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MEMBER ACIL

Report of Measurements
on

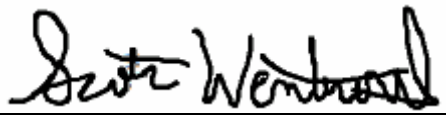
Single Use Tag Transmitter
Model: 360A
FCC ID: Q9V-360-A

Customer Name:	Radianse, Inc.
Customer P.O.:	1327
Test Report Date:	April 16, 2008
Test Report No.:	R-4985N
Test Start Date:	February 29, 2008
Test Finish Date:	March 10, 2008
Test Technician:	Matthew Seamans
Test Engineer:	Scott Wentworth
Supervisor:	Todd Hannemann
Results Prepared By:	Jamie Ramsey
Government Source Inspection:	N/A

Certification and Signatures

We certify that these Test Results are true results obtained from the tests of the equipment stated, and relates only to the equipment tested. We further certify that the measurements shown in this Test Results package were made in accordance with the procedures indicated and vouch for the qualifications of all Retlif Testing Laboratories personnel taking them.

Todd Hannemann
Laboratory Supervisor



Scott Wentworth
Branch Manager

Non-Warranty Provision
The testing services have been performed, findings obtained and reports prepared in accordance with generally accepted laboratory principles and practices. This warranty is in lieu of all others, either expressed or implied.

Non-Endorsement
This test report contains only findings and results arrived at after employing the specific test procedures and standards listed herein. It is not intended to constitute a recommendation, endorsement or certification of the product or material tested. This test report may not be used by the client to claim product endorsement by NVLAP, NIST or any agency of the U.S. Government.

Revision History

Revisions to this document are listed below; the latest revised document supersedes all previous issues of this document.

Revision	Date	Pages Affected
-	April 16, 2008	Original Release

Test Program Summary

Job Number:	R-4985N
Customer:	Radianse, Inc.
Address:	200 Brickstone Square, Suite 302
	Andover, Ma 01810
Test Sample:	Suite 302
Part Number:	N/A
Model Number:	360A
Serial Number:	N/A
Type:	Single Use Tag Transmitter
Power Requirements:	3VDC Internal Battery
Frequency Operation:	433.92MHz
Modulation:	ASK (Manchester Encoded)
Type of Transmission:	Pulsed Transmission containing Manchester Encoded Data Bits
Application:	Indoor Location & Tracking of People
Frequencies Tested:	433.92 MHz

Test Specification:
FCC Rules and Regulations Part 15, Subpart C, Paragraph 15.231

Test Procedure:
ANSI C3.4:2003

Purpose:
The purpose of this test program was to demonstrate compliance of the 360A Transmitter with the requirements of FCC Part 15.231

Test Methods:
The following table depicts the test methods that were performed on the EUT and the corresponding test results:

Testing Date(s)	Test Method	Test Results
2/29/08	15.231(e) Spurious Radiated Emissions (30MHz to 4.4GHz)	Complied
2/29/08	15.231(e) Field Strength of Fundamental	Complied
3/10/08	15.231(c) Occupied Bandwidth, 0.25% of Fundamental Frequency	Complied
3/10/08	Duty Cycle Determination	N/A

Test Sample Operation:
The device is normally automatically operated but can also be manually operated. The device transmits location ID data for indoor tracking of people. Normal operation of the EUT complies with the parameters required in Part 15, Subpart C, Section 15.231 (e) for devices which transmit data and with the general requirements of 15.231 for both automatic and manual momentary operated devices. For testing purposes only, the EUT was configured to continuously transmit.

