

May 8, 2001

Elite Electronic Engineering, Inc.
1516 Center Circle
Downers Grove, IL 60515

Attn: Mr. Richard King

Dear Richard:

Enclosed you will find an application for Certification of a Rainwise 315MHz Wireless Rain Gauge FCC ID: GTS315T. Certification is requested to the requirements of Part 15, Subpart C of the Commission's rules. This application is being filed by Retlif Testing Laboratories on behalf of Rainwise, Inc.

I trust that you will find the enclosed application to be complete; however, should you have any questions or require any additional information, please feel free to contact us.

Very truly yours,

RETLIF TESTING LABORATORIES

Scott Wentworth
Manager

Enc. (as stated)

APPLICANT	MANUFACTURER
Rainwise, Inc. 25 Federal Street Bar Harbor, ME 04609	SAME

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

TEST PROCEDURE: ANSI C63.4:1992

TEST SAMPLE DESCRIPTION

BRANDNAME: Rainwise MODEL: N/A

TYPE: Wireless Rain Gauge

POWER REQUIREMENTS: 3VDC Internal Batteries (2 AA) (Tested With New Batteries)

FREQUENCY OF OPERATION: 315MHz

MODULATION: Pulsed (On/Off Keying)

TYPE OF TRANSMISSION: Control Signal (Pulse Recognition Codes)

FCC ID: GTS315T

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

TESTS PERFORMED

Spurious Emissions

Field Strength of Fundamental

Occupied Bandwidth, 0.25% of Fundamental Frequency

Duty Cycle Determination

TEST SAMPLE OPERATION

The device is automatically operated during rainfall and is used to monitor rainfall amounts. When activated the device transmits a pulse recognition code packet consisting of 13 pulses. Normal operation of the EUT complies with the parameters required in Part 15, Subpart C, Section 15.231. For testing purposes only the EUT was configured to continuously transmit.

TEST SAMPLE / TEST PROGRAM

- The transmitter is automatically activated and ceases transmission after 4 seconds.
- The transmitter does not perform periodic transmissions at regularly predetermined intervals.
- The device is not employed for RC purposes involving security.
- The fundamental field strength at 315MHz did not exceed 6041.68 μ V/M (Average) at a test distance of 3 meters.
- The field strength of harmonic and spurious emissions did not exceed 604.17 μ V/M or 500 μ V/M as applicable.
- The bandwidth of emissions did not exceed 0.25% of the operating frequency and was determined as follows:

Fundamental Frequency	=	315MHz
0.25% of Center Frequency	=	787.5kHz
787.5 divided by 2	=	393.75kHz
Bandwidth Range	=	Fundamental Frequency + and - 393.75kHz
315MHz - 393.75kHz	=	314.61MHz
315MHz +393.75kHz	=	315.39MHz
Bandwidth Range	=	314.61MHz - 315.39MHz

- The device uses an external permanently attached antenna.
- Radiated Emissions from the EUT were measured in all three axis. Worst case emissions were found with the EUT in the vertical upright position. This orientation is also the position in which the device will normally be used. The attached Radiated Emissions test data is representative of this worst case orientation.

TEST SAMPLE / TEST PROGRAM (continued)

DETERMINATION OF FIELD STRENGTH LIMITS

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

Fundamental Frequency: 315MHz

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:

$$\begin{aligned} 41.6667(F) - 7083.3333 &= \text{Field Strength Limit } (\mu\text{V/m}) \\ 41.6667 \times 315 &= 13125.011 \\ 13125.001 - 7083.3333 &= 6041.68 \\ \text{Field Strength Limit} &= 6041.68 \mu\text{V/m} \end{aligned}$$

The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level.

The maximum permitted level of the peak emission is 20dB above the maximum permitted average limit.

TEST SAMPLE / TEST PROGRAM (continued)

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 transmitter on time was then summed and compared to the time for one full cycle in order to obtain the duty cycle.

