RETLIF TESTING LABORATORIES
TEST REPORT R-4664N-1
August 22, 2006

FCC/IC COMPLIANCE TEST REPORT
ON

SEKONIC CORPORATION
RT-32 RADIO MODULE
FCC ID: PFK-RT32-01
IC: 3916A-RT32-01

APPLICANT	MODULE MANUFACTURER
Sekonic Corporation 7-24-14, Oiaumi-Gakuen-cho Nerima-ku, Tokyo, 178-8686 Japan	LPA Design 41 IDX Drive, Suite 265 South Burlington, VT 05403

TEST SPECIFICATIONS: FCC Rules and Regulations Part 15, Subpart C, Para. 15.231
RSS 210, Issue 6

TEST PROCEDURE: ANSI C63.4:2003/RSS-210

PURPOSE:

The purpose of this test program was to demonstrate compliance of the RT-32 Radio Module when installed in Sekonic Models L-358CINE and L-758 Exposure Meters for the purpose of obtaining Limited Modular Certification on the RT-32 Radio Module. Limited Modular approval is necessary in order for Sekonic to sell the RT-32 Module as a user option for the two model exposure meters referenced above.

TEST SAMPLE DESCRIPTION:

BRANDNAME: Sekonic

MODEL: RT-32

TYPE: Radio Module

POWER REQUIREMENTS: 3VDC via host exposure meter

FREQUENCY BAND OF OPERATION: 344.04MHz to 354.0MHz

MODULATION: OOK (On/Off Keying)

TYPE OF TRANSMISSION: Control Signal (Pulse Recognition Codes)

APPLICATION: Remote Triggering of Flashpack

FREQUENCIES TESTED: 344.04MHz, 353.5MHz

FCC ID: PFK-RT32-01

IC: 3916A-RT32-01

TESTS PERFORMED:

15.231 (b)/RSS-210 Annex 1, Spurious Radiated Emissions (30MHz to 3.6GHz)

15.231 (b)/RSS-210 Annex 1, Field Strength of Fundamental

15.231 (c) Occupied Bandwidth, 0.25% of Fundamental Frequency

RSS-210, Annex 1, A1.1.3, 99% bandwidth, 0.25% of Center Frequency

Duty Cycle Determination

NOTE: Testing was performed at 2 frequencies (low and high) within the operational band as required for devices operating within a 1 - 10MHz band but not exceeding 10MHz.

TEST SAMPLE OPERATION:

The device is normally manually operated and transmits a control signal for remote triggering of a flashpack. Normal operation of the EUT complies with the parameters required in Part 15, Subpart C, Section 15.231 and RSS 210 for momentary operated devices. For testing purposes only the EUT was configured to continuously transmit.

TEST SAMPLE / TEST PROGRAM

- The transmitter is manually activated and employs a switch that automatically deactivates the transmitter within 5 seconds of being released.
- The transmitter does not perform periodic transmissions at regularly predetermined intervals.
- The device can not be employed for RC purposes involving security.
- The device uses an internal PCB antenna.
- The fundamental field strength at 344.04MHz did not exceed 7252µV/M (Average) at a test distance of 3 meters.
  The fundamental field strength at 353.5MHz did not exceed 7646µV/M (Average) at a test distance of 3 meters.
- The peak value of fundamental emissions did not exceed a peak field strength limit corresponding to 20dB above the maximum permitted average limit.
- The field strength of harmonic and spurious emissions did not exceed 725µV/M or 500µV/M as applicable for a fundamental frequency of 344.04MHz.
  The field strength of harmonic and spurious emissions did not exceed 764µV/M or 500µV/M as applicable for a fundamental frequency of 353.5MHz.
  No harmonic or spurious emissions were observed within 20dB of the specified limit at test distances of 1 or 3 meters.

