

REPORT OF MEASUREMENTS

GENERAL

Applicant: Safeguard Technology Inc.
Device: 10.525 GHz Field Disturbance Sensor
Model: IME250
Serial Number: N/A
FCC ID: OA4IME250
Input Power Requirements: 24 VAC
Rule Section: Part 15, Subpart C, Section 15.245

TEST METHODS PERFORMED

- 15.207 (a) Conducted Emissions, 450Khz to 30 MHz
- 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)(ii) The device is intended to be used outside of buildings and the field strength of harmonic emissions did not exceed 7.5 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 85% and 115% of the nominal rated supply voltage

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

15.31 (m) The device operates at a single frequency of 10.5265 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

This device has a pulsed square wave output, with a maximum repetition frequency of 2400 Hz. This yields a duty cycle of 50.0%, 50.0 mSec divided by 100 mSec. 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:

$$d \geq 2 D^2$$

Where: d = Test Distance

D = Largest Antenna Length

= 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
10.5265	2.7	3
21.0530	1.5	2
31.5795	1.0	3
42.1060	0.5	2
52.6325	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:

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

Setting the above equal to zero and utilizing the 208.3 microsecond pulsewidth yields a minimum required bandwidth of 3200 Hz. 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: OA4IME250

APPLICANT: Safeguard Technology Inc.

TEST METHOD: Radiated Emissions, Fundamental

SPECIFICATION: FCC Part 15, Section 15.245 (b)

PERFORMED BY: D. Cortes

DATE: 1/26/99

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
10.5265	H	X	96.3	6.7	103.0	141.3	2,500
	V	X	107.4	6.7	114.1	507.0	2,500
	H	Y	80.4	6.7	87.1	22.6	2,500
	V	Y	84.2	6.7	90.9	35.1	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: OA4IME250

APPLICANT: Safeguard Technology 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: 1/26/99

Input Voltage Variation

Frequency GHz	Test Voltage	Test Voltage VAC	Meter Reading dBuV	Antenna Factor +dB	Corrected Reading dBuV/m	Converted Reading mV/m	Limit at 3 Meters mV/m
10.5265	85% (Vmin)	20.4 VAC	107.4	6.7	114.1	507.0	2,500
	100% (Vnom)	24 VAC	107.4	6.7	114.1	507.0	2,500
	115% (Vmax)	27.6 VAC	107.3	6.7	114.0	501.2	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: OA4IME250

APPLICANT: Safeguard Technology Inc.

TEST METHOD: Radiated Emissions, Harmonics

SPECIFICATION: FCC Part 15, Section 15.245 (b)(1)

PERFORMED BY: D. Cortes

DATE: 1/26/99

Field Strength of Harmonics - Peak

Frequency GHz	Antenna Position & Distance H / V	EUT Orientatio n 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
21.0530	H - 1.2	X	41.6	32.5	3.5	70.6	3388.4	75000
	V - 1.1	X	42.7	32.5	3.5	71.7	3845.9	75000
	H - 1.1	Y	37.6	32.5	3.5	66.6	2138.0	75000
	V - 1.0	Y	38.0	32.5	3.5	67	2238.7	75000
31.5795	H - 1.1	X	52.8	36.0	0.0	88.8	27542.3	75000
	V - 1.1	X	52.0	36.0	0.0	88.0	25118.9	75000
	H - 1.0	Y	43.5	36.0	0.0	79.5	9440.6	75000
	V - 1.2	Y	43.3	36.0	0.0	79.3	9225.7	75000
42.1060	H - 1.1	X	39.3	39.9	7.0	72.2	4073.8	75000
	V - 1.1	X	42.7	39.9	7.0	75.6	6025.6	75000
	H - 1.2	Y	37.0	39.9	7.0	69.9	3126.1	75000
	V - 1.0	Y	37.3	39.9	7.0	70.2	3235.9	75000
52.6325	H - 1.0	X	34.0*	41.1	19.1	56.0	631.0	75000
	V - 1.0	X	34.0*	41.1	19.1	56.0	631.0	75000
	H - 1.0	Y	34.0*	41.1	19.1	56.0	631.0	75000
	V -1.0	Y	34.0*	41.1	19.1	56.0	631.0	75000

