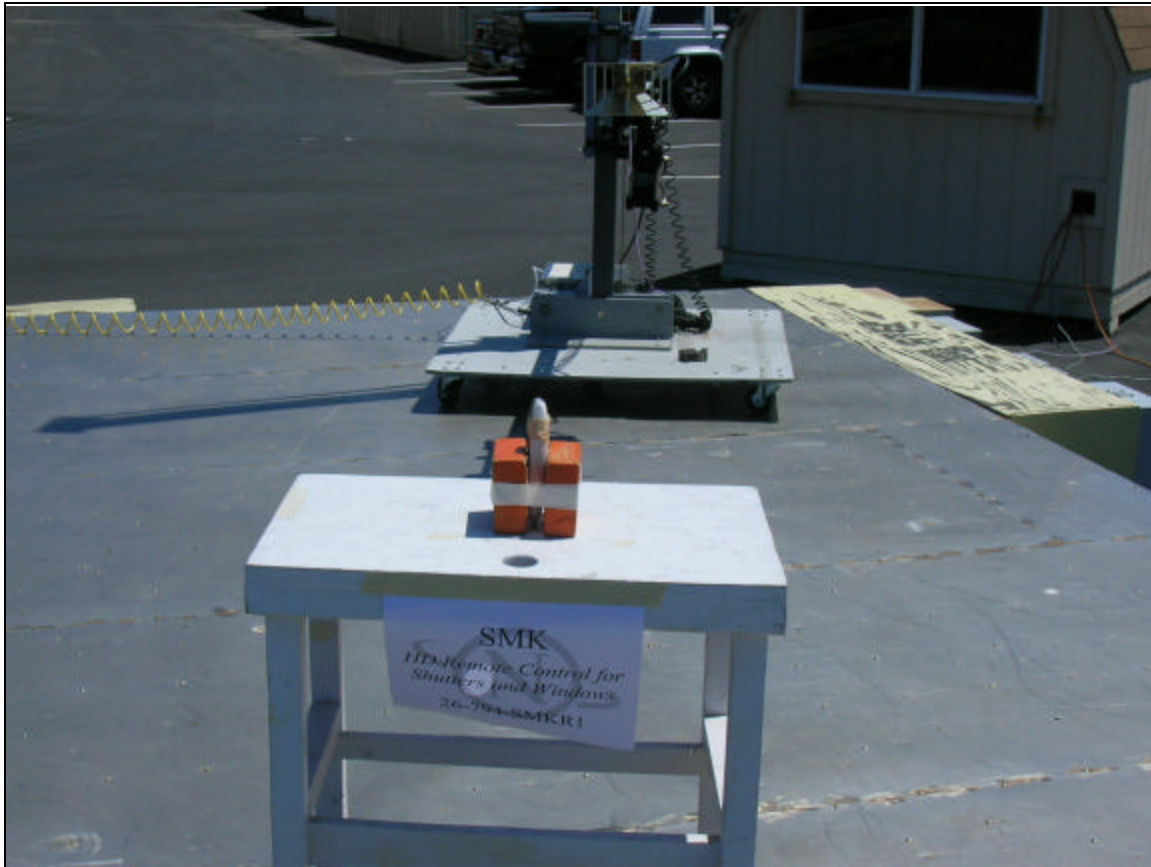
Radiated Emissions Setup (X-axis):



Radiated Emissions Setup (Y-axis):



Radiated Emissions Setup (Z-axis):



Appendix C: Block Diagram of Test Setups

Test Site For Radiated Emissions

