Retlif Testing Laboratories

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FCC CERTIFICATION TEST REPORT
ON
DETECTION SYSTEMS, INC.
10.525 GHz FIELD DISTURBANCE
SENSOR MODEL DS9360
FCC ID: ESV9360

CUSTOMER NAME: Detection Systems, Inc.

CUSTOMER P.O.: 105512SKI

DATE OF REPORT: June 8,1998

TEST REPORT NO.: R-7546

TEST START DATE: May 20,1998

TEST FINISH DATE: May 28,1998

TEST TECHNICIAN: D. Cortes

TEST ENGINEER: T. Schneider

SUPERVISOR: R. Reitz

REPORT PREPARED BY: D. Cortes

GOVERNMENT SOURCE INSPECTION: Not Applicable

CERTIFICATION AND SIGNATURES

We certify that this report is a true representation of the results obtained from the tests of the equipment stated. We further certify that the measurements shown in this report were made in accordance with the procedures indicated and vouch for the qualifications of all Retlif Testing Laboratories personnel taking them.

Thomas J. Schneider
EMC Test Engineer

Richard J. Reitz
Laboratory 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.

ADMINISTRATIVE DATA

RETLIF TESTING LABORATORIES TEST REPORT NUMBER: R-7546

TEST SPECIFICATION: FCC Part 15, Subpart C
Section 15.245

CUSTOMER: Detection Systems, Inc.
130 Perinton Parkway
Fairport, New York, 14450

TEST SAMPLE: 10.525 GHz Field Disturbance Sensor Model DS9360
FCC ID: ESV9360

APPLICABLE DOCUMENTS: FCC Part 2
FCC Part 15
ANSI C63.4:1992

CLASSIFICATION: Not Classified

TESTING DATES: May 20, 1998 to May 28, 1998

DATE OF REPORT: June 8,1998

ADMINISTRATIVE SIGNATURE: Lesley Anderson

APPLICATION FOR CERTIFICATION - 2.1033

2.1033 (a), 731 Form

Attached

2.1033 (b)(1), Manufacturer

Detection Systems, Inc.
130 Perinton Parkway
Fairport, New York 14450

2.1033 (b)(1), Applicant

Detection Systems, Inc.
130 Perinton Parkway
Fairport, New York 14450

2.1033 (b)(2), FCC Identifier

ESV9360

2.1033 (b)(3), Installation and Operating Instructions

See Exhibit 1

2.1033 (b)(4), Circuit Description

See Exhibit 2

2.1033 (b)(5), Block and Schematic Diagrams

See Exhibit 3

2.1033 (b)(6), Report of Measurements

See Exhibit 4

2.1033 (b)(7), Equipment Photographs and FCC ID Label

See Exhibit 5

APPLICATION FOR CERTIFICATION - 2.1033 (con't.)

2.1033 (b)(8), Peripheral Equipment

The device did not require any peripheral equipment.

2.1033 (b)(9), Transition Requirements

The device is being certified pursuant to the current FCC requirements.

2.1033 (b)(10), EBS Requirements

Not Applicable

2.1033 (b)(11), Processing Gain & frequency Hopping Requirements

Not Applicable

2.1033 (b)(12), Certification of Scanning Receivers

Not Applicable

2.1033 (c), Composite Devices

Not Applicable

EXHIBIT 4

REPORT OF MEASUREMENTS

2.1033 (b)(6)

Retlif Testing Laboratories

Test Report Number R-7546

REPORT OF MEASUREMENTS

GENERAL

Applicant:	Detection Systems, Inc.
Device:	10.525 GHz Field Disturbance Sensor
Model:	DS9360
Serial Number:	N/A
FCC ID:	ESV9360
Input Power Requirements:	6 to 15 VDC (12 VDC Nominal)
Rule Section:	Part 15, Subpart C, Section 15.245

TEST METHODS PERFORMED

15.245 (b) Radiated Emissions, Fundamental

15.245 (b)(1) Radiated Emissions, Harmonics

15.245 (b)(3) Radiated Emissions, Band Edges

15.245 (b)(3) Radiated Emissions, Spurious Emissions, 30 MHz to 52.625 GHz

TEST RESULTS

15.245 (a)	The device is an intentional radiator used as a field disturbance sensor.
15.245 (b)	The device operates within the 10.500 to 10.550 GHz frequency band. The field strength of the fundamental emission did not exceed 2500 millivolts per meter, average.
15.245 (b)(1)	The device does not produce harmonic emissions below 17.7 GHz.
15.245 (b)(1)(i)	The device is intended to be used only within buildings and the field strength of harmonic emissions did not exceed 25.0 millivolts per meter.
15.245 (b)(2)	All radiated emissions measurements were extrapolated to the specified 3 meter test distance.

