

APPLICANT

Bosch Security Systems, Inc.
 130 Perinton Parkway
 Fairport, NY 14450

MANUFACTURER

Bosch Security Systems, Inc.
 130 Perinton Parkway
 Fairport, NY 14450

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

TEST PROCEDURE: ANSI C63.4:2001

TEST SAMPLE DESCRIPTION

BRANDNAME: Bosch Security Systems, Inc. MODEL: RF1100

TYPE: Pulsed Transmitter

POWER REQUIREMENTS: 2 AA Batteries

FREQUENCY OF OPERATION: 304 MHz

TESTS PERFORMED

Para. 15.231(a), Radiated Emissions, Fundamental and Harmonics

Para. 15.231(b), Duty Cycle Determination

Para. 15.231(c), Occupied Bandwidth

REPORT OF MEASUREMENTS

Applicant: Bosch Security Systems, Inc.

Device: Pulsed Transmitter

FCC ID: ESV-RF1100

Power Requirements: 2 AA Batteries

Applicable Rule Section: Part 15, Subpart C, Section 15.231



Retlif Testing Laboratories

Test Report No. R-10364-1

FCC ID: ESV-RF1100

REPORT OF MEASUREMENTS (continued)

TEST RESULTS

- 15.231 (a): This device is used as a Remote Control/Security device.
- 15.231 (a)(1) & The transmitter is automatically operated.
- 15.231 (a)(3): The transmitter does perform periodic transmissions at intervals greater than once per hour.
- 15.231 (b): The fundamental field strength did not exceed 5580 $\mu\text{V/M}$ (Average) at a test distance of 3 meters. In addition, the requirements of section 15.35 for averaging pulsed emissions and for limiting peak emissions were met.
- The field strength of harmonic and spurious emissions did not exceed 558 $\mu\text{V/M}$ (AVERAGE).

DETERMINATION OF FIELD STRENGTH LIMITS

The field strength limits shown below are found in Section 15.231.

| Frequency | | Limit | |
|-----------|-------|-------|------|
| F1 | = 260 | 3750 | = L1 |
| Fo | = 304 | | Lo |
| F2 | = 470 | 12500 | = L2 |

The formula below was utilized to determine the limits:

$$\text{Limit} = L1 + [(Fo-F1)(L2-L1)/(F2-F1)]$$

Solving yields:

- Fundamental Limit = 5580 $\mu\text{V/M}$ (AVERAGE) @ 3 Meters
Harmonic Limit = 558 $\mu\text{V/M}$ (AVERAGE) @ 3 Meters



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DUTY CYCLE DETERMINATION

The unit's RF output was directly coupled to the input of the spectrum analyzer. 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. (See plots for additional information)

Transmitter On Time = 7.4 milliseconds (maximum)

Transmitter Cycle Time = 213 milliseconds

Transmitter Duty Cycle = 7.4 %

CALCULATION:

Duty Cycle (7.4/100) = 7.4 %

Correction Factor = $20 \log(0.074)$ = -22.6 dB



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Test Report No. R-10364-1

FCC ID: ESV-RF1100

SPECTRUM ANALYZER DESENSITIZATION CONSIDERATIONS

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. The following formula was utilized:

Setting pulse desensitization equal to zero and utilizing the minimum observed pulse width of 200 μ s yields a minimum required bandwidth of 3333 Hz. FCC specified bandwidths of 100 kHz and 1MHz were utilized below and above 1GHz, respectively.

GENERAL NOTES

1. All readings were taken utilizing a peak detector function at a test distance of 3 meters.
2. The duty cycle was applied to the peak readings in order to determine the average value of the emissions.
3. The frequency range was scanned from 30 MHz to 3.1 GHz. All emissions not reported were more than 20 dB below the specified limit.



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Test Report No. R-10364-1
FCC ID: ESV-RF1100

