

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: RF3402

TYPE: Pulsed Transmitter

POWER REQUIREMENTS: 3 VDC via a CR2 Lithium Battery

FREQUENCY OF OPERATION: 304 MHz

TESTS PERFORMED

Para. 15.231(b), Fundamental & Harmonics

Para. 15.231(b), Spurious Case

Para. 15.231(c), Occupied Bandwidth

Para. 15.35, Duty Cycle Determination

REPORT OF MEASUREMENTS

Applicant: Bosch Security Systems, Inc.

Device: Pulsed Transmitter

FCC ID: ESV-RF3402

Power Requirements: 3 VDC via a CR2 Lithium Battery

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



Retif Testing Laboratories

Test Report No: R-10020

FCC ID: ESV-RF3402

REPORT OF MEASUREMENTS (continued)

TEST RESULTS

- 15.231 (a): This device is used as a Remote Control/Security device.
- 15.231 (a)(1) & (a)(2) The transmitter is manually operated and ceases transmission within 5 seconds of activation.
- 15.231 (a)(3): The transmitter does perform periodic transmissions at intervals greater than once per hour (Every 65 minutes).
- 15.231 (b): The fundamental field strength did not exceed 5560 $\mu\text{V/M}$ (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 556 $\mu\text{V/M}$ (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 = 5560 $\mu\text{V/M}$ (AVERAGE) @ 3 Meters
Harmonic Limit = 556 $\mu\text{V/M}$ (AVERAGE) @ 3 Meters
Bandwidth = 760 kHz



Retif Testing Laboratories

Test Report No: R-10020

FCC ID: ESV-RF3402

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 = 15.0 milliseconds (maximum)

Transmitter Cycle Time = 110 milliseconds

Transmitter Duty Cycle = 15.0 %

CALCULATION:

Duty Cycle (15/100) = 15 %

Correction Factor = $20 \log(0.15)$ = -16.5 dB



Retif Testing Laboratories

Test Report No: R-10020

FCC ID: ESV-RF3402

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 15 milliseconds yields a minimum required bandwidth of 44 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. All measurements were made with new 3V CR2 Lithium Battery.
4. The frequency range was scanned from 30 MHz to 3.04 GHz. All emissions not reported were more than 20 dB below the specified limit.



Retif Testing Laboratories

Test Report No: R-10020

FCC ID: ESV-RF3402

EQUIPMENT LIST

FCC Part 15 Subpart C 15.231;Radiated Emissions.

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	6/21/2004	6/21/2005
133	Broadband Pre-Amplifier	Electro-Metrics	10 kHz - 1 GHz, 26dB	BPA-1000	6/12/2004	6/12/2005
206B	6.0 dB Attenuator	Texscan	0 - 1.0 GHz	FP-50 - 6 dB	6/12/2004	6/12/2005
543	Preamplifier	Hewlett Packard	1.0 GHz - 26.5 GHz	8449B	7/27/2004	7/27/2005
617	Interference Analyzer	Electro-Metrics	10 kHz - 1 GHz	EMC-30	10/5/2004	10/5/2005
723	H.P. Filter	Mini-Circuits	1 GHz	BHP-1000	7/14/2004	7/14/2005
763	Spectrum Analyzer	Agilent	30 Hz - 13.2 GHz	E4405B	7/9/2004	7/9/2005
767	Biconilog	EMCO	26 - 2000 MHz	3142B	10/7/2004	10/7/2005



