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FCC PART 15.231

TEST REPORT

Applicant	DELTA SYSTEMS INC.
Address	10036 Aurora - Hudson Road 1734 Frost Road Streetsboro, OH 44241 USA
FCC ID	R932031010
IC Label	IC: 6268A-2031010
Product Description	433.92MHz Remote Control
Date Sample Received	November 6, 2006
Date Tested	November 13, 2006
Tested By	Richard Block
Approved By	Mario de Aranzeta
Timco Report No.	3114UT6TestReport
Test Results	☒ Pass ☐ Fail

ACCREDITED
Certificate # 0955-01

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STATEMENT OF COMPLIANCE

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 and demonstrate that the equipment complies with the appropriate standards.

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.

ACCREDITED

Certificate #0955-01

Authorized by: Mario de Aranzeta

Signature: On file

Function: Engineer

Date: November 17, 2006

Tested by: Richard Block

Signature: on file

Date: November 15, 2006

REPORT SUMMARY

Disclaimer	The test result only related to the item tested.
Purpose of Test Report	To demonstrate the DUT compliance with FCC Par15.231 requirements for a 433.92 MHz remote control radio.
Applicable Rule(s)	FCC Part 15.231, ANSI C63.4 2003
Related Report	No related report

TEST ENVIRONMENT AND SYSTEM

Test Facility	The test sites used by Timco Engineering Inc. is located at 849 NW State Road 45 Newberry, FL 32669 USA.
Test Condition:	The DUT was tested in the laboratory in an environment with normal temperature and humidity. The temperature was 26°C with a relative humidity of 50%.
Test Exercise (e.g software description, test signal, etc.):	The DUT was placed in continuous transmit mode of operation.
Supporting Peripheral Equipment	Not applicable. The device is a stand-alone remote control radio.
Deviation to the standard(s)	No deviation from the standard(s)
Modification to the DUT:	No modification was made to the DUT.

DUT SPECIFICATION

Manufacturer	Delta Systems		
Description	Remote Control Transmitter		
FCC ID	R932031010		
IC Label	IC: 6268A-2031010		
Model Name	2031010		
Tx Frequency	433.92MHz		
DUT Power Source	☐ 110–120Vac/50– 60Hz		
	☐ DC Power		
	☒ Battery Operated Exclusively		
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☐ Fixed	☐ Mobile	☒ Portable
Antenna	Integrated		

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 10/30/06	10/30/08

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Analyzer Silver Tower RF Preselector	HP	85685A	2620A00294	CAL 10/30/06	10/30/08
Analyzer Silver Tower Quasi-Peak Adapter	HP	85650A	3303A01844	CAL 10/30/06	10/30/08
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	1096	CAL 10/11/06	10/11/08
Antenna: Biconnical	Eaton	94455-1	1057	CAL 12/12/05	12/12/07

TEST PROCEDURE

Radiation Interference: The test procedure used was ANSI standard 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 Standard C63.4-2003 10.1.7 Measurement Procedures: The DUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The DUT 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 to the limits of 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

Sample calculation of limit @ 433.92 MHz:

41.6667 (433.9)-7083.3333 = 10,995.85 uV/m
20log(10,995.85) = 80.82 dBuV/m limit @ 433.9 MHz

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Pol. V/H	Coax Loss dB	Correction Factor dB	Duty Cycle Factor dB	Field Strength dBuV/m	Margin dB
433.9	433.92	39.8	H	3.24	16.76	6.30	53.50	27.33
433.9	433.92	50.9	V	3.24	16.40	6.30	64.24	16.59
433.9	867.80	23.3	H	4.87	22.86	6.30	44.73	16.10
433.9	867.80	24.7	V	4.87	22.48	6.30	45.75	15.08
433.9	1,301.80 **	17.2	H	1.35	28.00	6.30	40.25	13.75
433.9	1,301.80 **	17.4	V	1.35	28.00	6.30	40.45	13.55
433.9	1,735.70	17.2	H	1.57	29.70	6.30	42.17	18.66
433.9	1,735.70	18.5	V	1.57	29.70	6.30	43.47	17.36
433.9	2,169.60	5.6	V	1.77	31.94	6.30	33.01	27.82
433.9	2,169.60	6.7	H	1.77	31.94	6.30	34.11	26.72
433.9	2,603.50	5.3	V	1.94	32.77	6.30	33.71	27.11
433.9	2,603.50	6.6	H	1.94	32.77	6.30	35.01	25.81
433.9	3,037.40	5.2	H	2.11	33.39	6.30	34.40	26.42
433.9	3,037.40	5.2	V	2.11	33.39	6.30	34.40	26.42
433.9	3,471.30	4.8	V	2.24	33.31	6.30	34.05	26.77
433.9	3,471.30	5.3	H	2.24	33.31	6.30	34.55	26.27
433.9	3,905.20 **	5.5	V	2.37	33.79	6.30	35.36	18.64
433.9	3,905.20 **	5.8	H	2.37	33.79	6.30	35.66	18.34
433.9	4,339.20 **	4.7	V	2.50	34.44	6.30	35.34	18.66
433.9	4,339.20 **	5.9	H	2.50	34.44	6.30	36.54	17.46

** -Denotes restricted bands

Note: Emissions attenuated more than 20 dB below the limit are not reported.