Equipment List

RE Fundamental and Harmonics

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due |
|-----------|-------------------------|---------------------|----------------------|------------------|-----------------|------------|
| 067 | Open Area Test Site | Retlif | 3 Meter | RNY | 10/1/2003 | 10/1/2006 |
| 128 | Double Ridged Guide | Electro-Mechanics | 1 GHz - 18 GHz | 3105 | 6/13/2004 | 6/21/2005 |
| 133 | Broadband Pre-Amplifier | Electro-Metrics | 10 kHz - 1 GHz, 26dB | BPA-1000 | 6/21/2004 | 6/12/2005 |
| 141 | Spectrum Analyzer | Hewlett Packard | 100 Hz - 40 GHz | 8566B | ½6/2004 | 7/26/2004 |
| 543 | Preamplifier | Hewlett Packard | 1.0 GHz - 26.5 GHz | 8449B | 7/24/2003 | 7/24/2004 |
| 617 | Interference Analyzer | Electro-Metrics | 10 kHz - 1 GHz | EMC-30 | 9/30/2003 | 9/30/2004 |
| 712A | Cable | Retlif | 10 kHz - 18 GHz | R&S Analyzer | 7/9/2003 | 7/9/2004 |
| 723 | H.P. Filter | Mini-Circuits | 1 GHz | BHP-1000 | 7/11/2003 | 7/11/2004 |
| 206B | 6.0 dB Attenuator | Texscan | 0 - 1.0 GHz | FP-50 - 6 dB | 6/12/2004 | 6/12/2005 |



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Test Report No. R-10364-1
FCC ID: ESV-RF1100

FCC 15.231(b)

RADIATED EMISSIONS, FUNDAMENTAL

(See separate e-file named Refundharm.pdf)



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Test Report No. R-10364-1
FCC ID: ESV-RF1100

FCC 15.231(c)
OCCUPIED BANDWIDTH
(See separate e-file named occbw.pdf)



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Test Report No. R-10364-1
FCC ID: ESV-RF1100

FCC 15.231(c)

DUTY CYCLE

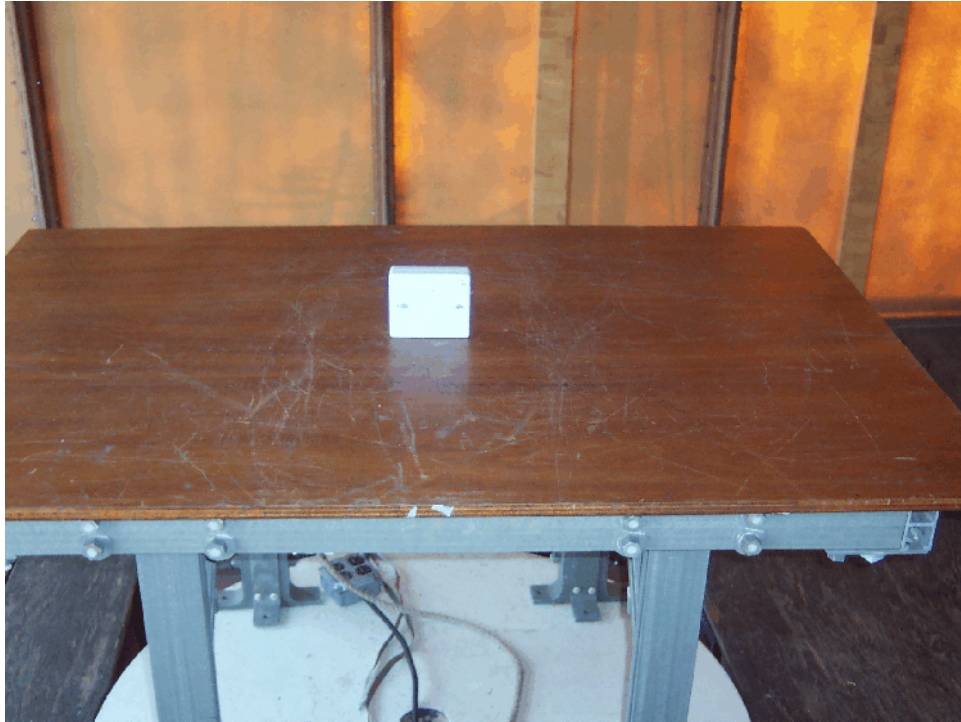
(See separate e-file named dutycycle.pdf)



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Test Report No. R-10364-1
FCC ID: ESV-RF1100

Test Setup Photograph



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Test Report No. R-10364-1
FCC ID: ESV-RF1100