Test Sample/Test Program:

- When manually activated the transmitter automatically ceases transmission within 5 seconds after activation per 15.231 a (1).
- In automatic mode the transmitter ceases transmission within 5 seconds after activation per the requirements of 15.231 a (2).
- In automatic mode operation is limited so that the duration of each transmission is less than one second (8.0msec) and the silent period between transmissions is more than 30 times the duration of the transmission and never less than ten seconds per the requirements of 15.231 (e).
- The device uses an internal PCB loop antenna.
- The fundamental field strength at 433.92MHz did not exceed 4398µV/M (Average) at a test distance of 3.0 meters.
- The peak value of fundamental emissions did not exceed a peak field strength limit corresponding to 20dB above the maximum permitted average limit.
- The field strength of harmonic and spurious emissions did not exceed 439µV/M as specified in 15.231 (e) for a fundamental frequency of 433.92MHz. No harmonic or spurious emissions were observed above the second harmonic within 10dB of the specified limit at test distances of 1 or 3 meters.
- Radiated Emissions from the EUT were measured in all three axis. The attached Radiated Emissions test data is representative of the worst case orientation.
- The device operates at 433.92MHz. The 20dB bandwidth of the emission did not exceed 0.25% of the center operating frequency.

Determination of Field Strength Limits:

The field strength limits shown below were calculated as instructed in Section 15.231.

Fundamental Frequency: 433.92MHz
Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strength for the band 260-470MHz, µV/m at 3 meters is as follows:

16.6667(F) – 2833.3333	=	Field Strength Limit (µV/m)
16.6667 x 433.92	=	7232
7232 - 2833.3333	=	4398
Field Strength Limit	=	4398µV/m = 72.87dBuV/M

The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level which equals 439.8µV/m = 52.87dBuV/M.

Determination of Duty Cycle:
The transmitter controls were adjusted to maximize the transmitted duty cycle. The analyzer was set for a frequency span of 0Hz. The sweep time was then adjusted in order to display one full pulse train. The pulse train was observed and the number and width of the pulses and the period of the train was determined. The transmitter on time was then summed and compared to the time for one full cycle in order to obtain the duty cycle. The cycle time exceeded 100msec therefore 100msec was used as the cycle time. The on times were determined as follows:

In the worst case duty cycle there were 66 individual pulses within the 100msec period (54 short pulse @55.51usec/ea & 12 long pulses @101.6usec/ea). The pulse durations were summed in order to obtain the total “on time” of 4.22msec.

Fundamental Frequency: 433.92MHz

Transmitter On Time	=	4.22milliseconds
Transmitter Cycle Time	=	100milliseconds
Transmitter Duty Cycle	=	4.22%
On Time divided by Cycle Time	=	Duty Cycle Factor
4.22 divided by 100	=	0.0422
0.0422 converted to dB (LOG_{10} .0422)20	=	-27.5
Duty Cycle Factor	**=**	***-27.5dB***

Duty Cycle Factor Determination Plots are included with this application as a separate attachment.

Test Methods:

15.231 (b) Fundamental & Spurious Radiated Emissions

The test sample was placed on a 80cm high wooden test stand which was located 3 meters from the test antenna on an FCC listed open area test site. Emissions from the EUT were maximized by rotating the test sample and adjusting the test sample orientation and antenna polarization. The maximized peak field strength of each emission was measured and recorded and compared to the limit specified in 15.35 (b) (peak limit corresponds to 20dB above the maximum permitted average limit). The duty cycle factor was applied to the peak readings in order to determine the average field strength of the emissions for comparison to the specified average limits.

Test Results: The worst case maximum peak field strength of the fundamental frequency at 433.92MHz was 69.31dBuV/M which met the peak limit of 92.8dBuV. The maximum average field strength at 433.92MHz was 41.81dBuV which met the specified average limit of 72.8dBuV. Harmonic/spurious frequencies did not exceed the specified limit of 439.8uV.

15.231 (c) Occupied Bandwidth

The test sample was placed on a test bench and configured to transmit its normal modulated signal at maximum power. The spectrum analyzers resolution bandwidth, sweep rate and span were adjusted for the frequency being measured. The upper and lower frequency points corresponding to levels 20dB down from the peak of the modulated carrier frequency were used to determine the occupied bandwidth as follows:

Fundamental Frequency	=	433.92MHz
0.25% of Center Frequency	=	1.0848MHz
1.0848 divided by 2	=	0.542MHz
Bandwidth Range	=	Fundamental Frequency + and – 0.542MHz
433.92MHz – 0.542MHz	=	433.378MHz
433.92MHz + 0.542MHz	=	434.462MHz
Bandwidth Range	**=**	***433.378MHz – 434.462MHz***