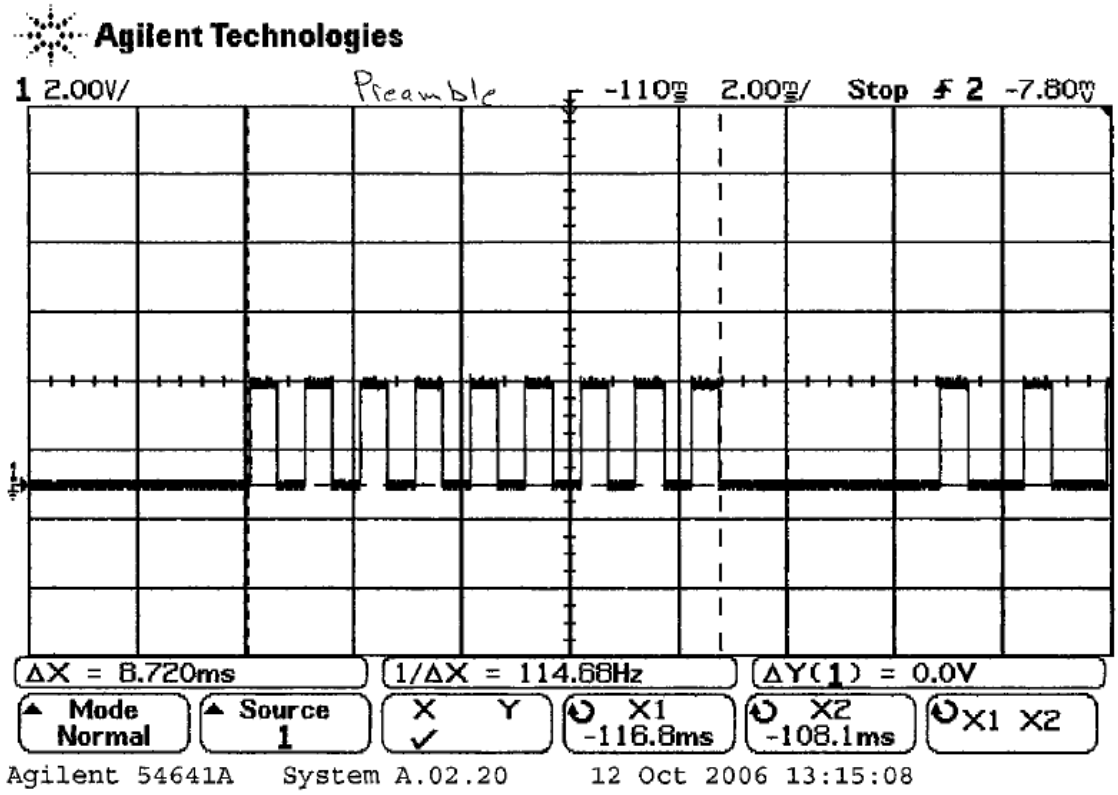
CALCULATION OF DUTY CYCLE

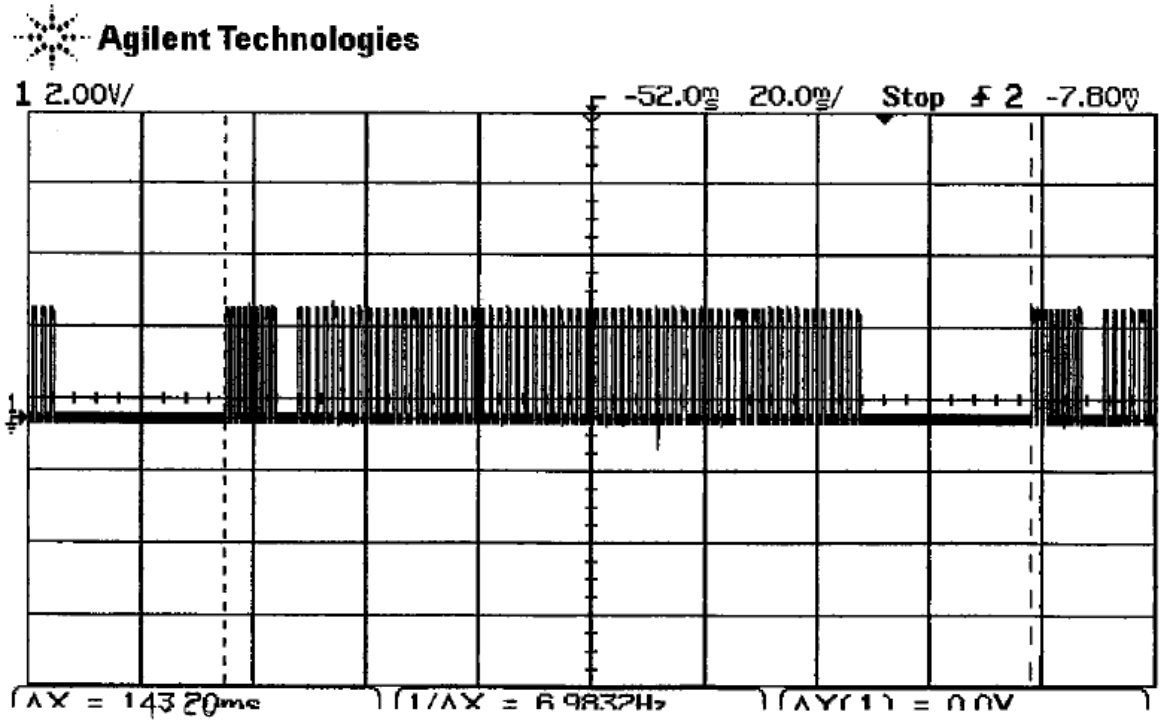
The period of the pulse train is determined by observing it on an oscilloscope or a spectrum analyzer with zero (0) frequency span. A plot is then made of the pulse train with a sweep time of 100 milliseconds. This sweep determines the duration of the pulse train, which in this case is millisecond. This 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 DUT 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.