| Test Method: | FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions. | | | | | | |
|---|---|-------------------|---------------|-------------------|-------------------|-------------------|----------------|
| Customer: | Bosch Security Systems, Inc. | Job No. | R-10364-1 | | | | |
| Test Sample: | 304 MHz Pulsed Transmitter. | Paragraph: | 15.231 | | | | |
| Model No.: | RF1100E | FCC ID: | ESV- | | | | |
| Operating Mode: | Continuously transmitting a 304 MHz signal. | | | | | | |
| Technician: | R. Soodoo / D. Lerner | Date: | June 23, 2004 | | | | |
| Notes: | Test Distance: 3 Meters Detector: Peak, Unless otherwise specified. QP += Quasi Peak limit at this frequency. | | | | | | |
| Test Freq. | Antenna Pol./Height | EUT Orientation | Meter Reading | Correction Factor | Corrected Reading | Converted Reading | Peak Limit |
| MHz | (V/H)/Meters | Degrees | dBuV | dB | dBuV/m | uV/m | uV/m |
| | H/1.0 | Y | 65.0 | 10.8 | 75.8 | 61656.0 | |
| | V/1.5 | X | 71.0 | 10.8 | 81.8 | 12303.0 | |
| | V/1.5 | Y | 71.0 | 10.8 | 81.8 | 12303.0 | |
| 304 | | | | | | | 110000 |
| 608 | H/1.0 | X | 19.0 | 14.6 | 33.6 | 47.9 QP | 200 QP+ |
| | H/1.0 | Y | 19.0 | 14.6 | 33.6 | 47.9 QP | |
| | V/1.5 | X | 12.0 | 14.5 | 26.5 | 21.1 QP | |
| | V/1.5 | Y | 12.0 | 14.5 | 26.5 | 21.1 QP | |
| 608 | | | | | | | 200 QP+ |
| 912 | H/1.25 | X | 14.0 | 17.6 | 31.6 | 38.0 | 11000 |
| | H/1.25 | Y | 14.0 | 17.6 | 31.6 | 38.0 | |
| | V/1.5 | X | 10.0 | 17.9 | 27.9 | 24.8 | |
| | V/1.5 | Y | 10.0 | 17.9 | 27.9 | 24.8 | |
| 912 | | | | | | | 11000 |
| 1216 | H/2.5 | X | 42.6 | -7.6 | 34.9 | 55.6* | 11000 |
| | H/2.5 | Y | 42.6 | -7.6 | 34.9 | 55.6* | |
| | V/1.0 | X | 42.5 | -7.6 | 35.0 | 56.2* | |
| | V/1.0 | Y | 42.5 | -7.6 | 35.0 | 56.2* | |
| 1216 | | | | | | | 11000 |
| 1520 | H/2.0 | X | 43.4 | -7.4 | 36.0 | 63.1* | 11000 |
| | H/2.0 | Y | 43.4 | -7.4 | 36.0 | 63.1* | |
| | V/1.0 | X | 45.2 | -7.4 | 37.8 | 77.6* | |
| | V/1.0 | Y | 45.2 | -7.4 | 37.8 | 77.6* | |
| 1520 | | | | | | | 11000 |
| The frequency range was scanned from 304 MHz to 3.1GHz. All emissions not recorded were more than 10 dB below the specified limit. Emissions from the EUT do not exceed the specified limits. | | | | | | | |
| *-=Noise Floor Measurements (Minimum system sensitivity). | | | | | | | |



Retlif Testing Laboratories

Retlif Job Number R-10364-1

| | | | |
|------------------------|--|-------------------|----------------|
| Test Method: | FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions | | |
| Customer: | Bosch Security Systems, Inc. | Job No. | R-10364-1 |
| Test Sample: | 304 MHz Pulsed Transmitter. | Paragraph: | 15.231 |
| Model No.: | RF1100E | FCC ID: | ESV- |
| Operating Mode: | Continuously transmitting a 304 MHz signal. | | |
| Technician: | R. Soodoo / D. Lerner | Date: | June 23, 2004. |

Notes: Test Distance: 3 Meters
 Detector: Peak, unless otherwise specified.

| Test Freq. | Antenna Pol./Height | EUT Orientation | Meter Reading | Correction Factor | Corrected Reading | Converted Reading | Peak Limit |
|------------|---------------------|-----------------|---------------|-------------------|-------------------|-------------------|------------|
| MHz | (V/H)-Meters | X / Y / Z | dBuV | dB | dBuV/m | uV/m | uV/m |
| | H/1.0 | Y | 40.0 | -4.5 | 35.5 | 59.6* | |
| | V/1.0 | X | 39.5 | -4.5 | 35.0 | 56.2* | |
| | V/1.0 | Y | 39.5 | -4.5 | 35.0 | 56.2* | |
| 1824 | | | | | | | 11000 |
| 2128 | H/1.0 | X | 39.4 | -3.6 | 35.8 | 61.7* | 11000 |
| | H/1.0 | Y | 39.4 | -3.6 | 35.8 | 61.7* | |
| | V/1.0 | X | 40.0 | -3.6 | 36.4 | 66.0* | |
| | V/1.0 | Y | 40.0 | -3.6 | 36.4 | 66.0* | |
| 2128 | | | | | | | 11000 |
| 2432 | H/1.0 | X | 45.6 | -1.9 | 43.7 | 153.0* | 11000 |
| | H/1.0 | Y | 45.6 | -1.9 | 43.7 | 153.0* | |
| | V/1.0 | X | 39.4 | -1.9 | 37.5 | 75.0* | |
| | V/1.0 | Y | 39.4 | -1.9 | 37.5 | 75.0* | |
| 2432 | | | | | | | 11000 |
| 2736 | H/1.0 | X | 42.2 | -1.7 | 40.5 | 106.0* | 11000 |
| | H/1.0 | Y | 42.2 | -1.7 | 40.5 | 106.0* | |
| | V/1.0 | X | 41.3 | -1.7 | 39.6 | 95.5* | |
| | V/1.0 | Y | 41.3 | -1.7 | 39.6 | 95.5* | |
| 2736 | | | | | | | 11000 |
| 3040 | H/1.0 | X | 40.0 | -0.3 | 39.7 | 96.6* | 11000 |
| | H/1.0 | Y | 40.0 | -0.3 | 39.7 | 96.6* | |
| | V/1.0 | X | 39.3 | -0.3 | 39.0 | 89.1* | |
| | V/1.0 | Y | 39.3 | -0.3 | 39.0 | 89.1* | |
| 3040 | | | | | | | 11000 |