Fundamental Frequency: 315MHz

Transmitter On Time	=	13.96milliseconds (maximum)
Transmitter Cycle Time	=	70.74 milliseconds
Transmitter Duty Cycle	=	19.73%
On Time divided by Cycle Time	=	Duty Cycle Factor
13.96 divided by 70.74	=	0.1973
0.1973 converted to dB ($\text{LOG}_{10} .1973$)20	=	-14.09dB
Duty Cycle Factor	=	-14.09dB

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

SPECTRUM ANALYZER

Due to the nature of the emissions being measured, care was taken to ensure that the resolution bandwidth of the spectrum analyzer was adequate to provide accurate measurements.

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.
3. The frequency range was scanned from 9kHz to 3.2GHz. Emission levels closest to the specified limit are listed on the attached data sheet.

EQUIPMENT LISTS

Field Strength of Fundamental

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
4202	Biconilog	EMCO	26 MHz - 2 GHz	3142	7/10/00	7/10/01
4895	Spectrum Analyzer	Hewlett Packard	9kHz - 22GHz	8593EM	2/17/01	2/17/02
4921	Graphics Plotter	Hewlett Packard	N/A	7550A	4/25/01	4/25/02
713	EMI Test Receiver	Rohde & Schwarz	20 Hz - 26.5 GHz	ESI26	3/9/01	3/9/02

Occupied Bandwidth

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
713	EMI Test Receiver	Rohde & Schwarz	20 Hz - 26.5 GHz	ESI26	3/9/01	3/9/02

Spurious Emissions

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
3116	Pre-Amplifier	Miteq	0.1 GHz - 18 GHz	AFS42-35	11/7/00	11/7/01
3117	Power Supply	B&K Precision	0-30 Vdc, 3.0 A	1630	2/23/01	2/23/02
3258	Double Ridge Guide	EMCO	1 - 18 GHz	3115	4/6/01	4/6/02
4202	Biconilog	EMCO	26 MHz - 2 GHz	3142	7/10/00	7/10/01
4895	Spectrum Analyzer	Hewlett Packard	9kHz - 22GHz	8593EM	2/17/01	2/17/02
4921	Graphics Plotter	Hewlett Packard	N/A	7550A	4/25/01	4/25/02
713	EMI Test Receiver	Rohde & Schwarz	20 Hz - 26.5 GHz	ESI26	3/9/01	3/9/02



Delta 1 [T1]