15.245 (b)(3)	The emissions radiated outside of the specified frequency band of 10.500 to 10.550 GHz did not exceed the general radiated emission limits of 15.209.
15.245 (b)(4)	The requirements of 15.35 for averaging pulsed emissions and limiting peak emissions were met.

NOTES

15.31 (a)(b)	All measurements were made in accordance with ANSI C63.4:1992.
15.31 (c)	The device does not use swept frequency techniques.
15.31 (d)	All testing was performed on Retlif Testing Laboratories Ronkonkoma, NY test site which has been listed with the FCC.
15.31 (e)	Variation of the radiated signal level of the fundamental frequency component was performed with the supply voltage varied between minimum and maximum rated input voltage range (6VDC.and 15VDC)
15.31 (f)(1)	Where testing was performed at distances other than the specified test distance, the obtained readings were extrapolated to the specified test distance using an inverse linear-distance extrapolation factor (20 dB / decade) for measurements between 30 MHz and 40 GHz. For measurements at frequencies above 40 GHz, an inverse linear-distance squared factor (40 dB / decade) was utilized.
15.31 (f)(5)	The device was rotated 360° in order to maximize the radiated emissions. The maximum field strength observed has been reported.
15.31 (g)	All consumer accessible controls were adjusted in order to maximize emissions (MW Range Control). A one meter length of unshielded twisted pair wire was connected to each of the relay and tamper outputs.
15.31 (m)	The device operates at a single frequency of 10.525 GHz.
15.31 (o)	All emissions within 20 dB of the specified limits have been reported unless otherwise stated.
15.33 (a)(2)	The device operates above 10 and below 30 GHz at a frequency of 10.525 GHz. Therefore radiated emissions measurements were made from 30 MHZ to 52.625 GHz, the fifth harmonic.

DUTY CYCLE

Twenty microsecond (20 μSec) pulses are applied to the gunn diode at a repetition rate of 1kHz. This yields a duty cycle of 2%, 20 μSec divided by 1000 μSec. This duty cycle was applied to the obtained peak readings in order to determine the average value of the emissions.

TEST DISTANCES

In order to obtain adequate system sensitivity at the harmonic frequencies of interest, it was necessary to perform certain measurements at a distance less than 3 meters. Care was taken to ensure that all measurements were taken in the far field region. The antenna was determined to be in the far field IFF:

$$d \geq 2 D^2 / \lambda$$

Where: d = Test Distance

D = Largest Antenna Length

λ = Wavelength at the Frequency of Interest

Solving for d yields the minimum test distances shown in the table below. Also shown is the actual test distance utilized.

Frequency GHz	Minimum Test Distance Meters	Actual Test Distance Meters
10.525	2.7	3
21.050	1.5	2
31.575	1.0	1
42.100	0.5	1
52.625	0.7	1

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 peak field strength measurements. The following formula was utilized:

$$\text{Pulse Desensitization } (\delta) = 20 \log (\text{Pulsewidth} * \text{bandwidth} * 1.5)$$

Setting the above equal to zero and utilizing the 20 microsecond pulsewidth yields a minimum required bandwidth of 33.3 kHz. The 1 MHz bandwidth specified in ANSI C63.4 was utilized for all fundamental and harmonic measurements.

TEST DATA

RADIATED EMISSIONS, FUNDAMENTAL

15.245 (b)

TEST SAMPLE: 10.525 GHz Field Disturbance Sensor
FCC ID: ESV9360
APPLICANT: Detection Systems, Inc.
TEST METHOD: Radiated Emissions, Fundamental
SPECIFICATION: FCC Part 15, Section 15.245 (b)
PERFORMED BY: D. Cortes
DATE: May 20,1998