* 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
21.0530	H - 1.2	X	3388.4	50.4	1698.2	7500
	V - 1.1	X	3845.9	50.4	1927.5	7500
	H - 1.1	Y	2138.0	50.4	1071.5	7500
	V - 1.0	Y	2238.7	50.4	1122.0	7500
31.5795	H - 1.1	X	27542.3	50.4	13803.8	7500
	V - 1.1	X	25118.9	50.4	12589.3	7500
	H - 1.0	Y	9440.6	50.4	4731.5	7500
	V - 1.2	Y	9225.7	50.4	4623.8	7500
42.1060	H - 1.1	X	4073.8	50.4	2041.7	7500
	V - 1.1	X	6025.6	50.4	3020.0	7500
	H - 1.2	Y	3126.1	50.4	1566.8	7500
	V - 1.0	Y	3235.9	50.4	1621.8	7500
52.6325	H - 1.0	X	631	50.4	316	7500
	V - 1.0	X	631	50.4	316	7500
	H - 1.0	Y	631	50.4	316	7500
	V - 1.0	Y	631	50.4	316	7500

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: OA4IME250

APPLICANT: Safeguard Technology Inc.

TEST METHOD: Radiated Emissions, Band Edges

SPECIFICATION: FCC Part 15, Section 15.245 (b)(3)