RBW

1 MHz

RF Att

20 dB

Ref Lvl

0.75 dB

VBW

1 MHz

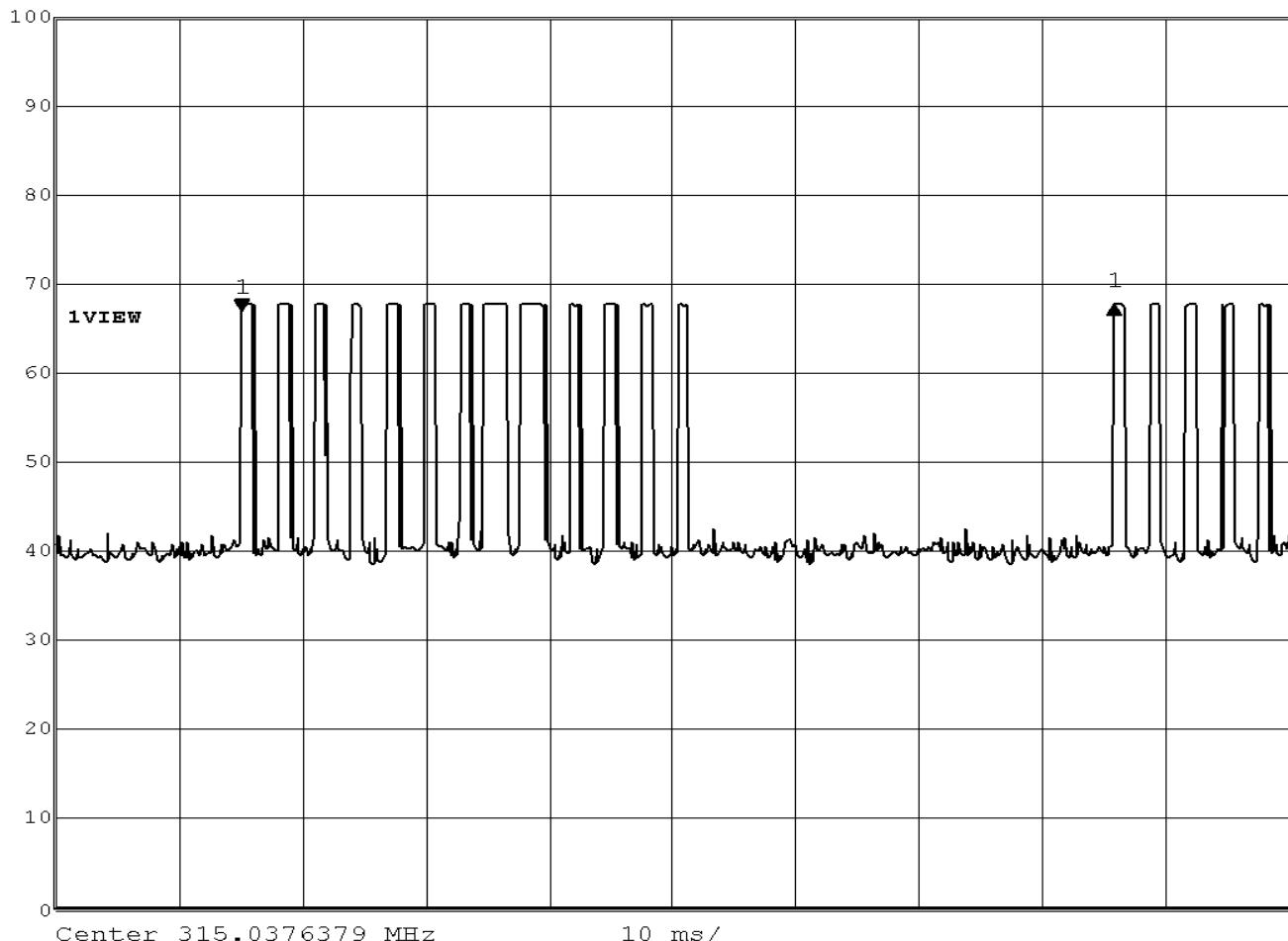
100 dB μ V

70.741483 ms

SWT

100 ms

Unit

dB μ V

Date: 24.APR.2001 09:44:25

Customer: Rainwise, Inc.
Test Sample: Wireless Rain Gauge 315 MHz RF Transmitter
Model No: n/a
Test Method: FCC Part 15.231, Duty Cycle Plot
Notes:

Date: 4/24/01

Tech: T. Hannemann

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Delta 1 [T1]