Field Strength of Fundamental

Frequency GHz	Antenna Position H / V	EUT Orientation X / Y / Z	Meter Reading dBuV	Antenna Factor +dB	Corrected Reading dBuV/m		Converted Reading mV/m	Limit at 3 Meters mV/m
10.525	H	X	63.7	29.9	93.6		47.9	2,500
	V	X	65.1	29.9	95.0		56.2	2,500
	H	Y	67.7	29.9	97.6		75.9	2,500
	V	Y	63.3	29.9	93.2		45.7	2,500
	H	Z	66.1	29.9	96.0		63.1	2,500
	V	Z	69.6	29.9	99.5		94.4	2,500

Detector Function: Peak
Test Distance: 3 Meters
Resolution Bandwidth: 1 MHz
Video Bandwidth: 3 MHz

TEST SAMPLE: 10.525 GHz Field Disturbance Sensor
FCC ID: ESV9360
APPLICANT: Detection Systems, Inc.
TEST METHOD: Radiated Emissions, Fundamental, Input Voltage Variation
SPECIFICATION: FCC Part 15, Section 15.245 (b), 15.31(e)
PERFORMED BY: D. Cortes
DATE: May 20,1998

Input Voltage Variation

Frequency GHz	Test Voltage	Test Voltage VDC	Meter Reading dBuV	Antenna Factor +dB	Corrected Reading dBuV/m		Converted Reading mV/m	Limit at 3 Meters mV/m
10.525	(Vmin)	6VDC	69.4	29.9	99.3		92.3	2,500
	100% (Vnom)	12VDC	69.6	29.9	99.5		94.4	2,500
	(Vmax)	15VDC	69.3	29.9	99.2		91.2	2,500

Detector Function: Peak
Test Distance: 3 Meters
Resolution Bandwidth: 1 MHz
Video Bandwidth: 3 MHz

TEST DATA

RADIATED EMISSIONS, HARMONICS

15.245 (b)(1)

TEST SAMPLE: 10.525 GHz Field Disturbance Sensor
FCC ID: ESV9360
APPLICANT: Detection Systems, Inc.
TEST METHOD: Radiated Emissions, Harmonics
SPECIFICATION: FCC Part 15, Section 15.245 (b)(1)
PERFORMED BY: D. Cortes
DATE: May 20,1998

Field Strength of Harmonics - Peak

Frequency GHz	Antenna Position & Distance H / V	EUT Orientation X / Y / Z	Meter Reading dBuV	Antenna Factor +dB	Test Distance Correction -dB	Corrected Reading dBuV/m	Converted Reading uV/m	Peak Limit at 3 Meters uV/m
21.050	H - 1.1	X	46.6	32.5	3.5	75.6	6025.6	250,000
	V - 1.1	X	46.1	32.5	3.5	75.1	5688.5	250,000
	H - 1.1	Y	49.4	32.5	3.5	78.4	8317.6	250,000
	V - 1.3	Y	48.1	32.5	3.5	77.1	7161.4	250,000
	H - 1.2	Z	48.0	32.5	3.5	77.0	7079.5	250,000
	V - 1.2	Z	46.9	32.5	3.5	75.9	6237.3	250,000
31.575	H - 1.2	X	46.5	36.1	9.5	73.1	4518.6	250,000
	V - 1.2	X	40.1	36.1	9.5	66.7	2162.7	250,000
	H - 1.0	Y	36.0	36.1	9.5	62.6	1349.0	250,000
	V - 1.1	Y	42.1	36.1	9.5	68.7	2722.7	250,000
	H - 1.1	Z	40.9	36.1	9.5	67.5	2371.4	250,000
	V - 1.2	Z	39.0	36.1	9.5	65.6	1905.5	250,000
42.100	H - 1.0	X	36.4*	39.9	19.1	57.2	724.4	250,000

	V - 1.0	X	36.4*	39.9	19.1	57.2	724.4	250,000
	H - 1.0	Y	36.4*	39.9	19.1	57.2	724.4	250,000
	V - 1.0	Y	36.4*	39.9	19.1	57.2	724.4	250,000
	H - 1.0	Z	36.4*	39.9	19.1	57.2	724.4	250,000
	V - 1.0	Z	36.4*	39.9	19.1	57.2	724.4	250,000
52.625	H - 1.0	X	34.0*	41.1	19.1	56.0	631.0	250,000
	V - 1.0	X	34.0*	41.1	19.1	56.0	631.0	250,000
	H - 1.0	Y	34.0*	41.1	19.1	56.0	631.0	250,000
	V -1.0	Y	34.0*	41.1	19.1	56.0	631.0	250,000
	H - 1.0	Z	34.0*	41.1	19.1	56.0	631.0	250,000
	V - 1.0	Z	34.0*	41.1	19.1	56.0	631.0	250,000

* Denotes Minimum Sensitivity of Measurement System.