PERFORMED BY: D. Cortes

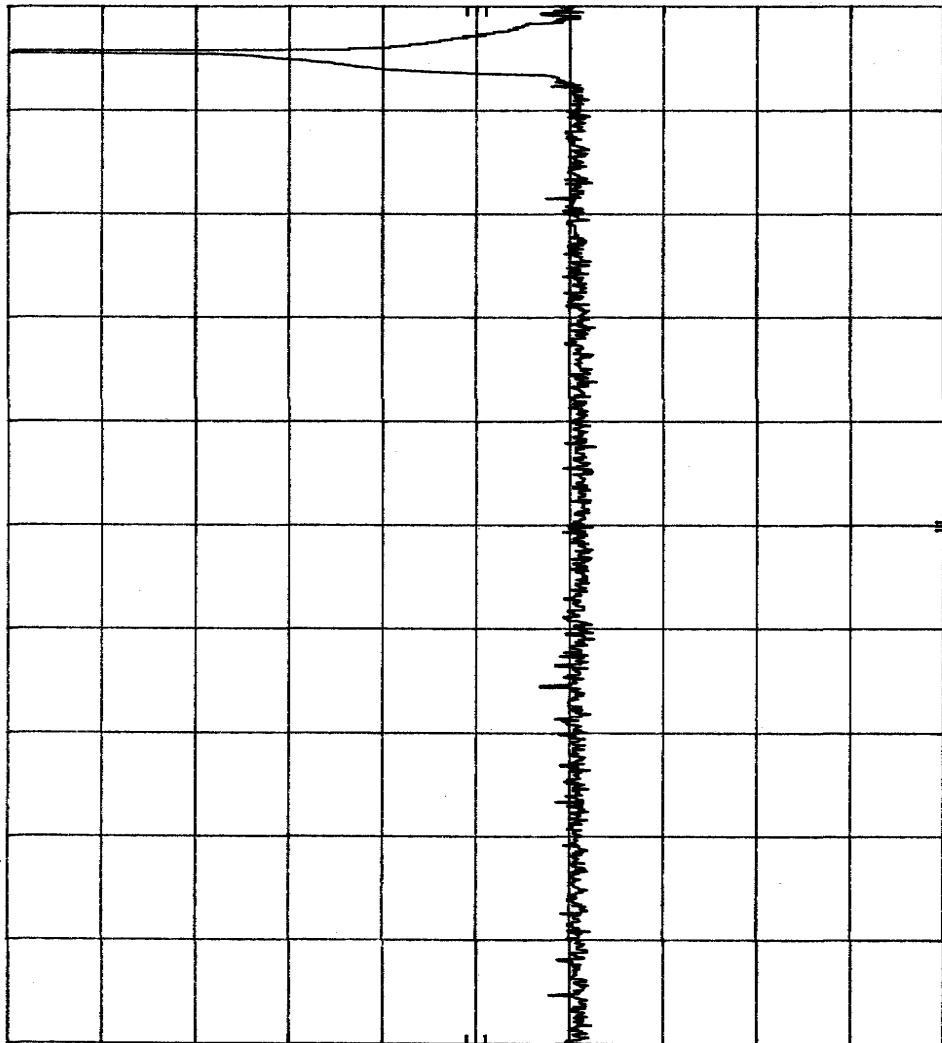
DATE: 1/26/99

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

R-7845-1 OCC BW 1/25/99 DC

REF 94.5 dB_μW ATTEM 10 dB

10 dB/
f_{IF}



START 10.000 GHz
RES BW 100 kHz
VBW 300 kHz
STOP 10.550 GHz
SWP 165 msec

Customer:	SafeGuard Technology, Inc
Test Sample:	Intrusion Detector (10.5 Ghz Transmitter)
Model No.:	IME250 FCC ID: OA4IME250
Test Method:	FCC 15.245 Occupied Bandwidth
Notes:	Emissions greater than 50 dB from modulated carrier at band edges

Date: January 25, 1999

Tech: Dennis Cortes

Sheet: 1 of 1



Retlif Testing Laboratories

Report No. R-7845-1

Test Report Number R-7845-1

TEST DATA
RADIATED EMISSIONS, SPURIOUS
15.245 (b)(3)

TEST SAMPLE: 10.525 GHz Field Disturbance Sensor

FCC ID: OA4IME250

APPLICANT: Safeguard Technology Inc.

TEST METHOD: Spurious Emissions, 30 MHz to 52.625 GHz

SPECIFICATION: FCC Part 15, Section 15.245 (b)(3)