TEST SAMPLE / TEST PROGRAM (continued)

- The device can operate within the range of 344.04 to 354.00MHz. The device was tested at the frequencies of 344.04MHz and 353.5MHz. The 20dB bandwidth and 99% bandwidth of emissions did not exceed 0.25% of the center operating frequency and was determined as follows:

Fundamental Frequency	=	344.04MHz
0.25% of Center Frequency	=	0.860MHz
0.860 divided by 2	=	0.430MHz
Bandwidth Range	=	Fundamental Frequency + and - 0.430MHz
344.04MHz - 0.430MHz	=	343.61MHz
344.04MHz + 0.430MHz	=	344.47MHz
Bandwidth Range	**=**	***343.61MHz - 344.47MHz***

Fundamental Frequency	=	353.5MHz
0.25% of Center Frequency	=	0.884MHz
0.884 divided by 2	=	0.442MHz
Bandwidth Range	=	Fundamental Frequency + and - 0.442MHz
353.5MHz - 0.442MHz	=	353.058MHz
353.5MHz + 0.442MHz	=	353.942MHz
Bandwidth Range	**=**	***353.058MHz - 353.942MHz***

- Radiated Emissions from the EUT were measured in all three axis. The attached Radiated Emissions test data is representative of the worst case orientation.

DETERMINATION OF FIELD STRENGTH LIMITS

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

Fundamental Frequency: 344.04MHz
Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strength for the band 260-470MHz, µV/m at 3 meters is as follows:

41.6667(F) - 7083.3333	=	Field Strength Limit (µV/m)
41.6667 x 344.04	=	14335.011
14335.011 - 7083.3333	=	7252
Field Strength Limit	=	7252µV/m = 77.21dBuV/M

The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level which equals 725µV/m = 57.21dBuV/M.

TEST SAMPLE / TEST PROGRAM (continued)

Field Strength Limit Calculations continued:

Fundamental Frequency: 353.5MHz
Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strength for the band 260-470MHz, µV/m at 3 meters is as follows:

41.6667(F) - 7083.3333	=	Field Strength Limit (µV/m)
41.6667 x 353.5	=	14729.178
14729.178 - 7083.3333	=	7645.845
Field Strength Limit	=	7645.845µV/m = 77.67dBuV/M

The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level which equals 764.58µV/m = 57.67dBuV/M

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. The on times were determined as follows:

The transmitter pulse train consisted of 3 identical pulse bursts. The individual pulses within each burst were measured and summed in order to obtain the total "on time".

Fundamental Frequency: 344.04MHz

Transmitter On Time	=	1.28 milliseconds
Transmitter Cycle Time	=	7.82 milliseconds
Transmitter Duty Cycle	=	16.45 %
On Time divided by Cycle Time	=	Duty Cycle Factor
1.28 divided by 7.82	=	0.1645
0.1645 converted to dB (LOG_{10} .1645)20	=	-15.68
Duty Cycle Factor	**=**	***-15.68dB***

DETERMINATION OF DUTY CYCLE (continued)

Fundamental Frequency: 353.5MHz

Transmitter On Time	=	1.54 milliseconds
Transmitter Cycle Time	=	7.81 milliseconds
Transmitter Duty Cycle	=	19.7 %
On Time divided by Cycle Time	=	Duty Cycle Factor
1.47 divided by 7.81	=	0.197
.197 converted to dB (LOG_{10} .197)20	=	-14.1
Duty Cycle Factor	**=**	***-14.1dB***

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

Test Methods

15.231 (b) Fundamental & Spurious Radiated Emissions

The test sample was placed on a 80cm high wooden test stand which was located 3 meters from the test antenna on an FCC listed open area test site. Emissions from the EUT were maximized by rotating the test sample and adjusting the test sample orientation and antenna polarization. The maximized peak field strength of each emission was measured and recorded and compared to the limit specified in 15.35 (b) (peak limit corresponds to 20dB above the maximum permitted average limit). The duty cycle factor was applied to the peak readings in order to determine the average field strength of the emissions for comparison to the specified average limits.

Test Results: The worst case maximum peak field strength of the fundamental frequency at 344.04MHz was 70.09dBuV/M which met the peak limit of 97.21dBuV. The maximum average field strength at 344.04MHz was 54.41dBuV which met the specified average limit of 77.21dBuV. The worst case maximum peak field strength of the fundamental frequency at 353.5MHz was 74.25dBuV/M which met the peak limit of 97.67dBuV. The maximum average field strength at 353.5MHz was 60.15dBuV which met the specified average limit of 77.67dBuV. No harmonic/spurious frequencies were observed.

15.231 (c) Occupied Bandwidth

The test sample was placed on a test bench and configured to transmit its normal modulated signal at maximum power. The spectrum analyzers resolution bandwidth, sweep rate and span were adjusted for the frequency being measured. The upper and lower frequency points corresponding to levels 20dB down from the peak of the modulated carrier frequency were used to determine the occupied bandwidth.