Retlif Testing Laboratories

Test Report No. R-10620

FCC ID: ESV-RF3402

FCC 15.231(b)
FUNDAMENTAL & HARMONICS



Retlif Testing Laboratories

Test Report No. R-10364-1

FCC ID: ESV-RF3402



Retlif Job Number R-10620

Test Method:	FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions						
Customer:	Bosch Security System Inc.					R-10620	
Test Sample:	RF3402 Transmitter				Paragraph:	15.231	
Model No.:	RF 3402				FCC ID:	ESV-RF3402	
Operating Mode:	Continuously Transmitting a 304 MHz Signal						
Technician:	R. Soodoo				Date:	October 30, 2004.	
Notes:	Test Distance: 3 Meters				Temperature: 12 °C		Humidity: 92 %
	Detector: Peak, unless otherwise specified						
Frequency	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	30.0	4.9	34.9	55.6*	
	H / 1.0	Z	30.0	4.9	34.9	55.6*	
	V / 1.0	X	30.0	4.0	34.0	50.1*	
	V / 1.0	Y	30.0	4.0	34.0	50.1*	
1827	V / 1.0	Z	30.0	4.0	34.0	50.1*	5559
2128	H / 1.0	X	40.0	1.2	41.2	114.8*	5559
	H / 1.0	Y	40.0	1.2	41.2	114.8*	
	H / 1.0	Z	40.0	1.2	41.2	114.8*	
	V / 1.0	X	40.0	1.2	41.2	114.8*	
	V / 1.0	Y	40.0	1.2	41.2	114.8*	
2128	V / 1.0	Z	40.0	1.2	41.2	114.8*	5559
2432	H / 1.0	X	40.0	3.8	43.8	154.9*	5559
	H / 1.0	Y	40.0	3.8	43.8	154.9*	
	H / 1.0	Z	40.0	3.8	43.8	154.9*	
	V / 1.0	X	40.0	3.8	43.8	154.9*	
	V / 1.0	Y	40.0	3.8	43.8	154.9*	
2432	V / 1.0	Z	40.0	3.8	43.8	154.9*	5559
2736	H / 1.0	X	40.0	5.1	45.1	179.9*	5012
	H / 1.0	Y	40.0	5.1	45.1	179.9*	
	H / 1.0	Z	40.0	5.1	45.1	179.9*	
	V / 1.0	X	40.0	5.1	45.1	179.9*	
	V / 1.0	Y	40.0	5.1	45.1	179.9*	
2736	V / 1.0	Z	40.0	5.1	45.1	179.9*	5012
3040	H / 1.0	X	40.0	6.2	46.2	204.2*	5559
	H / 1.0	Y	40.0	6.2	46.2	204.2*	
	H / 1.0	Z	40.0	6.2	46.2	204.2*	
	V / 1.0	X	40.0	6.2	46.2	204.2*	
	V / 1.0	Y	40.0	6.2	46.2	204.2*	
3040	V / 1.0	Z	40.0	6.2	46.2	204.2*	5559
	The frequency range was scanned from 30 MHz to 3.04 GHz.						
	All emissions not recorded were more than 20 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-10620

Test Method:	FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions						
Customer:	Bosch Security System Inc.					R-10620	
Test Sample:	RF3402 Transmitter				Paragraph:	15.231	
Model No.:	RF 3402				FCC ID:	ESV-RF3402	
Operating Mode:	Continuously Transmitting a 304 MHz Signal						
Technician:	R. Soodoo				Date:	October 30, 2004.	
Notes:	Test Distance: 3 Meters				Duty Cycle: 15 %		
	Detector: Peak, unless otherwise specified				Duty Cycle Correction: -16.5 dB		
Frequency	Antenna Pol./Height	EUT Orientation	Peak Reading	Correction Factor	Corrected Reading	Converted Reading	Avg. Limit
MHz	(V/H)-Meters	X / Y / Z	dBuV	dB	dBuV/m	uV/m	uV/m
	H /	Y	80.9	-16.5	64.4	1659.6	
	H /	Z	88.9	-16.5	72.4	4168.7	
	V /	X	81.6	-16.5	65.1	1798.9	
	V /	Y	85.6	-16.5	69.1	2851.0	
304	V /	Z	81.6	-16.5	65.1	1798.9	5559.0
608	H /	X	N/A	N/A	N/A	N/A	N/A
	H /	Y	N/A	N/A	N/A	N/A	N/A
	H /	Z	N/A	N/A	N/A	N/A	N/A
	V /	X	N/A	N/A	N/A	N/A	N/A
	V /	Y	N/A	N/A	N/A	N/A	N/A
608	V /	Z	N/A	N/A	N/A	N/A	N/A
912	H /	X	54.9	-16.5	38.4	83.2	555.9
	H /	Y	43.9	-16.5	27.4	23.4	
	H /	Z	49.9	-16.5	33.4	46.8	
	V /	X	53.9	-16.5	37.4	74.1	
	V /	Y	53.9	-16.5	37.4	74.1	
912	V /	Z	52.9	-16.5	36.4	66.1	555.9
1216	H /	X	48.7	-16.5	32.2	40.7	501.2
	H /	Y	38.7	-16.5	22.2	12.9	
	H /	Z	47.7	-16.5	31.2	36.3	
	V /	X	48.6	-16.5	32.1	40.3	
	V /	Y	50.6	-16.5	34.1	50.7	
1216	V /	Z	49.6	-16.5	33.1	45.2	501.2
1520	H /	X	46.6	-16.5	30.1	32.0	501.2
	H /	Y	40.6	-16.5	24.1	16.0	
	H /	Z	43.6	-16.5	27.1	22.6	
	V /	X	46.6	-16.5	30.1	32.0	
	V /	Y	54.6	-16.5	38.1	80.4	
1520	V /	Z	47.6	-16.5	31.1	35.9	501.2
	The frequency range was scanned from 30 MHz to 3.04 GHz.						
	All emissions not recorded were more than 20 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-10620