The frequency range was scanned from 304 MHz to 3.1 GHz. All emissions not recorded were more than 10 dB below the specified limit. Emissions from the EUT do not exceed the specified limits.

*=Noise Floor Measurements (Minimum system sensitivity).



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Retlif Job Number R-10364-1

| Test Method: | FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions. | | | | | | |
|---|---|-------------------|---|------------------------------|---------------------------------|-------------------|----------------|
| Customer: | Bosch Security Systems, Inc. | Job No. | R-10364-1 | | | | |
| Test Sample: | 304 MHz Pulsed Transmitter. | Paragraph: | 15.231 | | | | |
| Model No.: | RF1100E | FCC ID: | ESV- | | | | |
| Operating Mode: | Continuously transmitting a 304 MHz signal. | | | | | | |
| Technician: | R. Soodoo / D. Lerner | Date: | June 23, 2004. | | | | |
| Notes: | Test Distance: 3 Meter | | Duty Cycle: 7.4% | | Duty Cycle Correction: -22.6 dB | | |
| | Detector: Peak, unless otherwise specified. | | QP + = Quasi Peak limit at this frequency. | | | | |
| Test Freq. | Antenna Pol./Height | EUT Orientation | Peak Reading | Duty Cycle Correction Factor | Corrected Reading | Converted Reading | Avg. Limit |
| MHz | (V/H)-Meters | X / Y / Z | dBuV | dB | dBuV/m | uV/m | uV/m |
| | H/1.0 | Y | 75.8 | -22.6 | 53.2 | 457.1 | |
| | V/1.5 | X | 81.8 | -22.6 | 59.2 | 912.0 | |
| | V/1.5 | Y | 81.8 | -22.6 | 59.2 | 912.0 | |
| 304 | | | | | | | 11000 |
| 608 | H/1.0 | X | 33.6 QP | N/A | 33.6 | 47.9 | 200 QP+ |
| | H/1.0 | Y | 33.6 QP | N/A | 33.6 | 47.9 | |
| | V/1.5 | X | 26.5 QP | N/A | 26.5 | 21.1 | |
| | V/1.5 | Y | 26.5 QP | N/A | 26.5 | 21.1 | |
| 608 | | | | | | | 200 QP+ |
| 912 | H/1.25 | X | 31.6 | -22.6 | 9.0 | 2.8 | 11000 |
| | H/1.25 | Y | 31.6 | -22.6 | 9.0 | 2.8 | |
| | V/1.5 | X | 27.9 | -22.6 | 5.3 | 1.8 | |
| | V/1.5 | Y | 27.9 | -22.6 | 5.3 | 1.8 | |
| 912 | | | | | | | 11000 |
| 1216 | H/2.5 | X | 34.9 | -22.6 | 12.3* | 4.1 | 1100 |
| | H/2.5 | Y | 34.9 | -22.6 | 12.3* | 4.1 | |
| | V/1.0 | X | 35.0 | -22.6 | 12.4* | 4.1 | |
| | V/1.0 | Y | 35.0 | -22.6 | 12.4* | 4.1 | |
| 1216 | | | | | | | 1100 |
| 1520 | H/2.0 | X | 36.0 | -22.6 | 13.4* | 4.7 | 1100 |
| | H/2.0 | Y | 36.0 | -22.6 | 13.4* | 4.7 | |
| | V/1.0 | X | 37.8 | -22.6 | 15.2* | 5.8 | |
| | V/1.0 | Y | 37.8 | -22.6 | 15.2* | 5.8 | |
| 1520 | | | | | | | 1100 |
| The frequency range was scanned from 304 MHz to 3.1GHz. All emissions not recorded were more than 10 dB below the specified limit. Emissions from the EUT do not exceed the specified limits. | | | | | | | |
| * = Noise Floor Measurements (Minimum system sensitivity). | | | | | | | |