Field Strength of Harmonics - Average

Frequency GHz	Antenna Position H / V	EUT Orientation X / Y / Z	Peak Reading uV/m	Duty Cycle %		Average Reading uV/m	Limit at 3 Meters uV/m
21.050	H - 1.1	X	6025.6	2.0		120.5	25,000
	V - 1.1	X	5688.5	2.0		113.8	25,000
	H - 1.1	Y	8317.6	2.0		166.4	25,000
	V - 1.3	Y	7161.4	2.0		143.2	25,000
	H - 1.2	Z	7079.5	2.0		141.6	25,000
	V - 1.2	Z	6237.3	2.0		124.7	25,000

31.575	H - 1.2	X	4518.6	2.0		90.4	25,000
	V - 1.2	X	2162.7	2.0		43.3	25,000
	H - 1.0	Y	1349.0	2.0		27.0	25,000
	V - 1.1	Y	2722.7	2.0		54.5	25,000
	H - 1.1	Z	2371.4	2.0		47.4	25,000
	V - 1.2	Z	1905.5	2.0		38.1	25,000
42.100	H - 1.0	X	724.4	2.0		14.5	25,000
	V - 1.0	X	724.4	2.0		14.5	25,000
	H - 1.0	Y	724.4	2.0		14.5	25,000
	V - 1.0	Y	724.4	2.0		14.5	25,000
	H - 1.0	Z	724.4	2.0		14.5	25,000
	V - 1.0	Z	724.4	2.0		14.5	25,000
52.625	H - 1.0	X	631	2.0		12.6	25,000
	V - 1.0	X	631	2.0		12.6	25,000
	H - 1.0	Y	631	2.0		12.6	25,000
	V -1.0	Y	631	2.0		12.6	25,000
	H - 1.0	Z	631	2.0		12.6	25,000
	V - 1.0	Z	631	2.0		12.6	25,000

Detector Function: Peak / Duty Cycle Applied to Obtain Average Levels
Test Distance: As Specified for each frequency
Resolution Bandwidth: 1 MHz
Video Bandwidth: 3 MHz