Test Method:	FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions						
Customer:	Bosch Security System Inc.					R-10620	
Test Sample:	RF3402 Transmitter				Paragraph:	15.231	
Model No.:	RF 3402				FCC ID:	ESV-RF3402	
Operating Mode:	Continuously Transmitting a 304 MHz Signal						
Technician:	R. Soodoo				Date:	October 30, 2004.	
Notes:	Test Distance: 3 Meters				Duty Cycle: 15 %		
	Detector: Peak, unless otherwise specified				Duty Cycle Correction: - 16.5dB		
Frequency	Antenna Pol./Height	EUT Orientation	Peak Reading	Correction Factor	Corrected Reading	Converted Reading	Avg. Limit
MHz	(V/H)-Meters	X / Y / Z	dBuV	dB	dBuV/m	uV/m	uV/m
	H /	Y	34.9	-16.5	18.4	8.3	
	H /	Z	34.9	-16.5	18.4	8.3	
	V /	X	34.0	-16.5	17.5	7.5	
	V /	Y	34.0	-16.5	17.5	7.5	
1827	V /	Z	34.0	-16.5	17.5	7.5	5559
2128	H /	X	41.2	-16.5	24.7	17.2	5559
	H /	Y	41.2	-16.5	24.7	17.2	
	H /	Z	41.2	-16.5	24.7	17.2	
	V /	X	41.2	-16.5	24.7	17.2	
	V /	Y	41.2	-16.5	24.7	17.2	
2128	V /	Z	41.2	-16.5	24.7	17.2	5559
2432	H /	X	43.8	-16.5	27.3	23.2	5559
	H /	Y	43.8	-16.5	27.3	23.2	
	H /	Z	43.8	-16.5	27.3	23.2	
	V /	X	43.8	-16.5	27.3	23.2	
	V /	Y	43.8	-16.5	27.3	23.2	
2432	V /	Z	43.8	-16.5	27.3	23.2	5559
2736	H /	X	45.1	-16.5	28.6	26.9	501.2
	H /	Y	45.1	-16.5	28.6	26.9	
	H /	Z	45.1	-16.5	28.6	26.9	
	V /	X	45.1	-16.5	28.6	26.9	
	V /	Y	45.1	-16.5	28.6	26.9	
2736	V /	Z	45.1	-16.5	28.6	26.9	501.2
3040	H /	X	46.2	-16.5	29.7	30.5	5559
	H /	Y	46.2	-16.5	29.7	30.5	
	H /	Z	46.2	-16.5	29.7	30.5	
	V /	X	46.2	-16.5	29.7	30.5	
	V /	Y	46.2	-16.5	29.7	30.5	
3040	V /	Z	46.2	-16.5	29.7	30.5	5559
	The frequency range was scanned from 30 MHz to 3.04 GHz.						
	All emissions not recorded were more than 20 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-10620