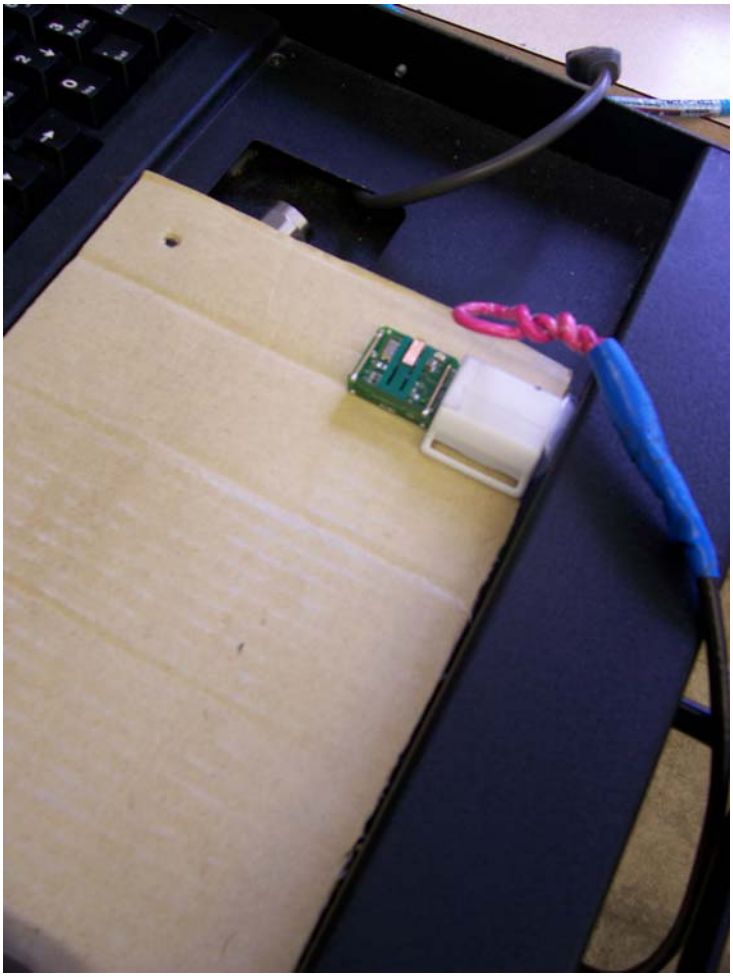
Test Results: The bandwidth of the emission at 433.92MHz was less than 0.25% of the center frequency and met the requirements of 15.231 (c).

Test Setup Photographs

Test Photograph
Radiated Emissions
30MHz to 1GHz

Test Photograph
Radiated Emissions
1GHz to 4.4GHz

Test Photograph
Occupied Bandwidth/99% Bandwidth/Duty Cycle



Equipment Lists

Fundamental & Spurious Radiated Emissions

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
3116	Pre-Amplifier	Miteq	0.1 GHz - 18 GHz	AFS42-35	8/27/2007	8/27/2008
3117	Power Supply	B&K Precision	0-30 Vdc, 3.0 A	1630	1/31/2008	1/31/2009
3258	Double Ridge Guide	EMCO	1 - 18 GHz	3115	11/14/2007	11/14/2008
4029B	Test Site Attenuation	Retlif	3 / 10 Meters	RNH	6/20/2007	6/20/2008
5053	Biconilog	EMCO	26 MHz - 3 GHz	3142C	10/4/2007	10/4/2008
5070	EMI Test Receiver	Rohde & Schwarz	20 Hz - 40 GHz	ESIB40	12/7/2007	12/7/2008

Occupied Bandwidth/Duty Cycle

Occupied Bandwidth

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
5070	EMI Test Receiver	Rohde & Schwarz	20 Hz - 40 GHz	ESIB40	12/7/2007	12/7/2008

