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FCC PART 15.231 TEST REPORT

Applicant	SEA USA INC.
Address	8332 NW 30TH Terrace
	Doral FL 33122
FCC ID	UCX-SMART
Product Description	Remote Control
Date Sample Received	September 8, 2006
Date Tested	September 12, 2006
Tested By	Joe Scoglio
Approved By	Mario de Aranzeta
Timco Report No.	1255ZUT6TestReport.PDF
Test Results	☒ Pass ☐ Fail

ACCREDITED
Certificate # 0955-01

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ATTESTATION STATEMENT

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.

Authorized by: Mario de Aranzeta

Signature: On file

Function: Engineer

Date: September 13, 2006

ACCREDITED
Certificate # 0955-01

GENERAL INFORMATION

Applicable Rule(s): FCC Part 15.231, ANSI C63.4

DUT Specification

Description	Remote Control Transmitter		
FCC ID	UCX-SMART		
Model Name	N/A		
Tx Frequency	433.92MHz		
Power Source	☐ 110–120Vac/50– 60Hz		
	☐ DC Power		
	☒ Battery Operated Exclusively		
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☐ Fixed	☐ Mobile	☒ Portable

Test Facility: The test sites are located at Timco Engineering Inc., 849 NW State Road 45 Newberry, FL 32669 USA.

Test Condition: The temperature was 26ºC with a relative humidity of 50%.

Modification to the DUT: No modification was made to the DUT during testing.

Deviation from the standard: No deviation.

Test Exercise (e.g software description, test signal, etc.): The DUT was placed in continuous transmit mode of operation.

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/06	1/10/09
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/27/04	3/26/07
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 12/7/05	12/7/07
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 12/7/05	12/7/07
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 12/8/05	12/8/07
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 12/8/05	12/8/07
Analyzer Blue Tower Spectrum Analyzer	HP	8568B	2928A04729 2848A18049	CAL 4/13/05	4/13/07
Analyzer Blue Tower RF Preselector	HP	85685A	2926A00983	CAL 9/5/05	9/5/07
Analyzer Blue Tower Quasi-Peak Adapter	HP	85650A	2811A01279	CAL 4/13/05	4/13/07
Analyzer Silver Tower Spectrum Analyzer	HP	8566B Opt 462	3552A22064 3638A08608	CAL 12/8/04	12/8/06
Analyzer Silver Tower RF Preselector	HP	85685A	2620A00294	CAL 4/27/04	12/8/06
Analyzer Silver Tower Quasi-Peak Adapter	HP	85650A	3303A01844	CAL 12/8/04	12/8/06
Analyzer Open-Frame Tower Preamplifier	HP	8449B	3008A01075	CAL 8/8/05	8/8/07
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 4/29/05	4/29/07
Antenna: Biconnical	Eaton	94455-1	1057	CAL 12/12/05	12/12/07

TEST PROCEDURE

Radiation Interference: The test procedure used was ANSI C63.4-2003 using a Agilent spectrum analyzer with a preselector. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz and the video bandwidth was 300 kHz.

Occupied Bandwidth: A small sample of the transmitter output was fed into the spectrum analyzer and the following plot was generated. The vertical scale is set to 10 dB per division.

Formula Of Conversion Factors: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:
Freq (MHz) METER READING + ACF +CL= FS
33 20 dBuV + 10.36 dB/m+1.2 = 31.56 dBuV/m @ 3m

ANSI C63.4-2003 Measurement Procedures: The DUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The UUT was placed in the center of the table. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to 10th harmonic of the fundamental.

Peak readings were taken in three (3) orthogonal planes if necessary and the highest readings were converted to average readings based on the duration of "ON" time in 100 mseconds.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

RADIATION INTERFERENCE

Rules Part No.: 15.231

Requirements:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBµV)	Field Strength of Harmonics and Spurious Emissions (dBµV/m @ 3m)
40.66 to 40.70	67.04	47.04
70 to 130	61.94	41.94
130 to 174	61.94 to 71.48	41.94 to 51.48
174 to 260	71.48	51.48
260 to 470	71.48 to 81.94	51.48 to 61.94
470 and above	81.94	61.94

The limit for average field strength dBuV/m for the fundamental frequency = 80.82 dBµV/m. No fundamental is allowed in the restricted bands.

