

RETLIF TESTING LABORATORIES
TEST REPORT R-4618N
July 14, 2006

FCC COMPLIANCE TEST REPORT
ON

RADIANSE, INC.
REUSABLE ID TAG
FCC ID: Q9V-110-A

| APPLICANT | MANUFACTURER |
|---|--------------|
| Radianse, Inc. 439 South Union Street, Suite 403 Lawrence, MA 01843 | SAME |

TEST SPECIFICATION: FCC Rules and Regulations Part 15, Subpart C, Para. 15.231

TEST PROCEDURE: ANSI C63.4:2003

TEST SAMPLE DESCRIPTION

BRANDNAME: Radianse

MODEL: 110A

TYPE: Reusable ID Tag

POWER REQUIREMENTS: 3VDC via internal battery

FREQUENCY OF OPERATION: 433.92MHz

TYPE OF TRANSMISSION: Pulsed emission containing manchester encoded data bits

FCC ID: Q9V-110-A

APPLICABLE RULE SECTION: Part 15, Subpart C, Section 15.231

TESTS PERFORMED

Spurious Emissions (30MHz to 4.4GHz)

Field Strength of Fundamental

Occupied Bandwidth, 0.25% of Fundamental Frequency

Duty Cycle Determination

TEST SAMPLE OPERATION

The EUT is powered by 3VDC, internal battery. The device is normally automatically operated but can also be manually operated. The device transmits location data for personnel/asset tracking applications. Operation of the EUT complies with the parameters required in Part 15, Subpart C, Section 15.231 (e) for devices which will transmit data and with the general requirements of 15.231 for both automatic and manual 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 five seconds after activation per the requirements of 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 is not employed for RC purposes involving fire, security and safety of life.
- The fundamental field strength at 433.92MHz did not exceed 4398 μ V/M (Average) at a test distance of 3 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 439 μ V/M as specified in 15.231 (e) for a fundamental frequency of 433.92MHz.
- The device operates at a single frequency of 433.92MHz The bandwidth of emissions did not exceed 0.25% of the operating frequency as specified in 15.231 (c) and was determined 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 |

- The device uses an internal loop antenna
- Radiated Emissions from the EUT were measured in all three axis. The attached Radiated Emissions test data is representative of the worst case orientation.

DETERMINATION OF FIELD STRENGTH LIMITS

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

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, μ V/m at 3 meters is as follows:

$$\begin{aligned} 16.6667(F) - 2833.3333 &= \text{Field Strength Limit } (\mu\text{V/m}) \\ 16.6667 \times 433.92 &= 7232 \\ 7232 - 2833.3333 &= 4398 \\ \text{Field Strength Limit} &= 4398 \mu\text{V/m} = 72.8\text{dBuV/M} \end{aligned}$$

The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level which equals $439.8 \mu\text{V/m} = 52.8\text{dBuV/M}$.

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. As the pulse train period (cycle time) was more than 100msec in duration the worst case duty cycle was determined by measuring/calculating the sum of the pulse widths “on time duration” within the 100msec period with the highest average value. The on times were determined as follows:

The individual pulse widths within the pulse train were measured and summed in order to obtain the total “on time” within the train (62 short pulses @46.89usec/ea & 11 long pulses @ 100.36usec/ea).

Fundamental Frequency: 433.92MHz

$$\begin{aligned} \text{Transmitter On Time} &= 4.01 \text{ milliseconds} \\ \text{Transmitter Cycle Time} &= 100 \text{ milliseconds} \\ \text{Transmitter Duty Cycle} &= 4.01\% \\ \text{On Time divided by Cycle Time} &= \text{Duty Cycle Factor} \\ 4.01 \text{ divided by } 100 &= 0.0401 \\ 0.0401 \text{ converted to dB } (\text{LOG}_{10} 0.0401)20 &= -27.94\text{dB} \\ \text{Duty Cycle Factor} &= \mathbf{-27.94dB} \end{aligned}$$

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

TEST SAMPLE / TEST PROGRAM (continued)

GENERAL NOTES

1. All readings were taken utilizing a peak detector function at a test distance of 3 meters.
2. The duty cycle factor was applied to the peak readings in order to determine the average value of the emissions.

SETUP PHOTOGRAPHS



Test Report No. R-4618N
FCC ID: Q9V-110-A

SETUP PHOTOGRAPH



Test Report No. R-4618N
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RETLIF TESTING LABORATORIES

TABULAR DATA SHEET

RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

Test Method:

Customer:

Radianse, Inc.