Test Results: The bandwidth of the emission at 344.04MHz and at 353.5MHz was less than 0.25% of the center frequency and met the requirements of 15.231 (c).

RSS 210, A1.1.3, 99% Bandwidth

The test sample was placed on a test bench and configured to transmit its normal modulated signal at maximum power. The spectrum analyzers resolution bandwidth, sweep rate and span were adjusted for the frequency being measured. Using the spectrum analyzer 99% bandwidth function the 99% bandwidth of the modulated carrier frequency was measured and recorded.

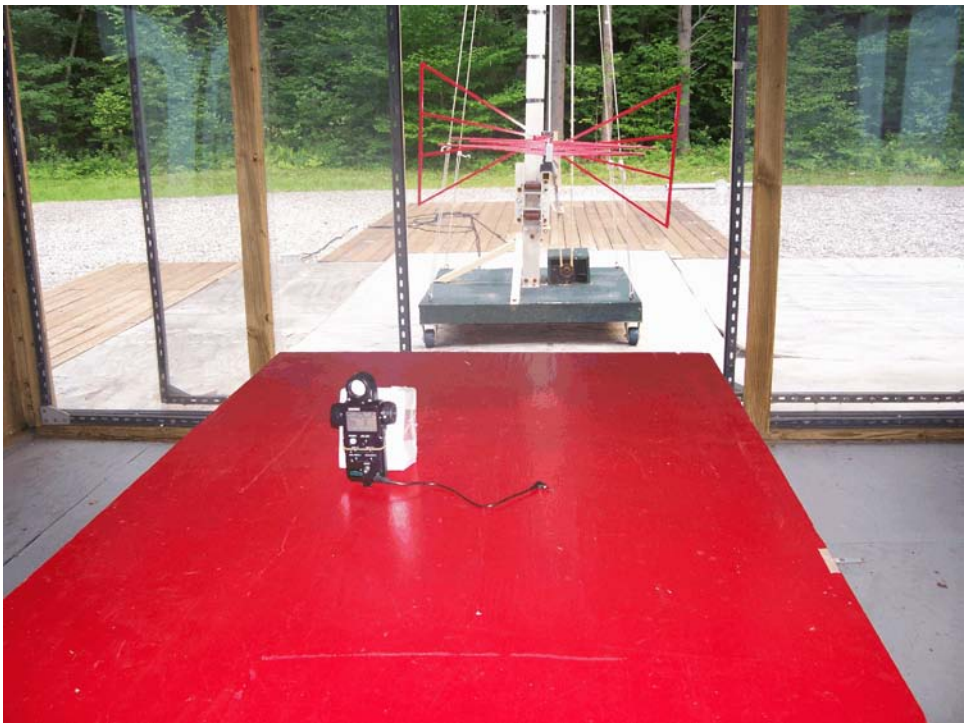
Test Results: The 99% bandwidth of the emission at 344.04MHz and at 353.5MHz was less than 0.25% of the center frequency and met the requirements of RSS-210.