The limit for average field strength dBuV/m for the harmonics and spurious frequencies = 60.82 dBµv/m. Spurious in the restricted bands must be less than 54 dBµV/m or 15.209.

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows:
1) for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F)-6136.3636;
2) for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F)-7083.3333.

Sample calculation of limit @ 315 MHz:

41.6667 (315)-7083.3333 = 6041.68 uV/m
20log(6041.68) = 75.62dBuV/m limit @ 315 MHz

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Duty Cycle Factor dB	Field Strength dBuV/m	Margin dB
433.9	433.90	51.7	H	3.24	16.76	7.00	64.70	16.13
433.9	433.90	54.5	V	3.24	16.40	7.00	67.14	13.69
433.9	867.80	29.5	H	4.87	22.86	7.00	50.23	10.60
433.9	867.80	36.5	V	4.87	22.48	7.00	56.85	3.98
433.9	1,301.70 *	24.9	H	1.35	28.00	7.00	47.25	6.75
433.9	1,301.70 *	28.0	V	1.35	28.00	7.00	50.35	3.65
433.9	1,735.60	19.7	H	1.57	29.70	7.00	43.97	16.86
433.9	1,735.60	23.7	V	1.57	29.70	7.00	47.97	12.86
433.9	2,169.50	12.5	H	1.77	31.94	7.00	39.21	21.62
433.9	2,169.50	15.1	V	1.77	31.94	7.00	41.81	19.02
433.9	2,603.40	10.0	H	1.94	32.77	7.00	37.71	23.11
433.9	2,603.40	11.4	V	1.94	32.77	7.00	39.11	21.71
433.9	3,037.30	8.3	H	2.11	33.39	7.00	36.80	24.02
433.9	3,037.30	10.1	V	2.11	33.39	7.00	38.60	22.22
433.9	3,471.20	6.3	V	2.24	33.31	7.00	34.85	25.97
433.9	3,471.20	9.8	H	2.24	33.31	7.00	38.35	22.47