PERFORMED BY: D. Cortes

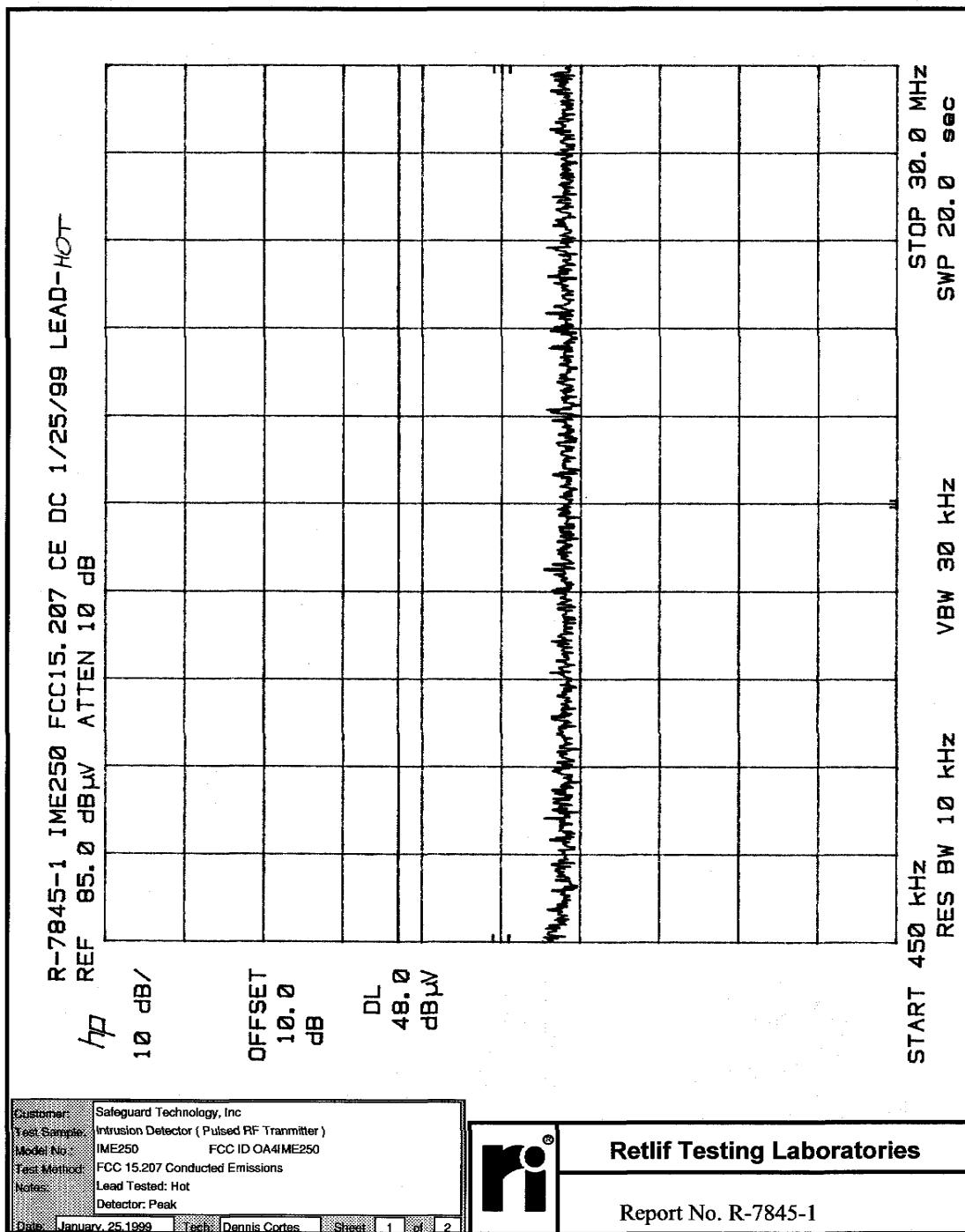
DATE: 1/26/99

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
52.6325	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