FCC 15.231(b)
SPURIOUS CASE



Retlif Testing Laboratories

Test Report No. R-10364-1
FCC ID: ESV-RF3402

	Retlif Testing Laboratories
	Retlif Job Number R-10620

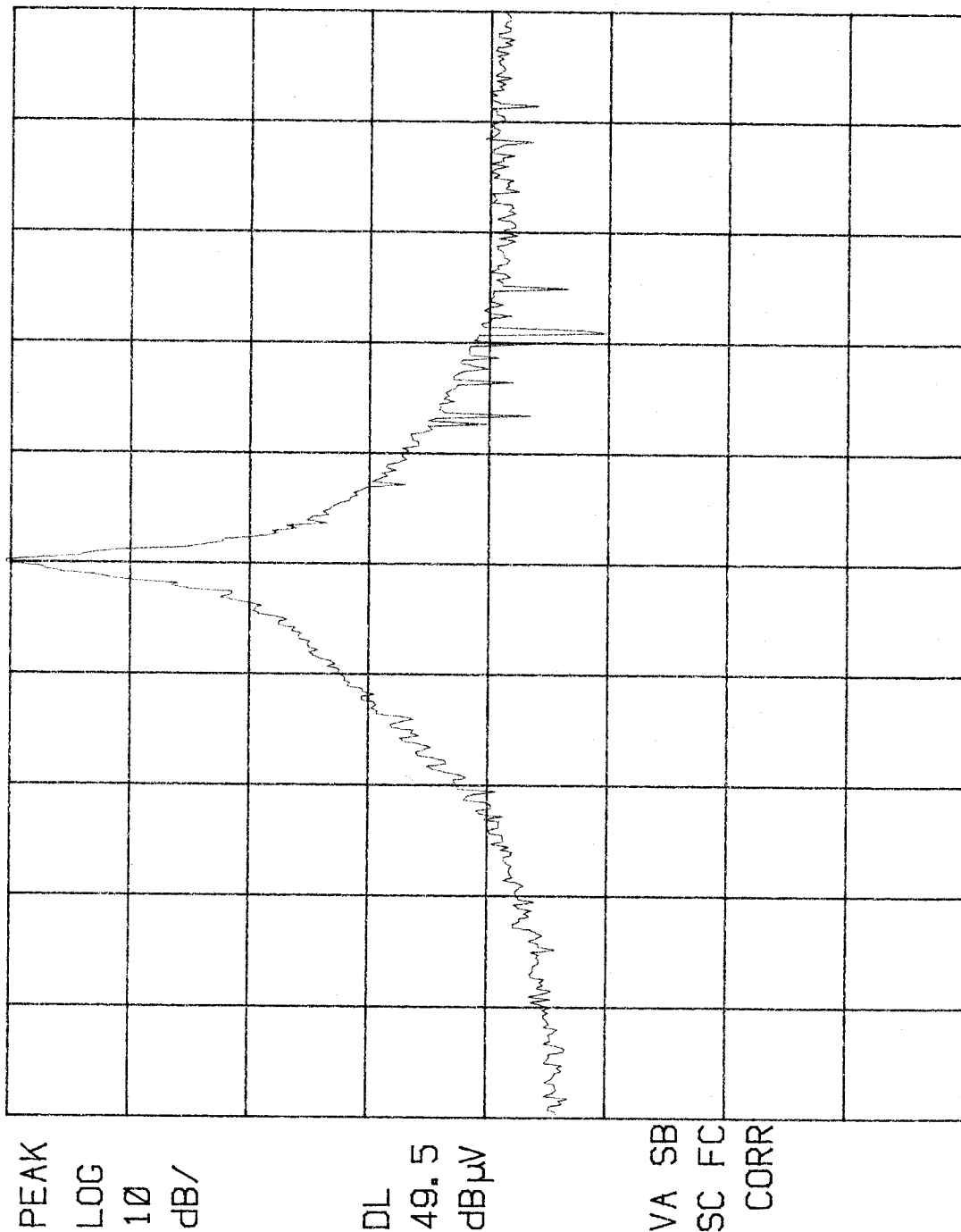
FCC 15.231(c)
OCCUPIED BANDWIDTH



Retlif Testing Laboratories

Test Report No. R-10364-1
FCC ID: ESV-RF3402

14:35:59 OCT 29, 2004
 R-10620 BOSCH RF3402 Occupied Bandwidth TS
 REF 69.5 dBμV AT 10 dB



CENTER 304.0038 MHz SPAN 760.0 kHz
 #RES BW 9.0 kHz SWP 33.3 msec

Customer:	Bosch Security Systems Inc.
Test Sample:	304 MHz Pulsed RF Transmitter
Model No.:	RF3402, FCC ID: ESV-RF3402
Test Method:	FCC Part 15, Para. 15.231(c) Occupied Bandwidth
Notes:	Bandwidth does not exceed 0.25 % of Center Frequency =760 kHz at the 20 dB down points
Date:	October 29, 2004
Tech:	T. Schneider
Sheet	1 of 1