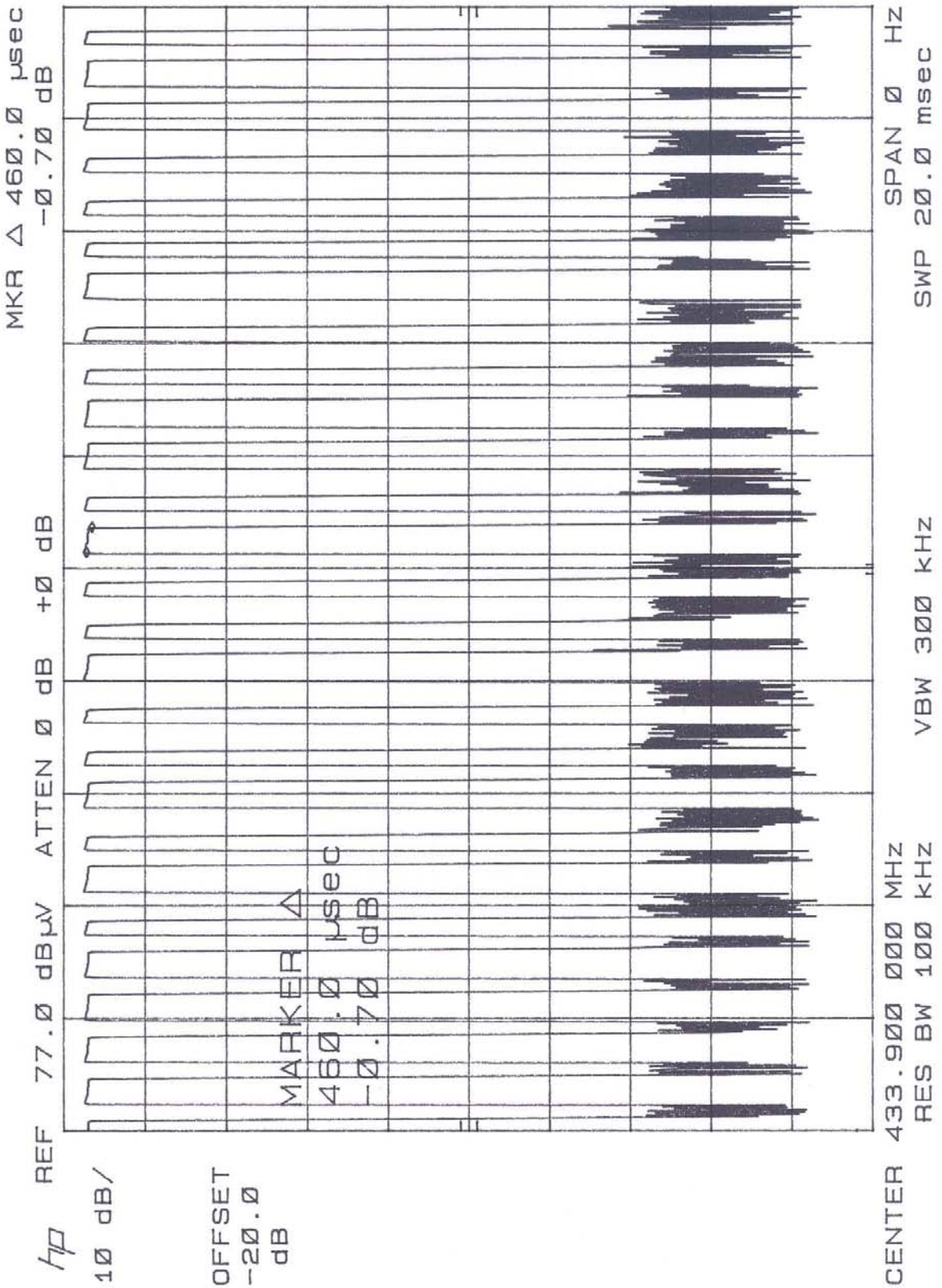
* -Denotes restricted bands

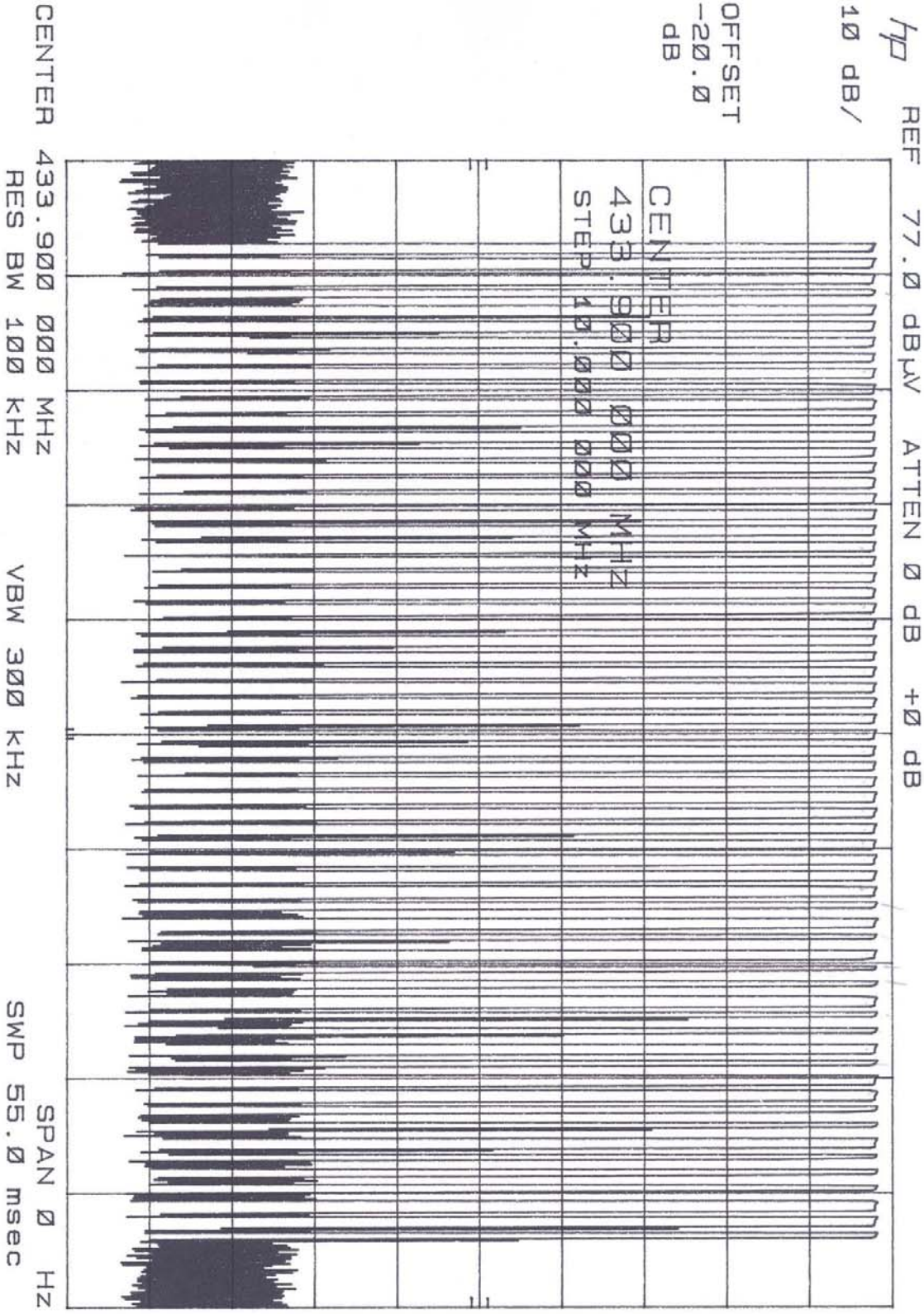
CALCULATION OF DUTY CYCLE

The period of the pulse train is determined by observing it on an oscilloscope or a spectrum analyzer with zero (0) frequency span. A plot is then made of the pulse train with a sweep time of 100 milliseconds. This sweep determines the duration of the pulse train, which in this case is millisecond. This sweep allows the determination of the number of and type of pulses, i.e. long & short. Plots are then made showing the duration of each type of pulse and its duration. From the 100 millisecond Plot, the number of a given type of pulse is then multiplied by the duration of that type pulse. This allows the calculation of the amount of time the UUT is on within 100 ms. If the pulse train is longer than 100 ms then this number is multiplied by 100 to determine the percentage ON TIME. If the pulse train is less than 100 ms the total on time is divided by the length of the pulse train and then multiplied by 100 to determine the percentage ON TIME.