Model No.:

110A

Test Specification:

FCC Part 15.231

Operating Mode:

Transmitting at 433.92 MHz

Notes:

Allowed Bandwidth 0.25% of center frequency, at 20 dB down

Occupied Bandwidth

Test Sample:

Reusable ID Tag

Job No.:

R-4618N

Serial No.:

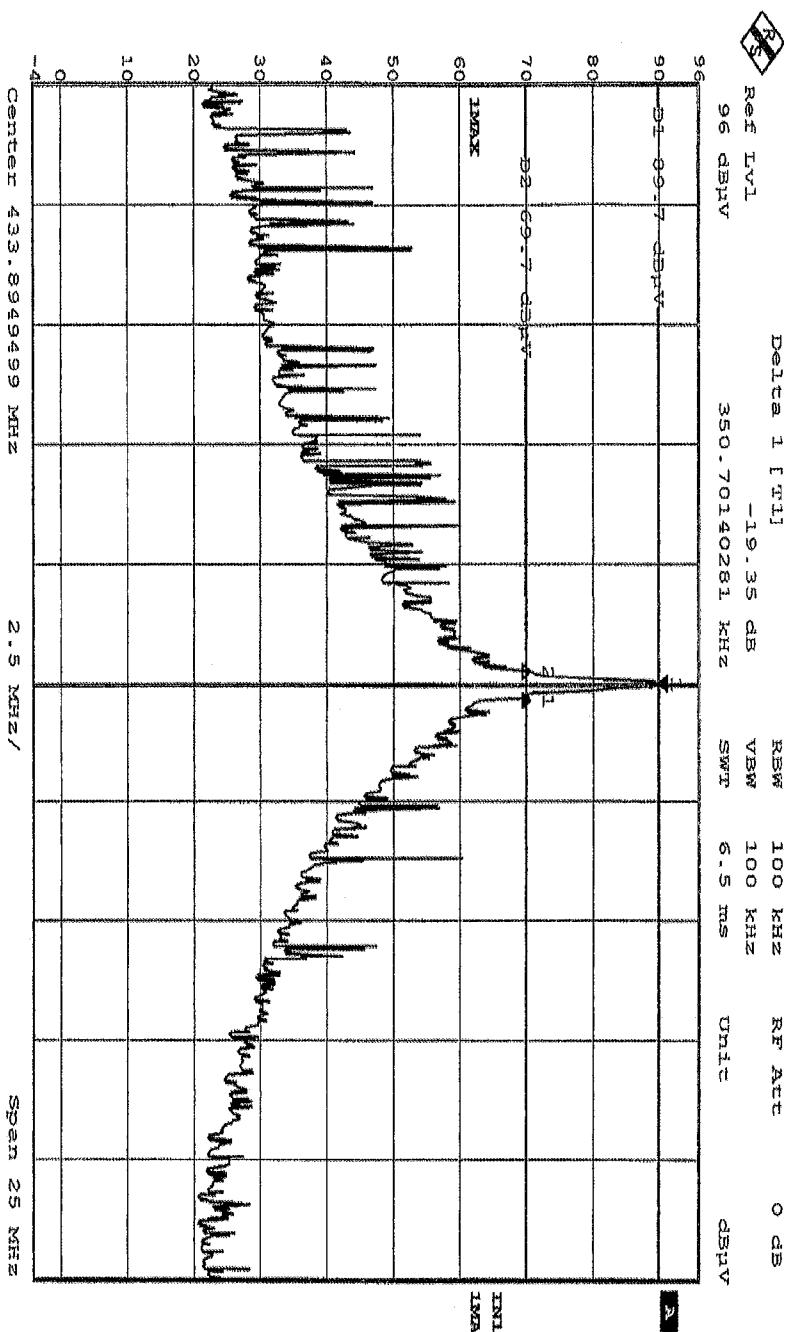
N/A

Technician:

M. Seamans

Date:

May 16, 2006



Date: 12-MAY-2006 15:35:50

RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

Test Method

Customer: Radianse, Inc.

Model No: 110A

Test Specification: FCC Part 15.231

Operating Mode: Transmitting at 433.92 MHz

Notes: Single Transmission Pulse

Duty Cycle

Customer: Radianse, Inc.