RADIATED EMISSIONS SETUP PHOTOGRAPHS

L-358 WITH RT-32 MODULE

RADIATED EMISSIONS SETUP PHOTOGRAPHS

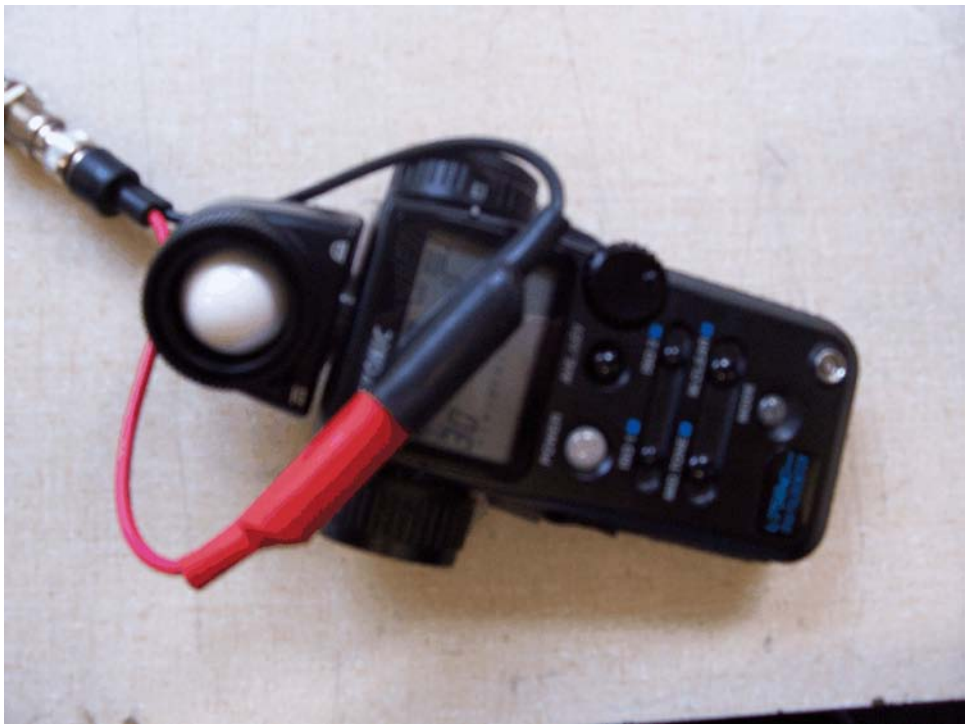
L-758CINE WITH RT-32 MODULE



OCCUPIED BANDWIDTH & DUTY CYCLE SETUP PHOTOGRAPH

L-358 WITH RT-32 MODULE

L-758CINE WITH RT-32 MODULE



99% BANDWIDTH

L-358 WITH RT-32 MODULE

L-758CINE WITH RT-32 MODULE

RETLIF TESTING LABORATORIES

TABULAR DATA SHEET

Test Method:	Fundamental Field Strength		
Customer:	Sekonic Corporation	**Job No:**	R-4664N-1
Test Sample:	Exposure Meter RF Module		
Model No:	RT-32 FCC Module	**Serial No:**	JQ42-000001
Test Specification:	FCC Part 15, Subpart C Paragraph: 15.231(b)		
Operating Mode:	Installed in a Model L-358, Flash Master Continuously transmitting		
Technician:	T. Hannemann	**Date:**	07/26/2006
Notes:	Corrected peak readings meet peak limit (20dB above average limit) per 15.35		

Transmit Frequency		Antenna/EUT Position	Meter Reading	Correction Factor	Corrected Peak	Duty Cycle Correction	Corrected Reading	Average Limit at 3 Meters	Converted Reading	Limit at 3 Meters
MHz		Polarization/Axis	dBuV	dB	dBuV/m	dB	dBuV/m	dBuV	uV/m	uVm
344.04		H/Z	44.09	25.61	69.70	-15.68	54.02	77.21	502.34	7251.68
353.51		V/X	43.76	26.14	69.90	-14.10	55.80	77.67	616.60	7646.43

RETLIF TESTING LABORATORIES

TABULAR DATA SHEET

Test Method:	Spurious Emissions 30MHz to 3.6GHz		
Customer:	Sekonic Corporation	**Job No:**	R-4664N-1
Test Sample:	Exposure Meter RF Module		
Model No:	RT-32 FCC Module	**Serial No:**	JQ42-000001
Test Specification:	FCC Part 15, Subpart C Paragraph: 15.231(b)		
Operating Mode:	Installed in a Model L-358, Flash Master Continuously transmitting		
Technician:	T. Hannemann	**Date:**	07/26/2006
Notes:	Fundamental Frequency: 344.0375752 MHz		

Harmonic Frequency		Antenna/EUT Position	Meter Reading	Correction Factor	Duty Cycle Correction	Corrected Reading			Converted Reading	Limit at 3 Meters
MHz		Polarization/Axis	dBuV	dB	dB	dBuV/m			uV/m	uVm
688.08		-	-	-	-	-			-	725.17
1032.11		-	-	-	-	-			-	500.00
1376.15		-	-	-	-	-			-	500.00
1720.19		-	-	-	-	-			-	725.17
2064.23		-	-	-	-	-			-	725.17
2408.26		-	-	-	-	-			-	725.17
2752.30		-	-	-	-	-			-	500.00
3096.34		-	-	-	-	-			-	725.17
3440.38		-	-	-	-	-			-	725.17

No harmonic frequencies were observed above the noise floor of the test equipment which was a minimum of 10 dB below the limit.