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Retlif Job Number R-10364-1

| Test Method: | FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions. | | | | | | |
|--|---|-----------------|--------------|---------------------------------|-------------------|-------------------|------------|
| Customer: | Bosch Security Systems, Inc. | | | Job No.: | R-10364-1 | | |
| Test Sample: | 304 MHz Pulsed Transmitter. | | | Paragraph: | 15.231 | | |
| Model No.: | RF1100E | | | FCC ID: | ESV- | | |
| Operating Mode: | Continuously transmitting a 304 MHz signal. | | | | | | |
| Technician: | R. Soodoo / D. Lerner | | | Date: | June 23, 2004. | | |
| Notes: | Test Distance: 3 Meters | | | Duty Cycle: 7.4 % | | | |
| | Detector: Peak, unless otherwise specified | | | Duty Cycle Correction: -22.6 dB | | | |
| Test Freq. | Antenna Pol./Height | EUT Orientation | Peak Reading | Duty Cycle Correction Factor | Corrected Reading | Converted Reading | Avg. Limit |
| MHz | (V/H)-Meters | X / Y / Z | dBuV | dB | dBuV/m | uV/m | uV/m |
| | H/1.0 | Y | 35.5 | -22.6 | 12.9* | 4.4 | |
| | V/1.0 | X | 35.0 | -22.6 | 12.4* | 4.2 | |
| | V/1.0 | Y | 35.0 | -22.6 | 12.4* | 4.2 | |
| 1824 | | | | | | | 1100 |
| 2128 | H/1.0 | X | 35.8 | -22.6 | 13.2* | 4.6 | 1100 |
| | H/1.0 | Y | 35.8 | -22.6 | 13.2* | 4.6 | |
| | V/1.0 | X | 36.4 | -22.6 | 13.8* | 4.9 | |
| | V/1.0 | Y | 36.4 | -22.6 | 13.8* | 4.9 | |
| 2128 | | | | | | | 1100 |
| 2432 | H/1.0 | X | 43.7 | -22.6 | 21.1* | 11.4 | 1100 |
| | H/1.0 | Y | 43.7 | -22.6 | 21.1* | 11.4 | |
| | V/1.0 | X | 37.5 | -22.6 | 14.9* | 5.6 | |
| | V/1.0 | Y | 37.5 | -22.6 | 14.9* | 5.6 | |
| 2432 | | | | | | | 1100 |
| 2736 | H/1.0 | X | 40.5 | -22.6 | 17.9* | 7.9 | 500 |
| | H/1.0 | Y | 40.5 | -22.6 | 17.9* | 7.9 | |
| | V/1.0 | X | 39.6 | -22.6 | 17* | 7.1 | |
| | V/1.0 | Y | 39.6 | -22.6 | 17* | 7.1 | |
| 2736 | | | | | | | 500 |
| 3040 | H/1.0 | X | 39.7 | -22.6 | 17.1* | 7.2 | 500 |
| | H/1.0 | Y | 39.7 | -22.6 | 17.1* | 7.2 | |
| | V/1.0 | X | 39.0 | -22.6 | 16.4* | 6.6 | |
| | V/1.0 | Y | 39.0 | -22.6 | 16.4* | 6.6 | |
| 3040 | | | | | | | 500 |
| The frequency range was scanned from 304 MHz to 3.1 GHz. All emissions not recorded were more than 10 dB below the specified limit. Emissions from the EUT do not exceed the specified limits. | | | | | | | |
| * = Noise Floor Measurements (Minimum system sensitivity) | | | | | | | |