Model No: 110A

Test Specification: FCC Part 15.231

Operating Mode: Transmitting at 433.92 MHz

Notes: Single Transmission Pulse

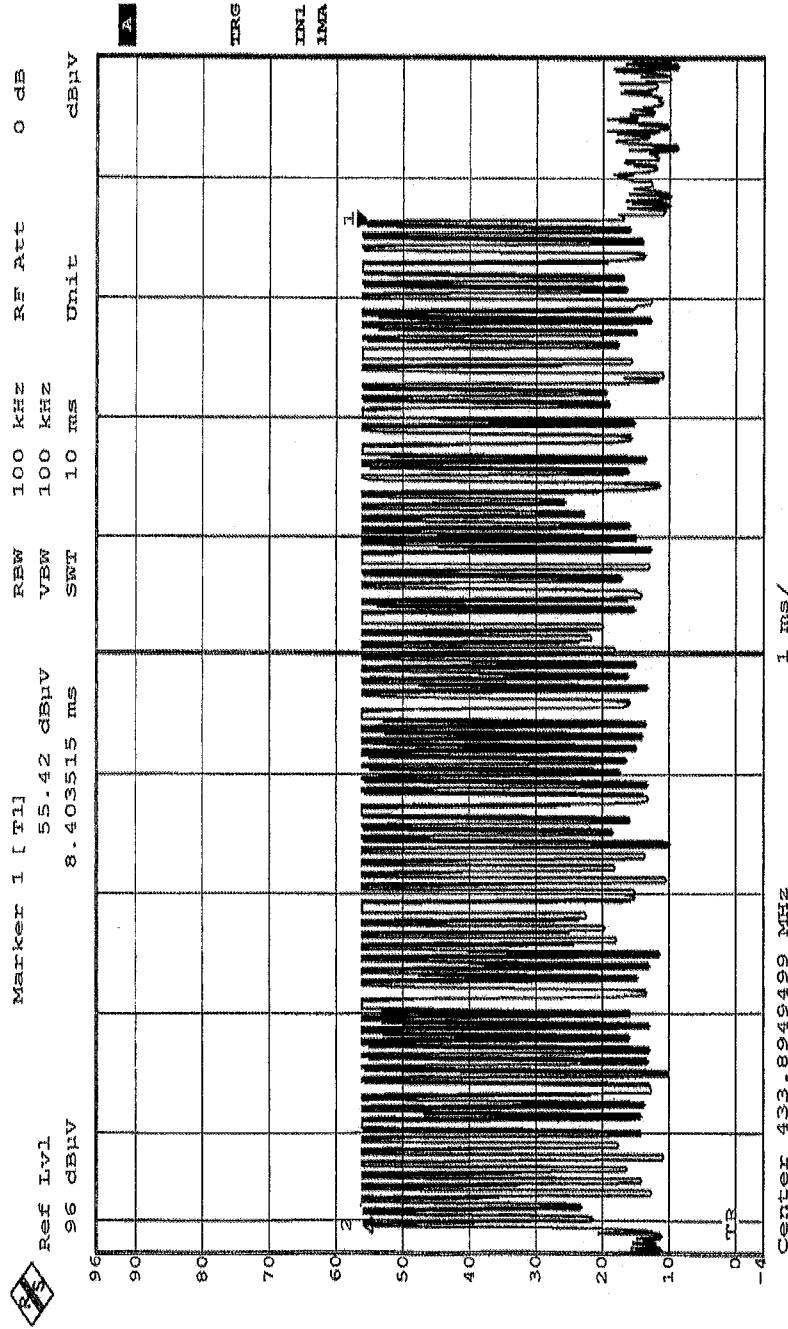
Test Sample: Reusable ID Tag

Serial No: N/A

Date: May 16, 2006

Job No: R-4618N

Technician: M. Seamans



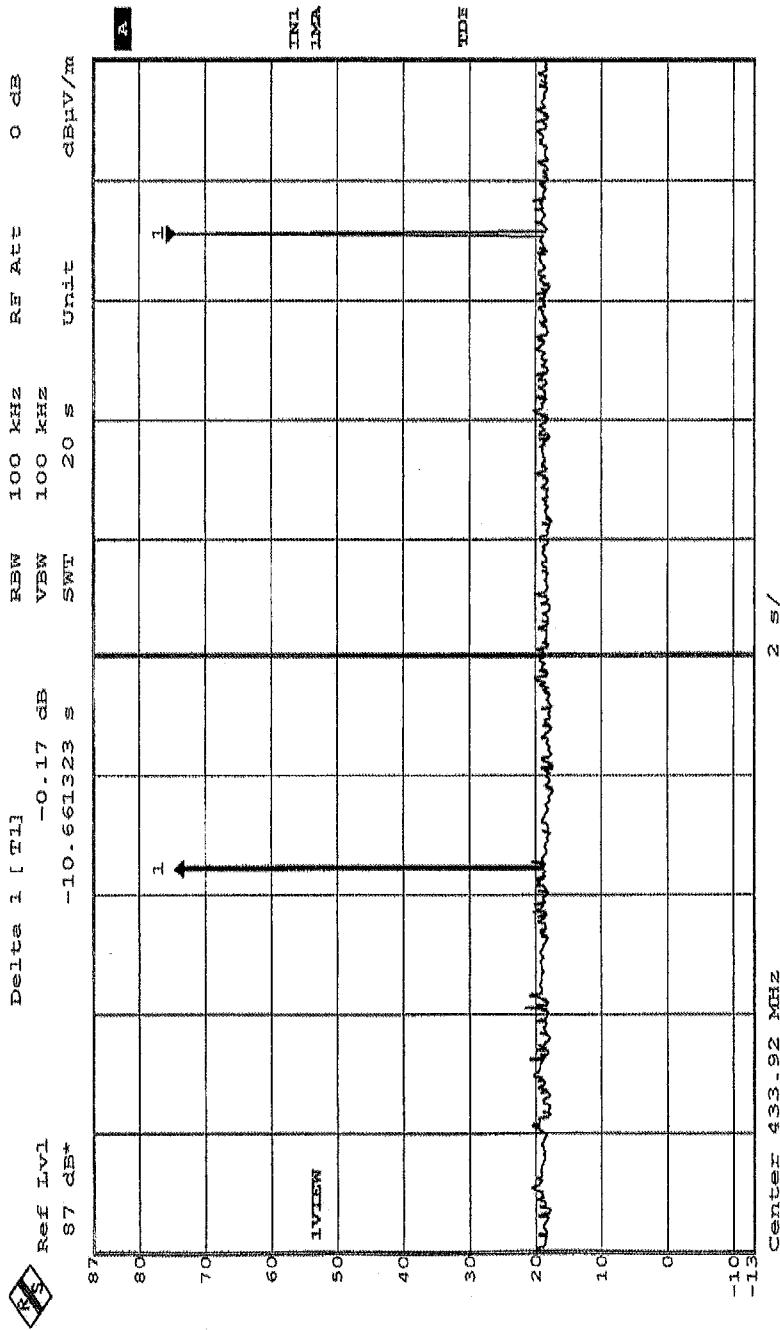
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RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

Duty Cycle

| | | | |
|---------------------|----------------------------|--------------|-----------------|
| Customer: | Radianse, Inc. | Test Sample: | Reusable ID Tag |
| Model No: | 110A | Serial No: | N/A |
| Test Specification: | FCC Part 15, 231 | Date: | May 16, 2006 |
| Operating Mode: | Transmitting at 433.92 MHz | | |
| Notes: | Off time between pulses | | |