Retlif Testing Laboratories

Report No. R-10630

FCC 15.231(c)
DUTY CYCLE

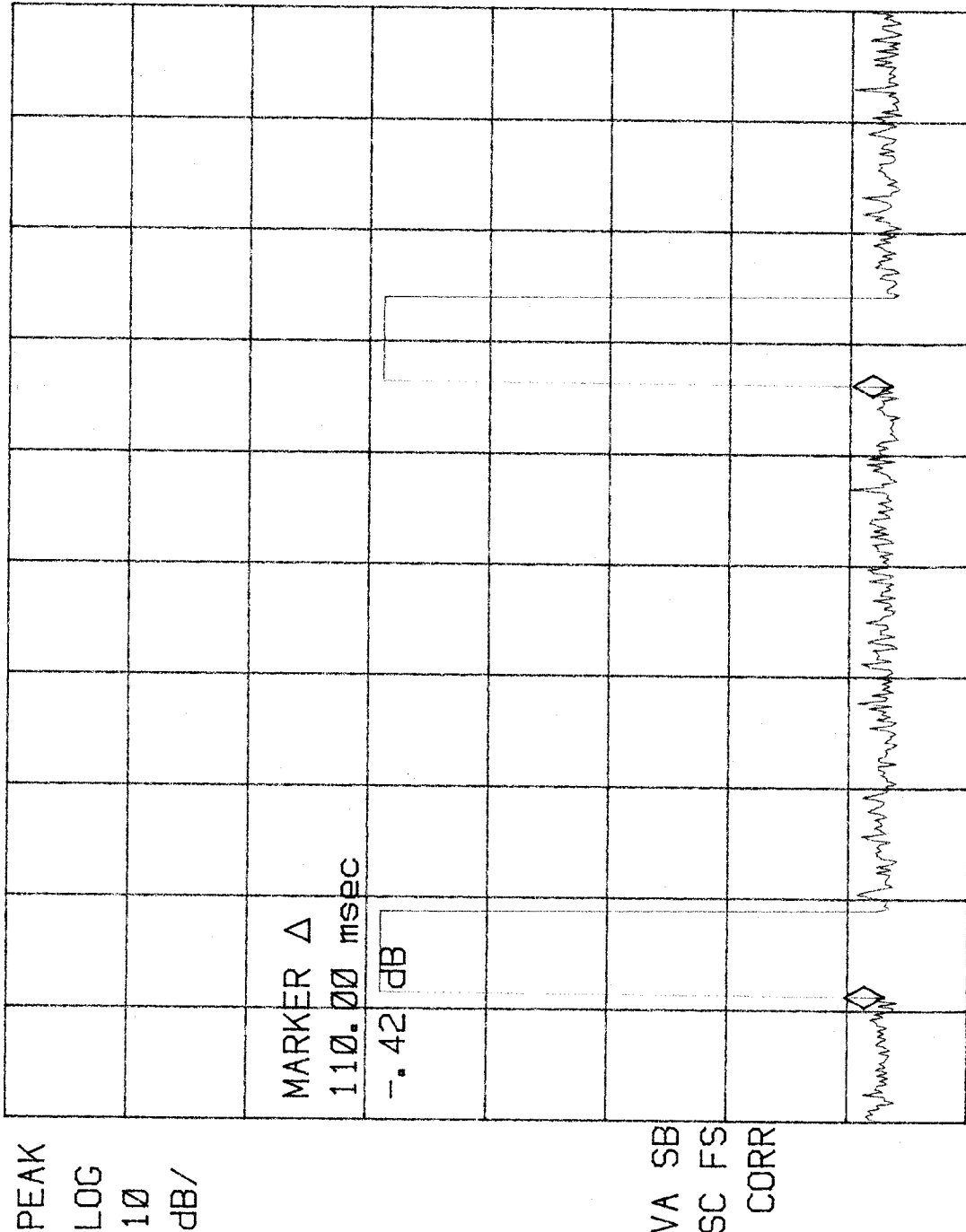


Retlif Testing Laboratories

Test Report No. R-10364-1

FCC ID: ESV-RF3402

15:03:31 OCT 29, 2004
 R-10620 BOSCH RF3402 Duty Cycle TS MKR 110.00 msec
 REF 100.0 dBμV AT 10 dB -42 dB