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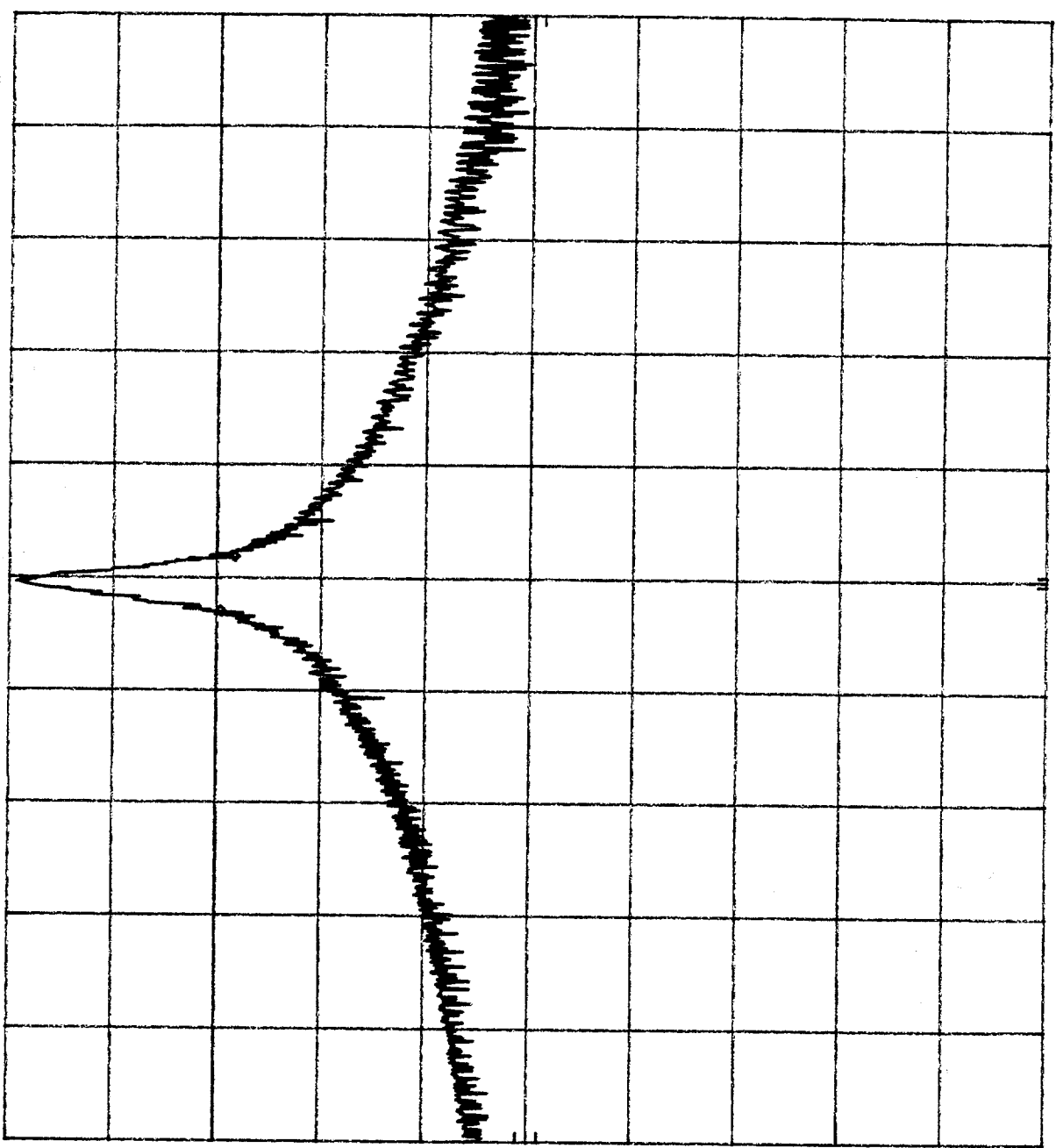
Retlif Job Number R-10364-1

R-10364 BOSCH RF1100 OCCUPIED BANDWIDTH TS 5/1 MKR4Δ 48 kHz
 REF -1.3 dBm ATTEN 10 dB

hp

10 dB/

DL
 -21.3
 dBm



CENTER 304.05 MHz RES BW 10 kHz
 VBW 30 kHz SPAN 1.00 MHz SWP 30.0 msec

| | |
|--------------|--|
| Customer: | Bosch Security System, Inc. |
| Test Sample: | 304 MHz Pulsed Transmitter. |
| Model No.: | RF 1100, FCC ID: ESV- |
| Test Method: | FCC Part 15 Subpart C 15.231(c), Occupied Bandwidth |
| Notes: | Bandwidth does not exceed 0.25% of Center Frequency at the 20 dBc points (760 kHz) |
| Date: | June 24, 2004. |
| Tech: | T. S. |
| Sheet: | 1 of 1 |