TEST DATA

RADIATED EMISSIONS, BAND EDGES

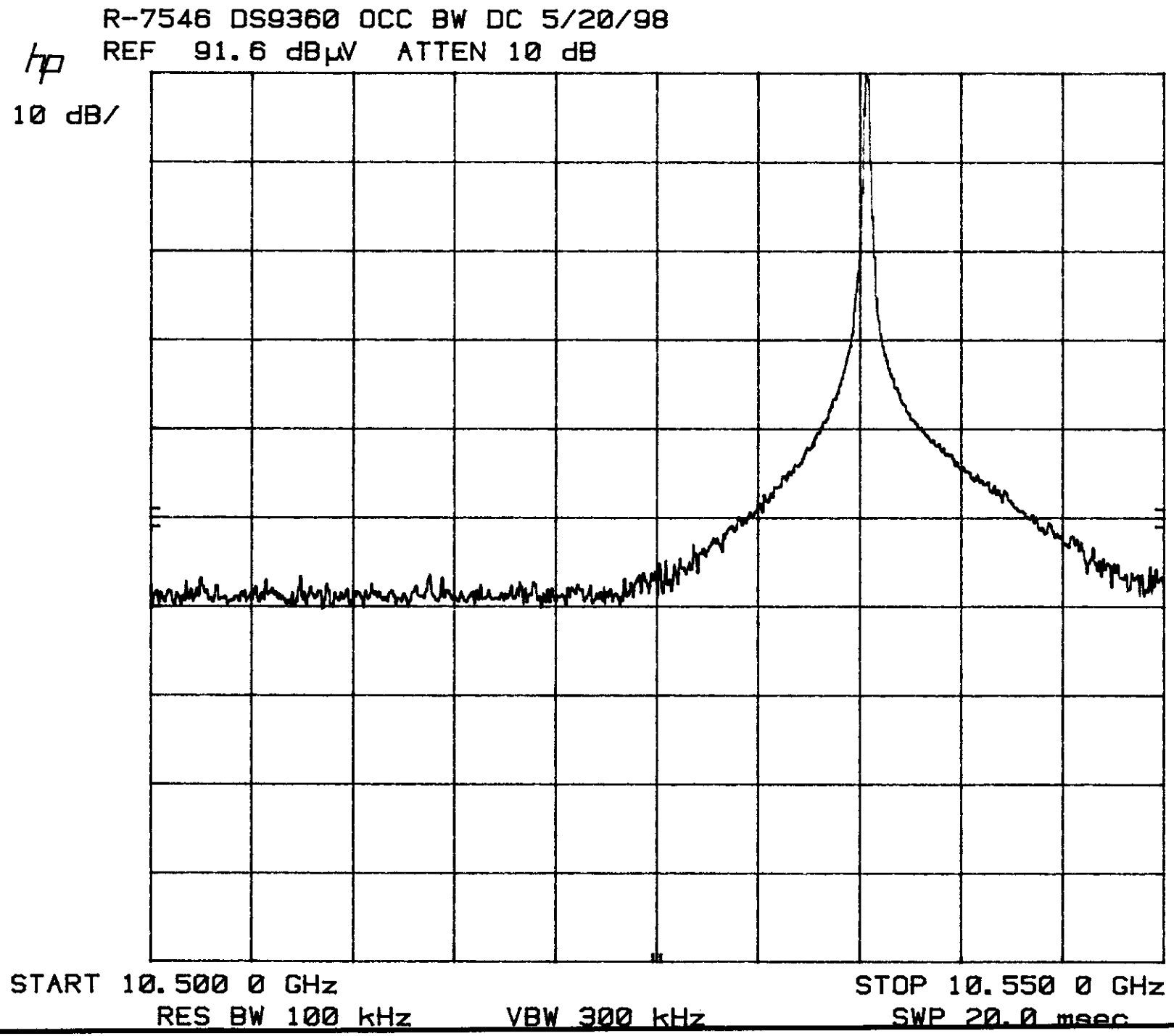
15.245 (b)(3)

TEST SAMPLE: 10.525 GHz Field Disturbance Sensor
FCC ID: ESV9360
APPLICANT: Detection Systems, Inc.
TEST METHOD: Radiated Emissions, Band Edges
SPECIFICATION: FCC Part 15, Section 15.245 (b)(3)
PERFORMED BY: D. Cortes
DATE: May 20,1998

The emissions at the band edges (10.500 and 10.550 GHz) were attenuated 50 dB below the level of the fundamental. See attached plot.

Customer: Detection Systems, Inc
Test Sample: Microwave Passive Infrared Intrusion Detector
Model No.: DS9360
Test Method: FCC 15.245 Occupied Bandwidth
Notes: Emissions > 50 dB from Modulated Carrier at Band Edges

Date: May 20,1998 Tech: Dennis Cortes Sheet 1 of 1



Retlif Testing Laboratories

Report No. R-7546

TEST DATA

RADIATED EMISSIONS, SPURIOUS

15.245 (b)(3)

TEST SAMPLE: 10.525 GHz Field Disturbance Sensor
FCC ID: ESV9360
APPLICANT: Detection Systems, Inc.
TEST METHOD: Spurious Emissions, 30 MHZ to 52.625 GHz
SPECIFICATION: FCC Part 15, Section 15.245 (b)(3)
PERFORMED BY: D. Cortes
DATE: May 26,1998

Frequency GHz	Antenna Distance Meters		Meter Reading dBuV	Antenna Factor +dB	Test Distance Correction -dB	Corrected Reading dBuV/m	Converted Reading uV/m	Limit at 3 Meters uV/m
0.030	3		-					100 QP
0.088	3		-					100 / 150
0.216	3		-					150 / 200
0.960	3		-					200 / 500
1.0	3		-					500
1.0	1		-					5000 Pk 500 Ave
52.625	1		-					5000 Pk 500 Ave

The frequency range was scanned from 30 MHZ to 52.625 GHz. No spurious emissions were observed within 20 dB of the specified limit in the 30 MHZ to 40 GHz range. No spurious emissions were observed within 10 dB of the specified limit above 40 GHz.

	For F < 1 GHz	For F > 1 GHz
Resolution Bandwidth:	100 kHz	1 MHz
Video Bandwidth:	300 kHz	3 MHz
Detector:	Quasi-Peak	Peak / Average