CENTER 304.004 MHz SPAN 0 Hz
 #RES BW 120 kHz #SWP 200 msec
 VBW 300 kHz

VA SB
 SC FS
 CORR

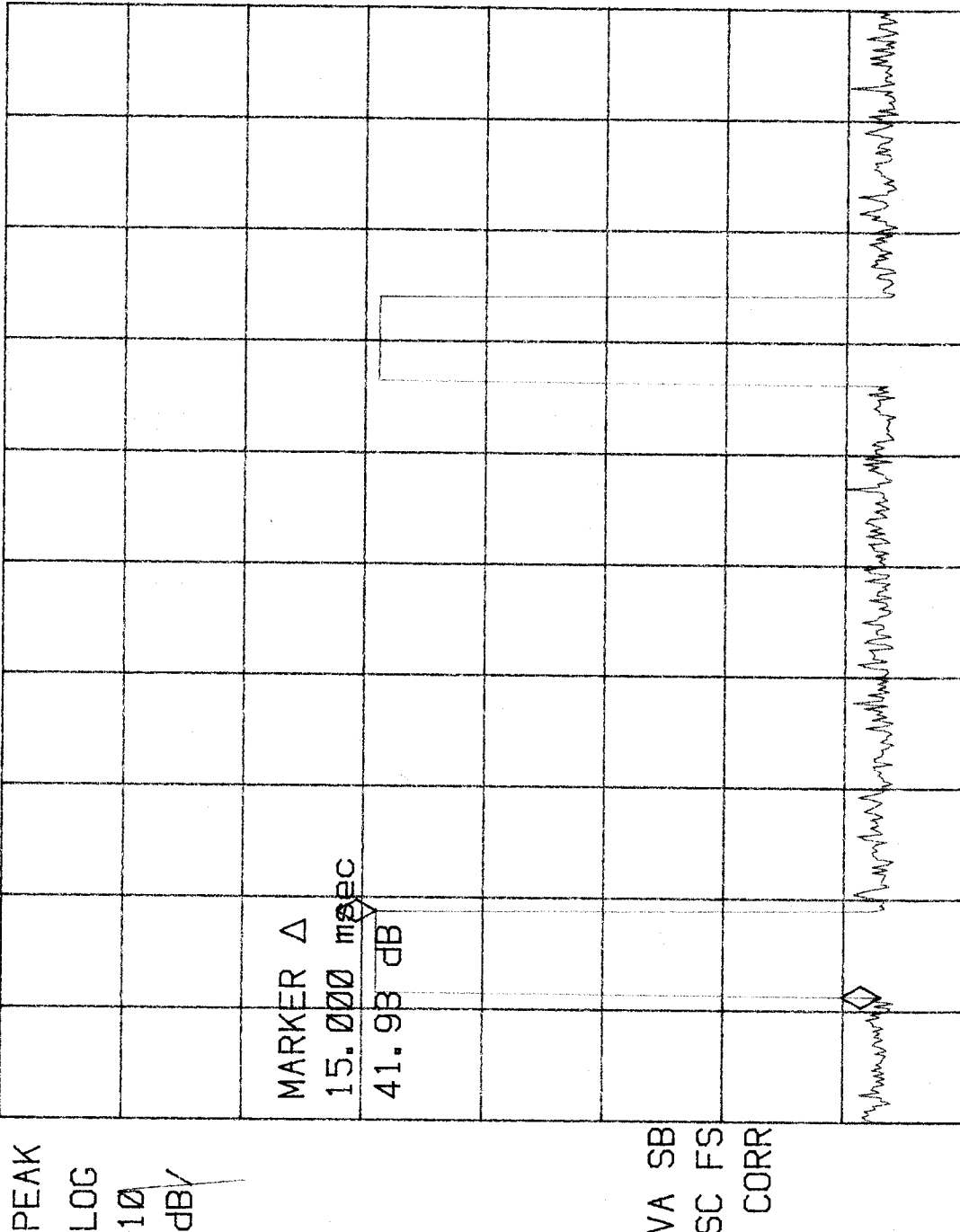
Customer:	Bosch Security Systems Inc.
Test Sample:	304 MHz Pulsed RF Transmitter
Model No.:	RF3402, FCC ID: ESV-RF3402
Test Method:	FCC Part 15, Para. 15.35 Duty Cycle determination
Notes:	Cycle time determination > 100 mscec=110 mSec
Date:	October 29, 2004
Tech:	T. Schneider
Sheet	1 of 2



Retlif Testing Laboratories

Report No. R-10630

15:09:04 OCT 29, 2004
 R-10620 BOSCH RF3402 Duty Cycle TS MKR 15.000 msec
 REF 100.0 dBμV AT 10 dB 41.93 dB



CENTER 304.004 MHz SPAN 0 Hz
 #RES BW 120 kHz #SWP 200 msec
 VBW 300 kHz

Customer:	Bosch Security Systems Inc.
Test Sample:	304 MHz Pulsed RF Transmitter
Model No.:	RF3402, FCC ID: ESV-RF3402
Test Method:	FCC Part 15, Para. 15.35 Duty Cycle determination
Notes:	On time determination = 15.0 msec
Date:	October 29, 2004
Tech:	T. Schneider
Sheet	2 of 2



Retlif Testing Laboratories

Report No. R-10630