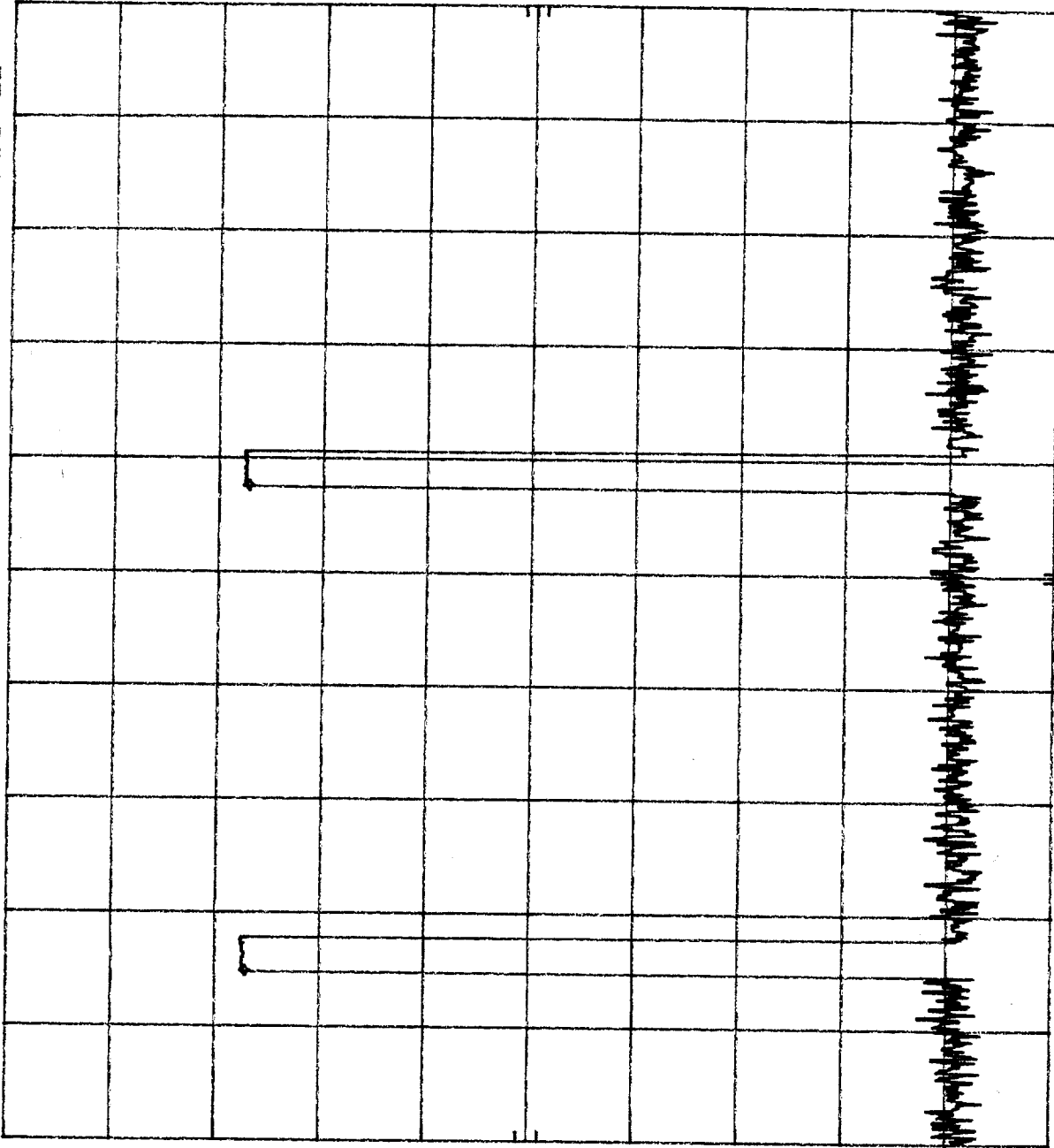
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Report No. R-10364-1

R-10364 BOSCH RF1100 DUTY CYCLE TS 5/11/04MKR Δ 213.5 msec
 REF 10.0 dBm ATTEN 20 dB

HP

10 dB/



CENTER 304.056 000 MHZ
 RES BW 10 KHZ
 VBW 30 KHZ
 SWP 500 msec
 SPAN 0 Hz

Customer: Bosch Security System, Inc.
 Test Sample: 304 MHz Pulsed Transmitter.
 Model No.: RF 1100, FCC ID: ESV-
 Test Method: FCC Part 15 Subpart , Duty Cycle Determination
 Notes: Pulse train cycle time measurement= 213.5 mSec (> 100 mSec)