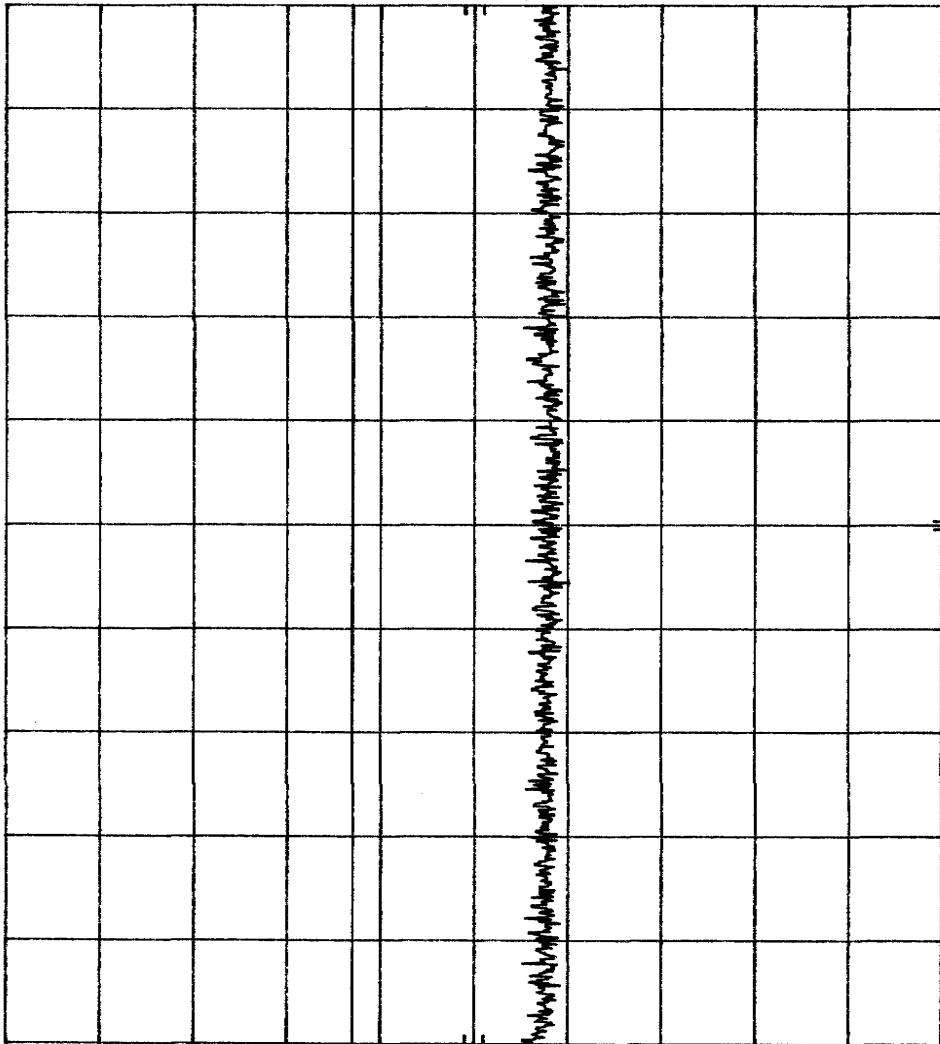
15.207 Conducted Emissions



Test Report Number R-7845-1

R-7845-1 IME250 FCC15.207 CE DC 1/25/99 LEAD-NEUTRAL

REF 85.0 dB_μV ATTN 10 dB



START 450 kHz
RES BW 10 kHz
VBW 30 kHz
SWP 20.0 sec
STOP 30.0 MHz

Customer	Safeguard Technology, Inc		
Test Sample	Intrusion Detector (Pulsed RF Transmitter)		
Model No.	IME250	FCC ID	OA4IME250
Test Method	FCC 15.207 Conducted Emissions		
Notes:	Lead Tested: Neutral Detector: Peak		
Date	January, 25, 1999	Tech	Dennis Cortes
	Sheet	2	2



Retlif Testing Laboratories

Report No. R-7845-1

Test Report Number R-7845-1

EQUIPMENT LIST

FCC Part 15 Subpart C

EN	Type	Manufacturer	Frequency Range	Model No.	Cal Date	Due Date
067	Open Area Test Site	Retlif	3 Meter	RNY	8/30/97	8/30/99
078	LISN	Solar Electronics	10 kHz - 30 MHz	8028-50-TS24BNC	5/6/98	5/6/99
127B	Biconical Antenna	Electro-Metrics	20 MHz - 200 MHz	BIA-25	11/24/98	11/24/99
128C	Double Ridge Guide	Eaton Corporation	1 GHz - 18 GHz	96001	10/6/98	10/6/99
129E	High Gain Horn Antenna	Microlab/FXR	18 GHz - 26.5 GHz	K638A	10/14/98	10/14/99
129H	High Gain Horn Antenna	Microlab/FXR	26.5 GHz - 40 GHz	U638A	10/14/98	10/14/99
133	Broadband Pre-Amplifier	Electro-Metrics	10 kHz - 1 GHz, 26dB	BPA-1000	6/22/98	6/22/99
141	Spectrum Analyzer	Hewlett Packard	100 Hz - 40 GHz	8566B	9/19/98	3/19/99
141A	Graphics Plotter	Hewlett Packard	N/A	7470A	3/4/98	3/4/99
141B	Quasi-Peak Adaptor	Hewlett Packard	100 Hz - 1 GHz	85650A	9/19/98	3/19/99
202	Transient Limiter	Hewlett Packard	.009 MHz - 200 MHz	11947A	7/23/98	7/23/99
206B	6.0 dB Attenuator	Texscan	0 - 1.0 GHz	FP-50 - 6 dB	6/22/98	6/22/99
420	Amplifier	Hewlett Packard	2.0 GHz - 18 GHz	11975A	7/16/98	7/16/99
421	Harmonic Mixer	Hewlett Packard	18 GHz - 26.5 GHz	11970K	7/2/97	7/2/99
421A	Harmonic Mixer	Hewlett Packard	26.5 GHz - 40 GHz	11970A	1/5/99	2/5/99
421B	Harmonic Mixer	Hewlett Packard	40 GHz - 60 GHz	11970U	3/12/96	3/12/99
513	LISN	Solar Electronics	10 kHz - 30 MHz	8028-50-TS24BNC	11/2/98	11/2/99
523	Biconilog	Electro-Mechanics	26 - 2000 MHz	3142B	10/22/98	4/22/00
543	Preamplifier	Hewlett Packard	1.0 GHz - 26.5 GHz	8449B	9/3/98	9/3/99