RBW

1 MHz

RF Att

20 dB

Ref Lvl

0.43 dB

VBW

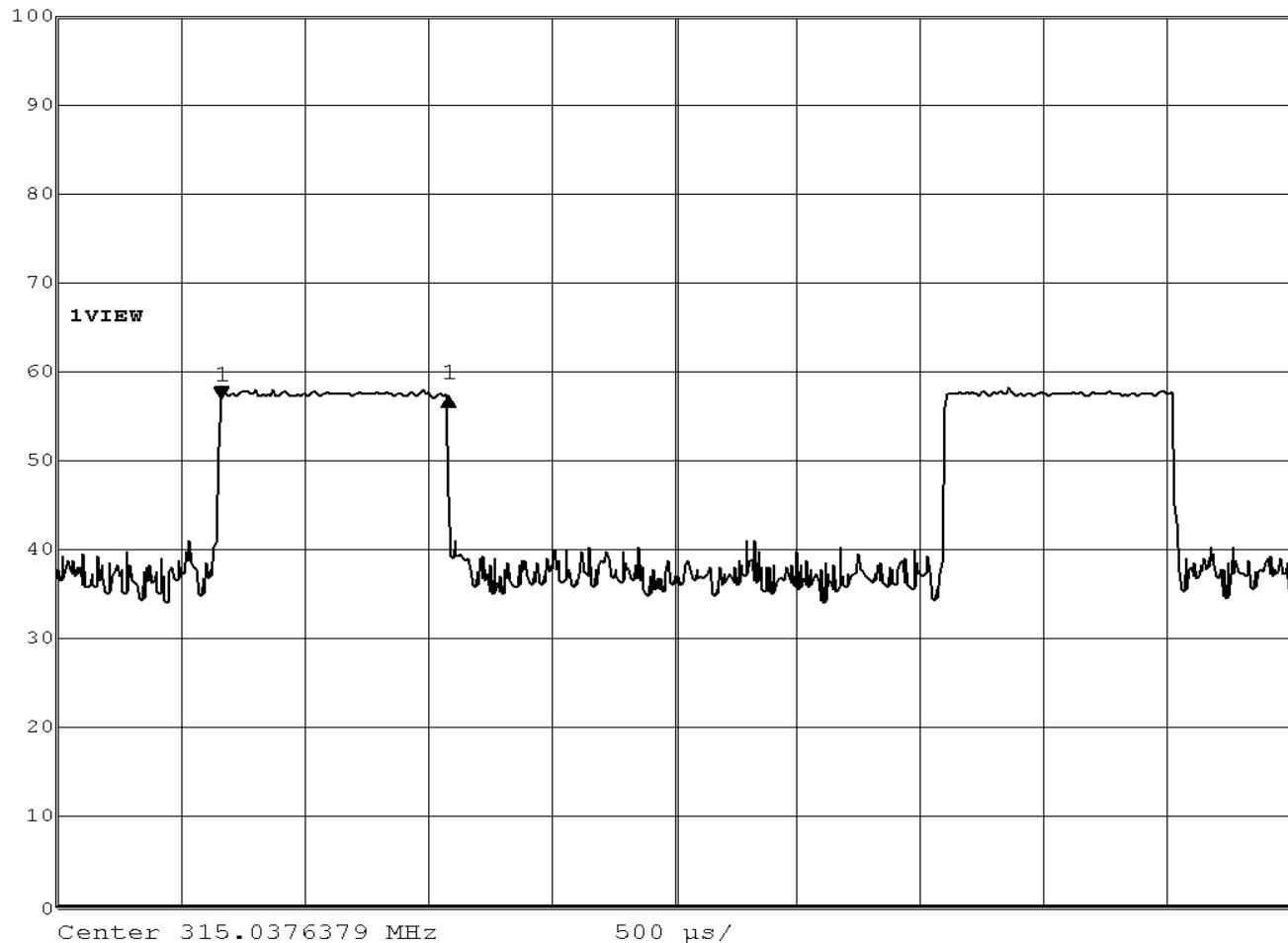
1 MHz

100 dB μ V921.843687 μ s

SWT

5 ms

Unit

dB μ V

Date: 24.APR.2001 10:18:58

Customer: Rainwise, Inc.
Test Sample: Wireless Rain Gauge 315 MHz RF Transmitter
Model No: n/a
Test Method: FCC Part 15.231, Duty Cycle Plot
Notes:

Date: 4/24/01

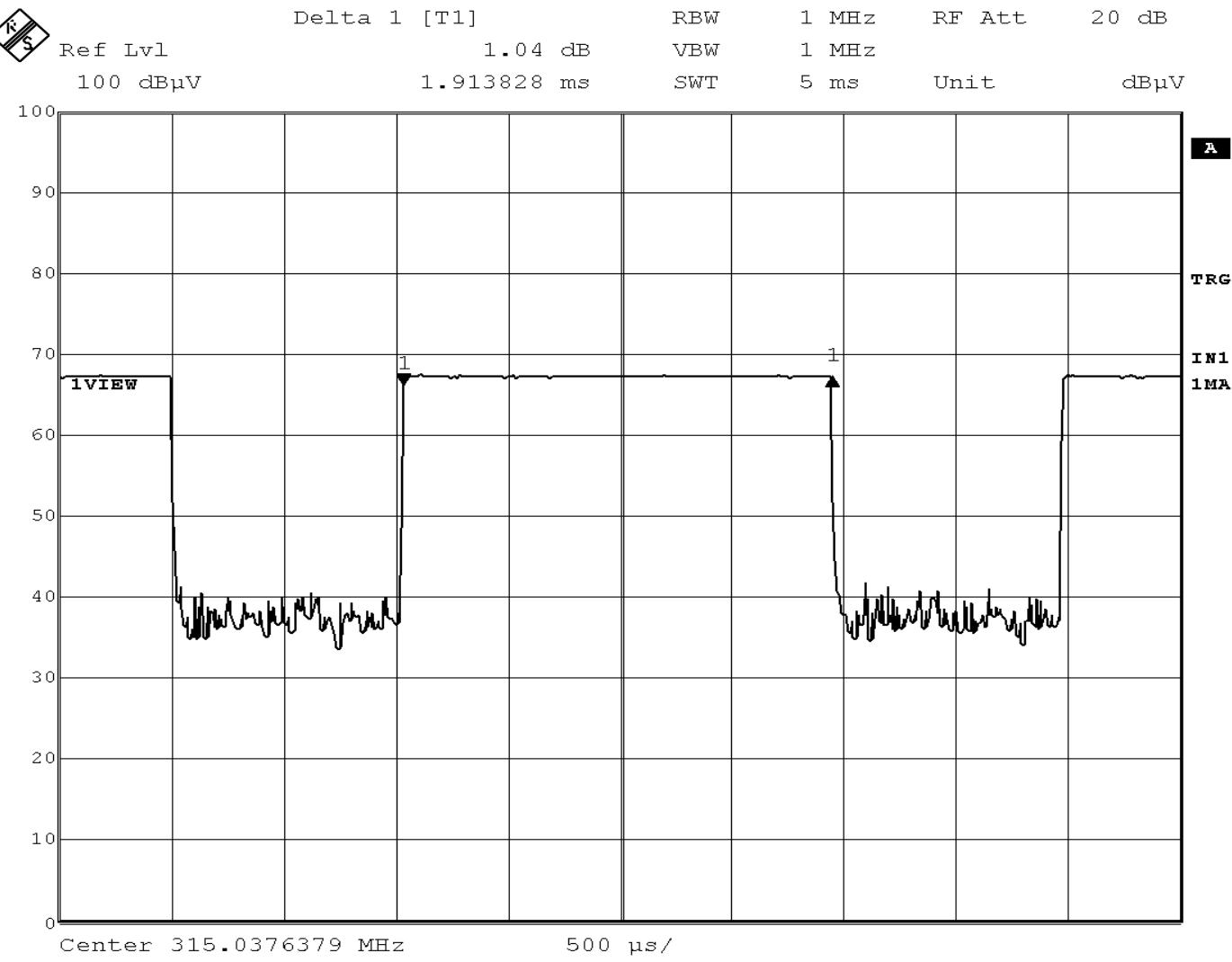
Tech: T. Hannemann

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Report No. R-3728N



Date: 24.APR.2001 10:17:53

Customer:	Rainwise, Inc.
Test Sample:	Wireless Rain Gauge 315 MHz RF Transmitter
Model No:	n/a
Test Method:	FCC Part 15.231, Duty Cycle Plot
Notes:	



Retlif Testing Laboratories

Report No. R-3728N

Date: 4/24/01 Tech: T. Hannemann Sheet 1 of 5

RETLIF TESTING LABORATORIES

TABULAR DATA SHEET

Test Method:	Fundamental Field Strength		
Customer:	Rainwise, Inc.	Job No:	R-3728N
Test Sample:	Wireless Rain Gauge 315 MHz RF Transmitter		
Model No:	n/a	Serial No:	n/a
Test Specification:	FCC Part 15.231 Paragraph: n/a		
Operating Mode:	Continuously Transmitting		
Technician:	T. Firkowski	Date:	4/25/01
Notes:	Detector Function: Peak		