Date: June 24, 2004. Tech: T. S. *[Signature]* Sheet 1 of 2



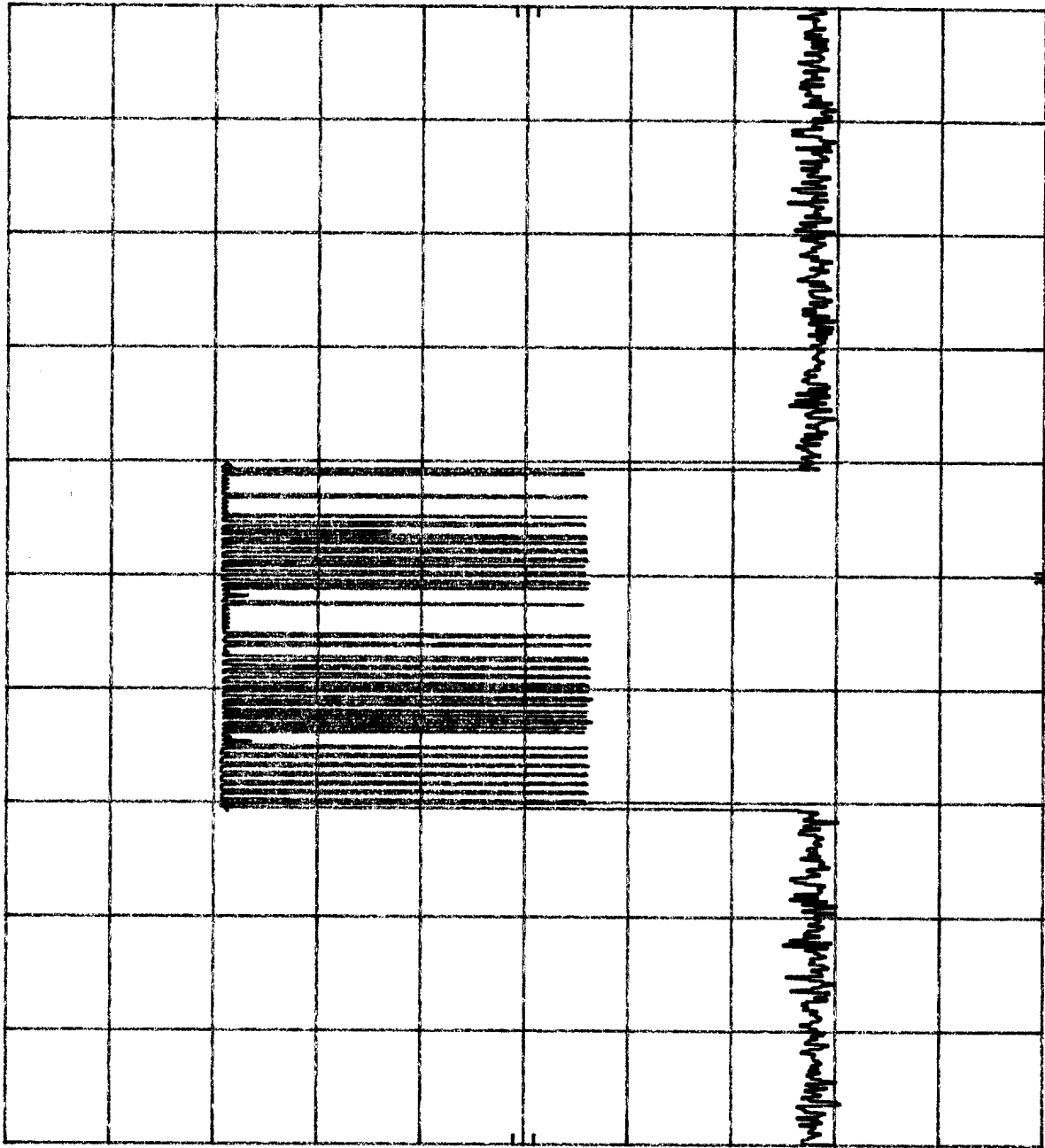
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Report No. R-10364-1

R-10364 BOSCH RF1100 DUTY CYCLE TS 5/11/04 MKR Δ 14.85 msec
 REF 10.0 dBm ATTEN 20 dB

hp

10 dB/



CENTER 304.056 000 MHz
 RES BW 100 kHz
 VBW 300 kHz
 SWP 50.0 msec
 SPAN 0 Hz

| | |
|--------------|---|
| Customer: | Bosch Security System, Inc. |
| Test Sample: | 304 MHz Pulsed Transmitter. |
| Model No.: | RF 1100, FCC ID: ESV- |
| Test Method: | FCC Part 15 Subpart C Duty Cycle Determination |
| Notes: | Transmitter on time measurement= approximately 50% of total on time= 0.5(14.85 mSec)= 7.4 msec=7.4 % Duty Cycle |
| Date: | June 24, 2004. |
| Tech: | T. S. |
| Sheet | 2 of 2 |



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