Test Data

RETLIF TESTING LABORATORIES

TABULAR DATA SHEET

Test Method:	Fundamental Field Strength		
Customer:	Radianse	**Job No:**	R-4985N
Test Sample:	Single Use Tag Transmitter		
Model No:	360A	**Serial No:**	N/A
Test Specification:	FCC Part 15, Subpart C Paragraph: 15.231(e)		
Operating Mode:	Continuously Transmitting		
Technician:	M.Seamans	**Date:**	March 10, 2008
Notes:	Corrected peak readings meet peak limit (20dB above average limit) per 15.35		

Transmit Frequency		Antenna/EUT Position	Meter Reading	Correction Factor	Corrected Peak	Duty Cycle Correction	Corrected Reading	Average Limit at 3 Meters	Converted Reading	Limit at 3 Meters
MHz		Polarization/Axis	dBuV	dB	dBuV/m	dB	dBuV/m	dBuV	uV/m	uVm
433.92		V/Y	49.28	20.03	69.31	-27.50	41.81	72.87	123.17	4398.68

RETLIF TESTING LABORATORIES

TABULAR DATA SHEET

Test Method:	Spurious Emissions 30MHz to 4.5GHz		
Customer:	Radianse	**Job No:**	R-4985N
Test Sample:	Single Use Tag Transmitter		
Model No:	360A	**Serial No:**	N/A
Test Specification:	FCC Part 15, Subpart C Paragraph: 15.231(e)		
Operating Mode:	Continuously Transmitting		
Technician:	M.Seamans	**Date:**	3/10/2008
Notes:	Fundamental Frequency: 433.92 MHz		

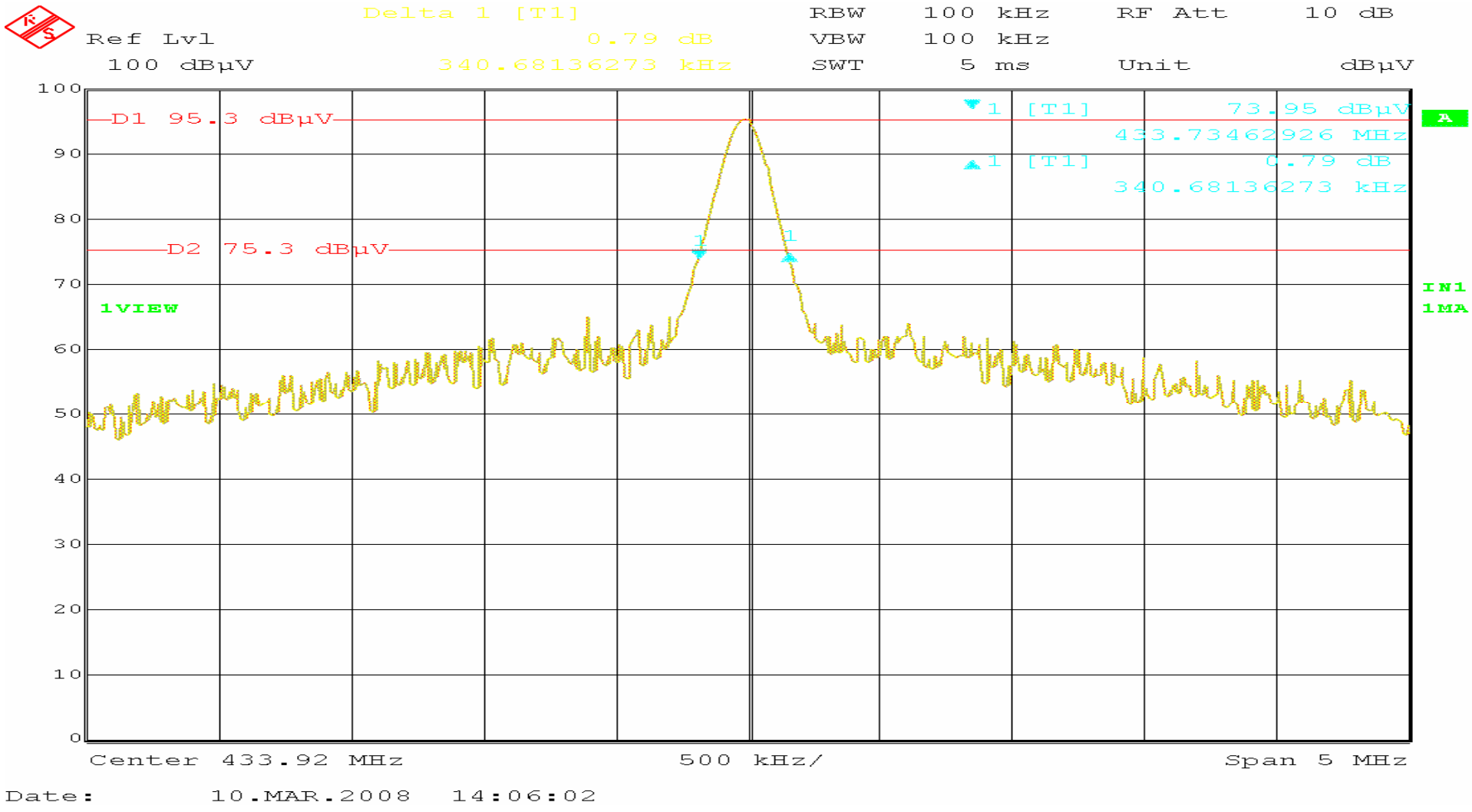
Harmonic Frequency		Antenna/EUT Position	Meter Reading	Correction Factor	Duty Cycle Correction	Corrected Reading			Converted Reading	Limit at 3 Meters
MHz		Polarization/Axis	dBuV	dB	dB	dBuV/m			uV/m	uVm
867.84		H/Y	30.7	27.6	-27.5	30.8			34.67	439.87
*1301.76		-	-	-	-	-			-	439.87
*1735.68		-	-	-	-	-			-	439.87
*2169.6		-	-	-	-	-			-	439.87
*2603.52		-	-	-	-	-			-	439.87
*3037.44		-	-	-	-	-			-	439.87
*3471.36		-	-	-	-	-			-	439.87
*3905.28		-	-	-	-	-			-	439.87
*4339.2		-	-	-	-	-			-	439.87