In this case there were 14 short pulses .240 mS long and 50 long pulses .460 ms long for a total of 26.36 ms ON TIME within a 58.4 ms pulse train. The average field strength is determined by multiplying the peak field strength by the percent on time.

dB = 20*log(ON TIME/PERIOD)
dB = 20*log{[(50*0.46) + (14*0.24)]/58.4]}
dB = 20*log(26.36/58.4)
dB = 20*log(0.45)
dB = -6.91


MKR Δ 460.0 µsec
-0.70 dB
REF 77.0 dBµV
ATTEN 0 dB
+0 dB
10 dB/
OFFSET
-20.0
dB
MARKER Δ
460.0 µsec
-0.70 dB
CENTER 433.900 000 MHz
RES BW 100 kHz
VBW 300 kHz
SPAN 0 Hz
SWP 20.0 msec


hp
REF 77.0 dBµV
10 dB/
ATTEN Ø dB
+Ø dB
OFFSET
-20.Ø
dB
CENTER
433.900 000 MHz
STEP 10.000 000 MHz
CENTER 433.900 000 MHz
RES BW 100 kHz
VBW 300 kHz
SPAN Ø Hz
SWP 55.Ø msec

OCCUPIED BANDWIDTH

Rules Part No.: 15.231(C)

Requirements: The bandwidth of the emission shall be no wider than .25% of the centerfrequency for devices operating between 70 and 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Data: The following plot represents the emissions taken for the device.

NOTES:
1255ut6 occupied bandwidth