RETLIF TESTING LABORATORIES

TABULAR DATA SHEET

Test Method:	Spurious Emissions 30MHz to 3.6GHz		
Customer:	Sekonic Corporation	**Job No:**	R-4664N-1
Test Sample:	Exposure Meter RF Module		
Model No:	RT-32 FCC Module	**Serial No:**	JQ42-000001
Test Specification:	FCC Part 15, Subpart C Paragraph: 15.231(b)		
Operating Mode:	Installed in a Model L-358, Flash Master Continuously transmitting		
Technician:	T. Hannemann	**Date:**	07/26/2006
Notes:	Fundamental Frequency: 353.511523 MHz		

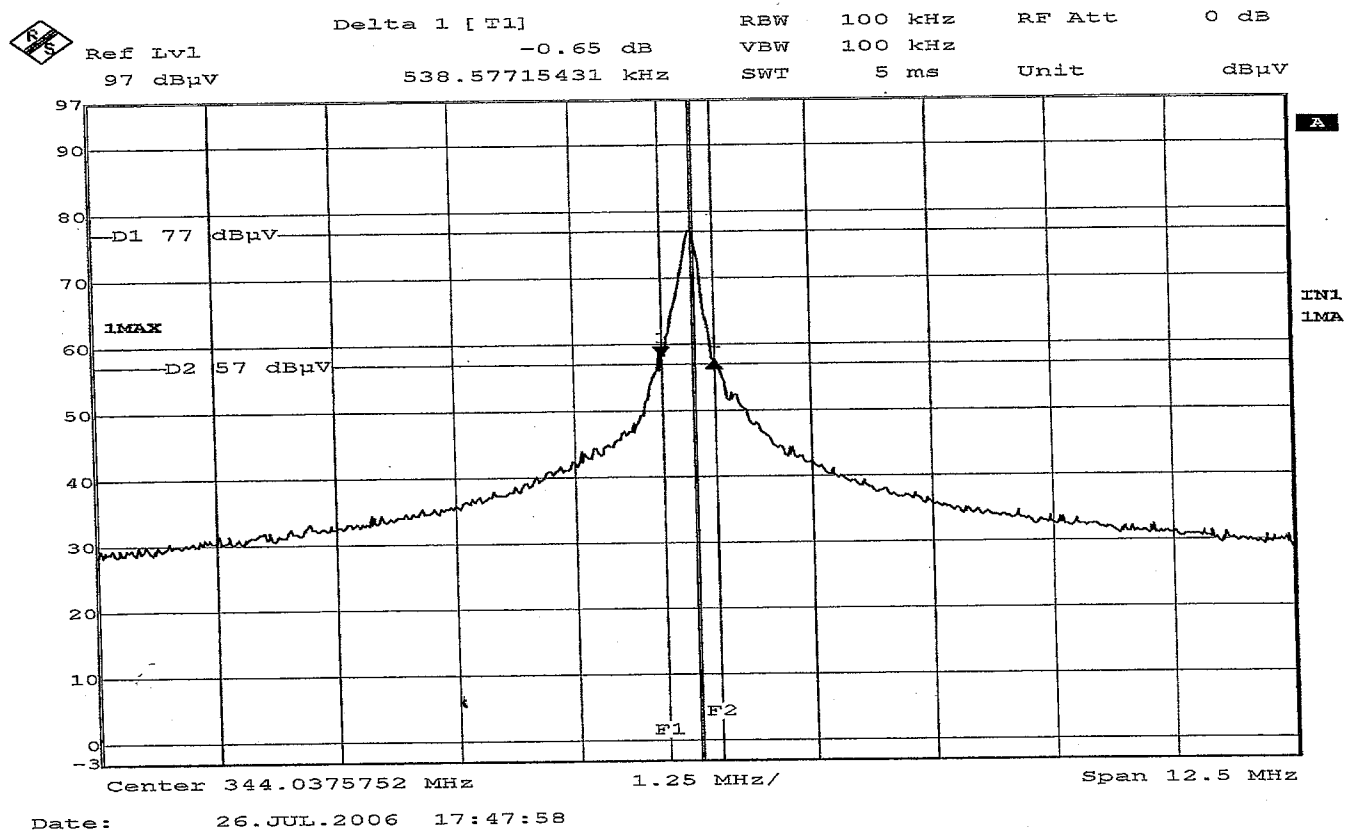
Harmonic Frequency		Antenna/EUT Position	Meter Reading	Correction Factor	Duty Cycle Correction	Corrected Reading			Converted Reading	Limit at 3 Meters
MHz		Polarization/Axis	dBuV	dB	dB	dBuV/m			uV/m	uVm
707.02		-	-	-	-	-			-	764.64
1060.53		-	-	-	-	-			-	500.00
1414.05		-	-	-	-	-			-	500.00
1767.56		-	-	-	-	-			-	764.64
2121.07		-	-	-	-	-			-	764.64
2474.58		-	-	-	-	-			-	764.64
2828.09		-	-	-	-	-			-	500.00
3181.60		-	-	-	-	-			-	764.64
3535.12		-	-	-	-	-			-	764.64