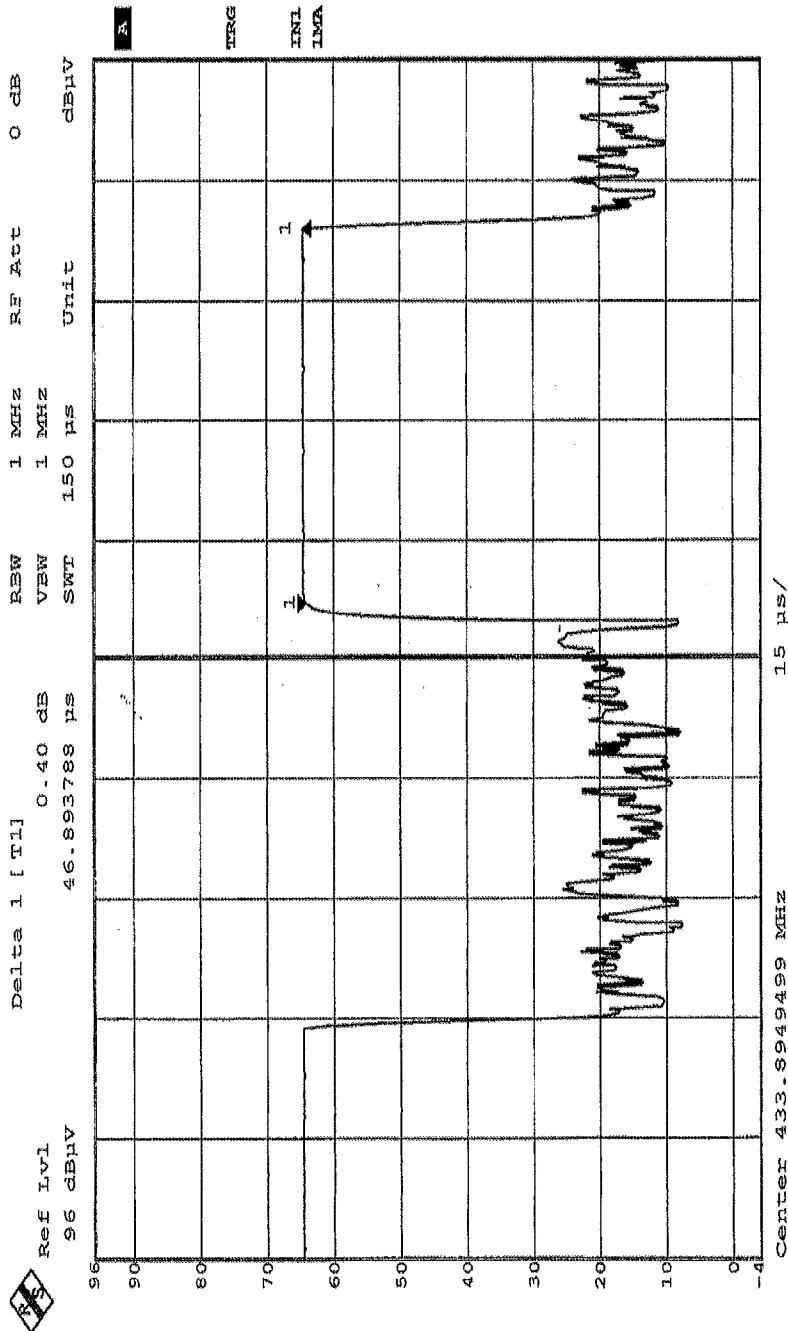


RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

Duty Cycle

| | | | |
|---------------------|----------------------------|--------------|-----------------|
| Test Method: | Radianse, Inc. | Test Sample: | Reusable ID Tag |
| Customer: | 110A | Serial No.: | N/A |
| Model No. | | | |
| Test Specification: | FCC Part 15, 231 | | |
| Operating Mode: | Transmitting at 433.92 MHz | | |
| Notes: | On time (Short pulse) | | |