dB = -6.3

The worst case duty cycle per the manufacturer gives a correction factor of 6.3 dB.

Plots are included below.


Agilent Technologies
1 2.00V/
Preamble
-110ms 2.00ms/ Stop 2 -7.80V
ΔX = 8.720ms
1/ΔX = 114.68Hz
ΔY(1) = 0.0V
Mode Normal
Source 1
X Y
X1 -116.8ms
X2 -108.1ms
X1 X2
Agilent 54641A System A.02.20 12 Oct 2006 13:15:08


Agilent Technologies
1 2.00V/
-52.0ms 20.0ms/ Stop 2 -7.80V

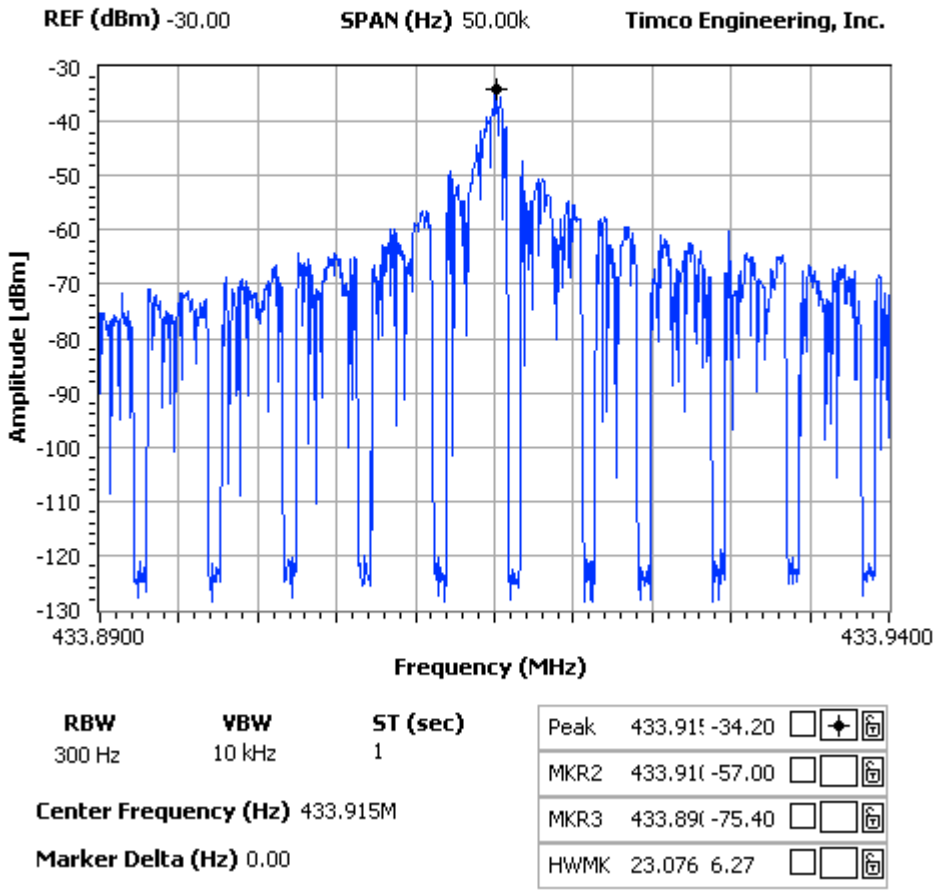
OCCUPIED BANDWIDTH

Rules Part No.: 15.231(C)

Requirements: The bandwidth of the emission shall be no wider than .25% of the center frequency 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 for the device.

NOTES:
OCCUPIED BANDWIDTH
DELTA SYSTEMS INC. -- FCC ID: R93 TBD



POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: Pt 15.207

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

Test Data: Not applicable because the DUT is battery operated exclusively.