* These harmonic frequencies were not observed above the noise floor of the test equipment which was a minimum of 10dB below the limit.

RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

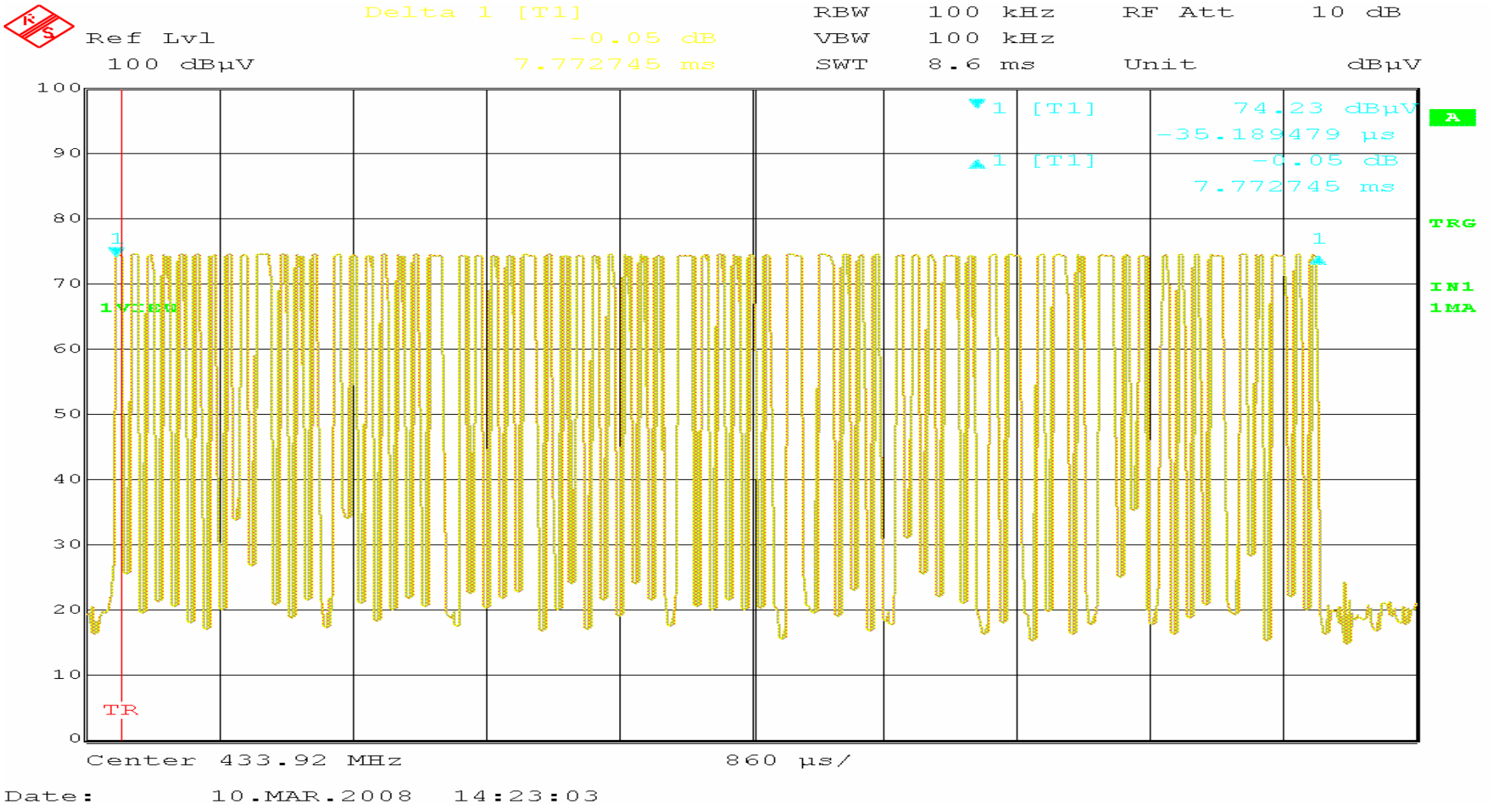
Test Method:	**Occupied Bandwidth**				
Customer:	Radianse	**Test Sample:**	Single Use Tag Transmitter	**Job No:**	R-4985N
Model No:	360A	**Serial No:**	N/A	**Technician:**	M. Seamans
Test Specification:	FCC Part 15, Subpart C		15.231(c)	**Date:**	3/10/2008
Operating Mode:	Continously Transmiting				
Notes:	Transmit Frequency: 433.92 MHz Occupied Bandwidth: 340.6813 Allowed bandwith: 0.25% of center frequency, at 20 db down.				



RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

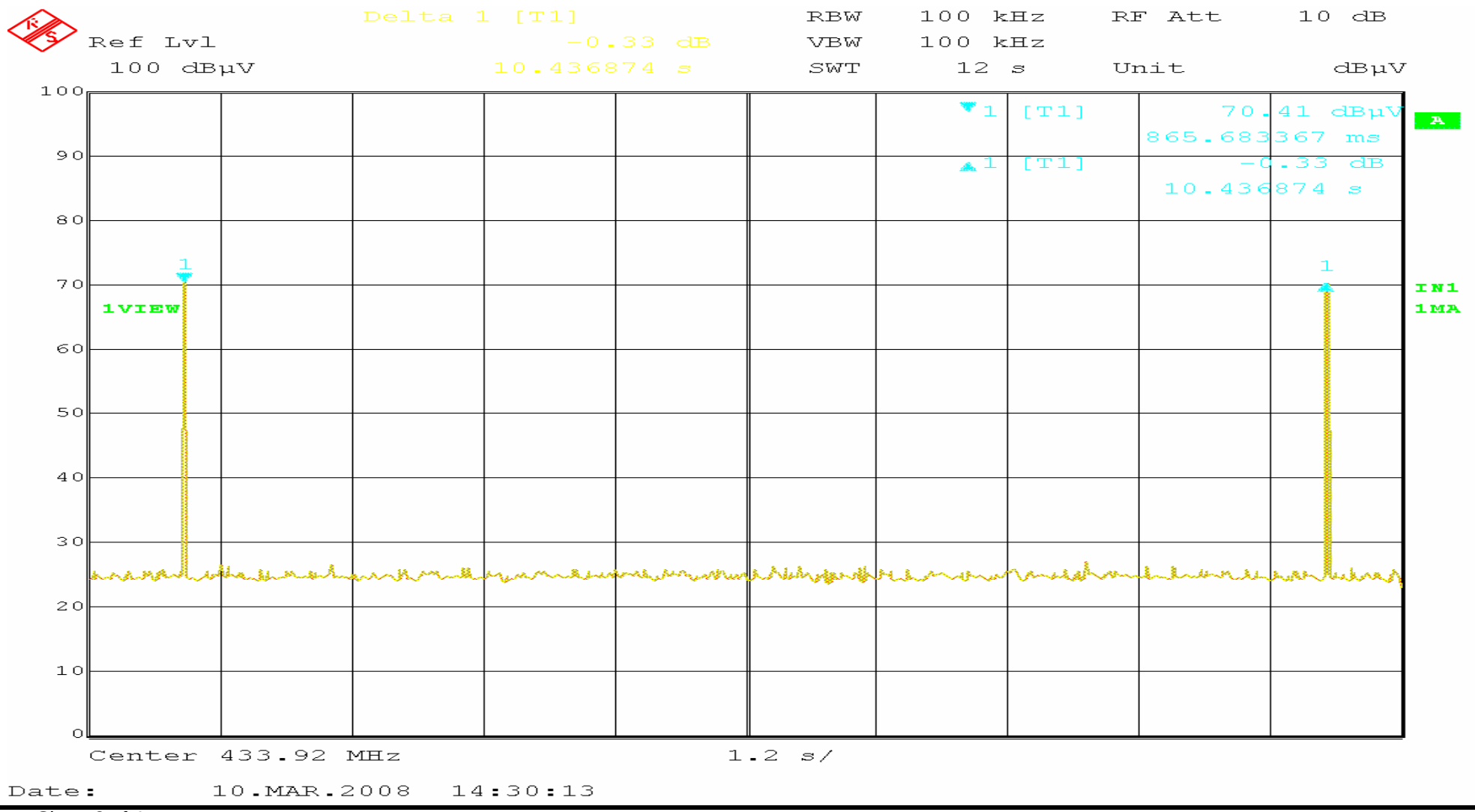
Test Method:	**Duty Cycle Plots**				
Customer:	Radianse	**Test Sample:**	Single Use Tag Transmitter	**Job No:**	R-4985N
Model No:	360A	**Serial No:**	N/A	**Technician:**	M. Seamans
Test Specification:	FCC Part 15, Subpart C		15.231(e)	**Date:**	3/10/2008
Operating Mode:	Transmitting signal at 433.92 MHz				
Notes:	Fundamental Frequency: 433.92 MHz SingleTransmission Pulse				



RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

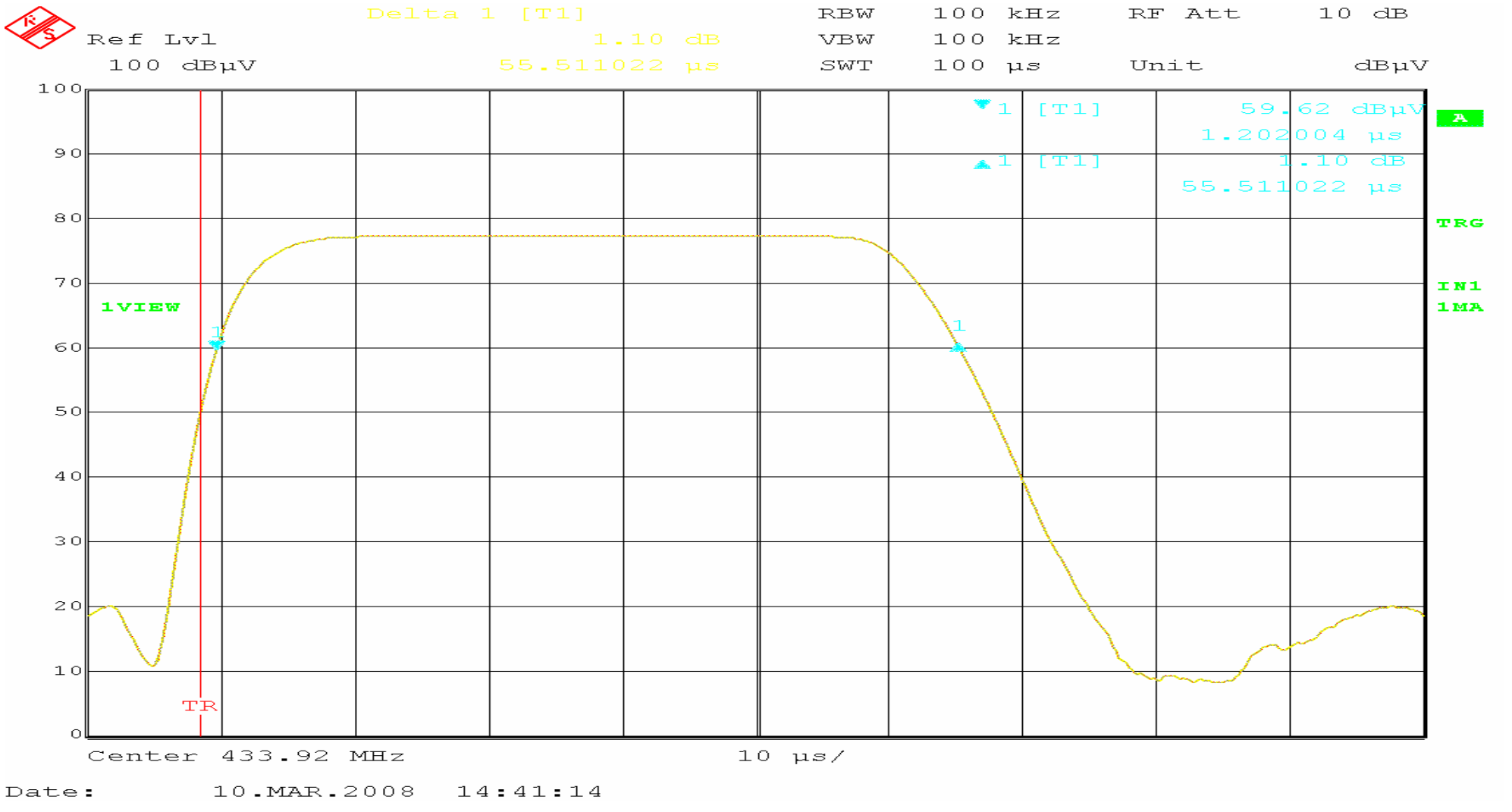
Test Method:	**Duty Cycle Plots**				
Customer:	Radianse	**Test Sample:**	Single Use Tag Transmitter	**Job No:**	R-4985N
Model No:	360A	**Serial No:**	N/A	**Technician:**	M. Seamans
Test Specification:	FCC Part 15, Subpart C	15.231(e)		**Date:**	3/10/2008
Operating Mode:	Transmitting signal at 433.92 MHz				
Notes:	Fundamental Frequency: 433.92 MHz Off Time Between Pulses				



RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

Test Method:	**Duty Cycle Plots**				
Customer:	Radianse	**Test Sample:**	Single Use Tag Transmitter	**Job No:**	R-4985N
Model No:	360A	**Serial No:**	N/A	**Technician:**	M. Seamans
Test Specification:	FCC Part 15, Subpart C		15.231(e)	**Date:**	3/10/2008
Operating Mode:	Transmitting signal at 433.92 MHz				
Notes:	Fundamental Frequency: 433.92 MHz Short Pulse				



RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

Test Method:	**Duty Cycle Plots**				
Customer:	Radianse	**Test Sample:**	Single Use Tag Transmitter	**Job No:**	R-4985N
Model No:	360A	**Serial No:**	N/A	**Technician:**	M. Seamans
Test Specification:	FCC Part 15, Subpart C		15.231(e)	**Date:**	3/10/2008
Operating Mode:	Transmitting signal at 433.92 MHz				
Notes:	Fundamental Frequency: 433.92 MHz Long Pulse