Center 433.94999 MHz

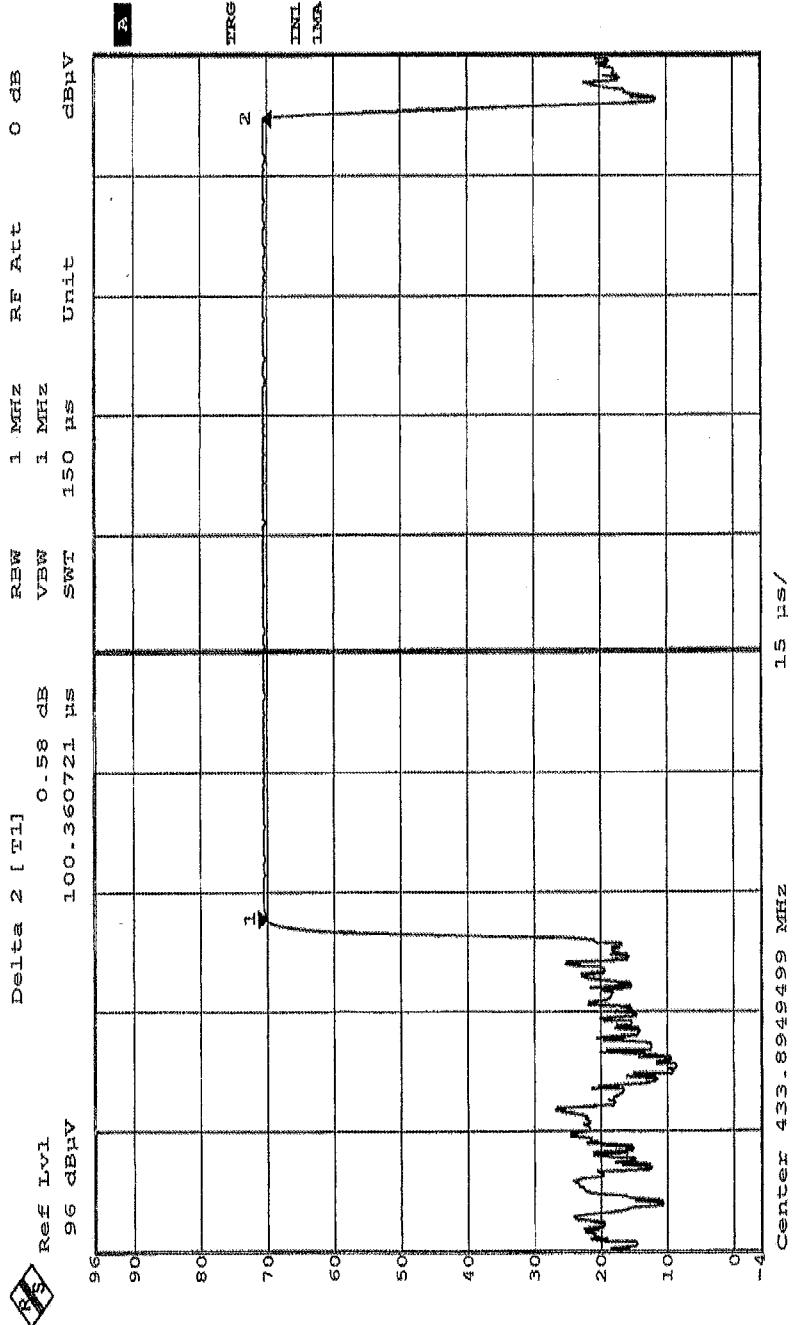
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RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

Test Method

| | | | |
|---------------------|----------------------------|--------------|-----------------|
| Customer: | Radianse, Inc. | Test Sample: | Reusable ID Tag |
| Model No: | 110A | Serial No: | N/A |
| Test Specification: | FCC Part 15, 231 | Date: | May 16, 2006 |
| Operating Mode: | Transmitting at 433.92 MHz | | |
| Notes: | On time (Long pulse) | | |



EQUIPMENT LISTS

FUNDAMENTAL & SPURIOUS EMISSIONS

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due |
|-----------|-----------------------|---------------------|--------------------|------------------|-----------------|------------|
| 4029B | Test Site Attenuation | Retlif | 3 / 10 Meters | RNH | 12/3/2004 | 6/3/2006 |
| 4984A | High Gain Horn | Microlab/FXR | 1.0 - 1.7 GHz | L638A | 1/25/2006 | 1/25/2007 |
| 4984B | High Gain Horn | Microlab/FXR | 1.7 - 2.6 GHz | R638A | 1/25/2006 | 1/25/2007 |
| 4984C | High Gain Horn | Microlab/FXR | 2.6 - 3.95 GHz | S638A | 1/25/2006 | 1/25/2007 |
| 4984D | High Gain Horn | Microlab/FXR | 3.95 - 5.85GHz | H638AF | 1/25/2006 | 1/25/2007 |
| 713 | EMI Test Receiver | Rohde & Schwarz | 20 Hz - 26.5 GHz | ESI26 | 4/3/2006 | 4/3/2007 |
| R417 | Preamplifier | Hewlett Packard | 1-26.5 GHz | AT/8449B | 5/2/2005 | 5/2/2007 |
| 3130 | 20 dB Attenuator | Narda | DC - 18 GHz | 768-20 | 2/8/2006 | 2/8/2007 |
| 5053 | Biconilog | EMCO | 26 MHz - 3000 MHz | 3142C | 2/7/2006 | 2/7/2007 |
| 713 | EMI Test Receiver | Rohde & Schwarz | 20 Hz - 26.5 GHz | ESI26 | 4/3/2006 | 4/3/2007 |

OCCUPIED BANDWIDTH

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due |
|-----------|-------------------|---------------------|--------------------|------------------|-----------------|------------|
| 713 | EMI Test Receiver | Rohde & Schwarz | 20 Hz - 26.5 GHz | ESI26 | 4/3/2006 | 4/3/2007 |