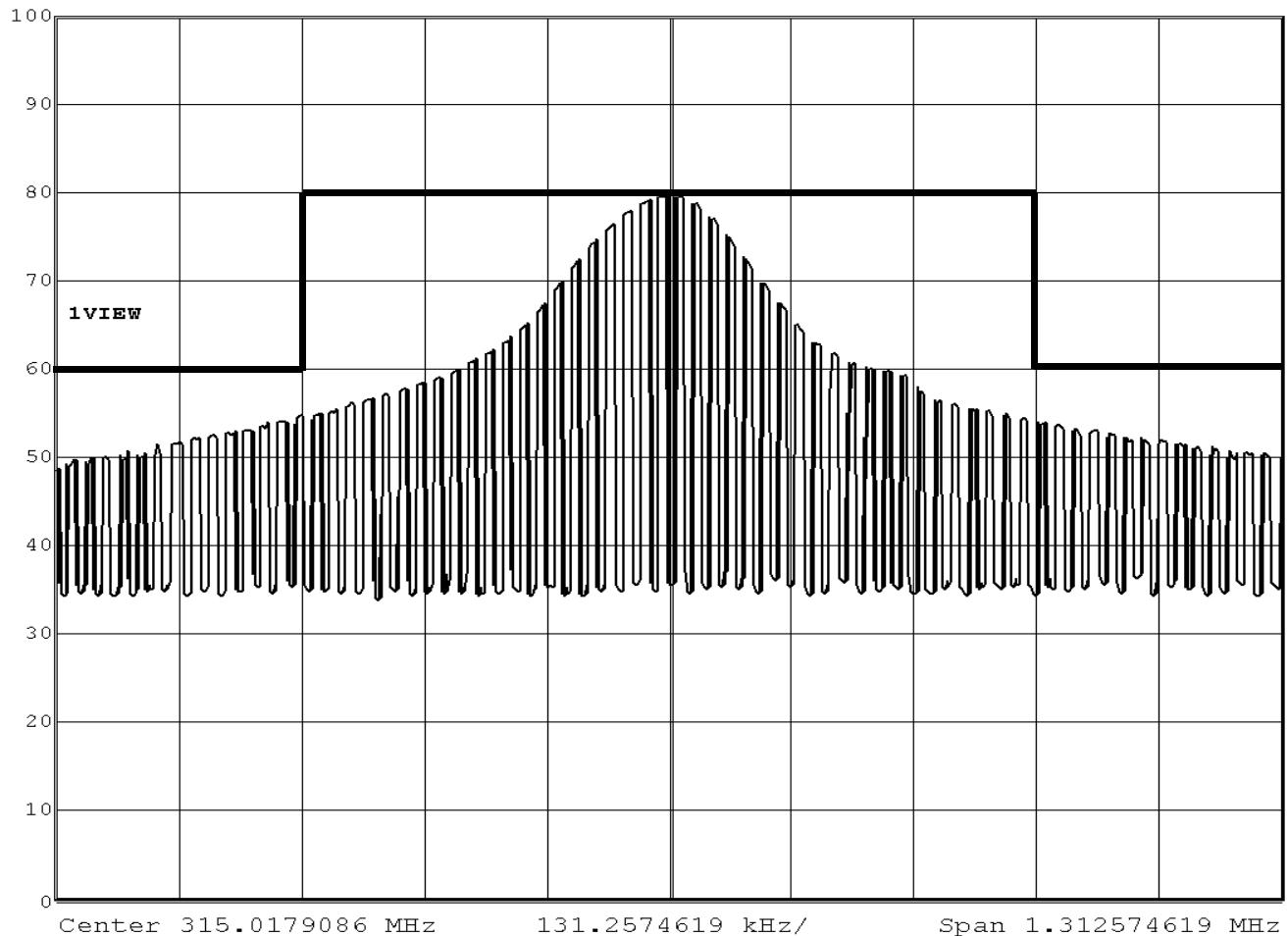
Limit for Corrected Peak Reading is 20 dB above the average limit, which is 95.62 dBuV/m. Peak Reading is below this limit.



Ref Lvl

100 dB μ V

RBW 100 kHz RF Att 20 dB
VBW 300 kHz
SWT 5 s Unit dB μ V



Date: 24.APR.2001 11:03:52

Customer: Rainwise, Inc.
Test Sample: Wireless Rain Gauge 315 MHz RF Transmitter
Model No: n/a
Test Method: FCC Part 15.231, Occupied Bandwidth
Notes:

Date: 4/24/01

Tech: T. Hannemann

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Report No. R-3728N

RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

Test Method:	Spurious Emissions 9 kHz to 3.2 Ghz		
Customer:	Rainwise, Inc.	Job No:	R-3728N
Test Sample:	Wireless Rain Gauge 315 MHz RF Transmitter		
Model No:	n/a	Serial No:	n/a
Test Specification:	FCC Part 15.231 Paragraph: n/a		
Operating Mode:	Continuously Transmitting		
Technician:	T. Firkowski	Date:	5/1/01
Notes:	Fundamental Frequency: 315 MHz Detector Function: Peak		