No harmonic frequencies were observed above the noise floor of the test equipment which was a minimum of 10 dB below the limit.

RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

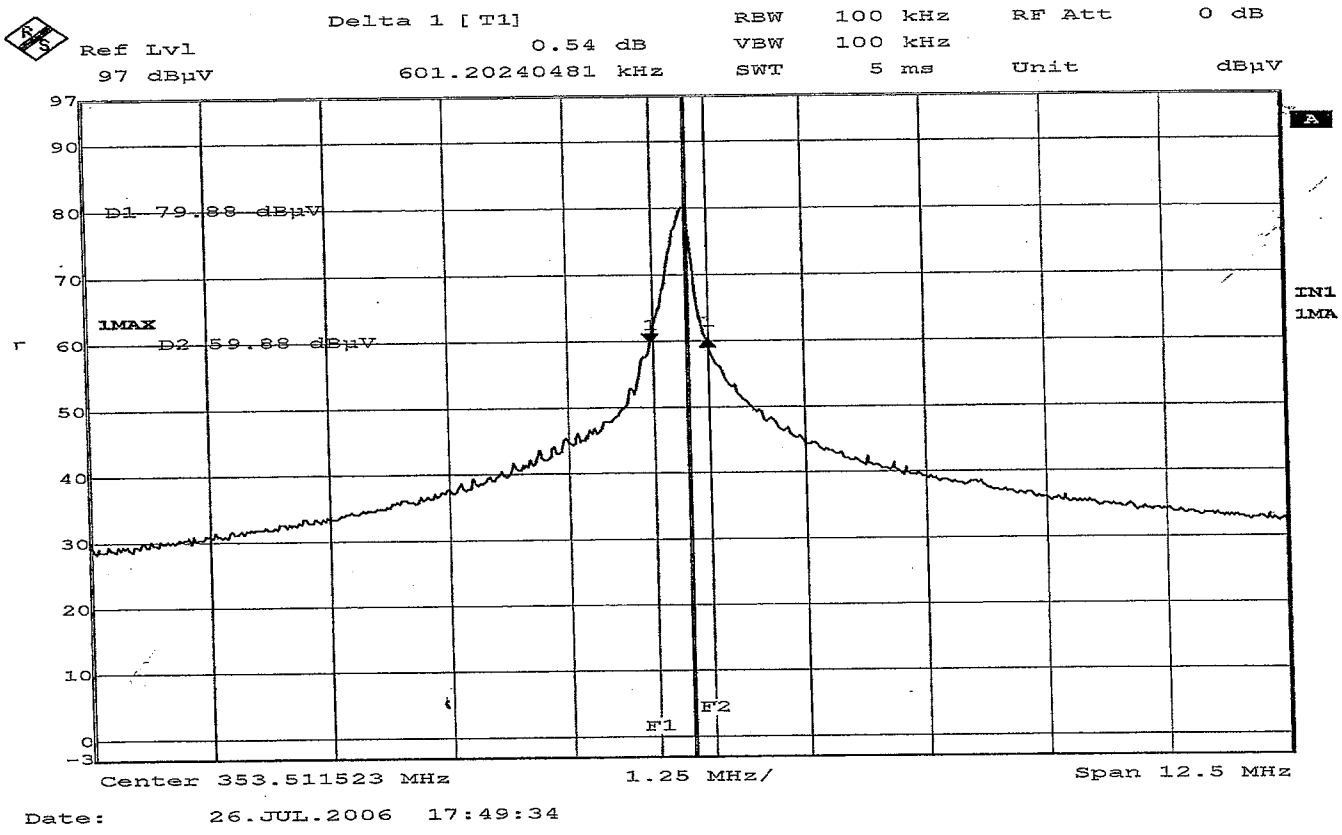
Test Method:	**Occupied Bandwidth**				
Customer:	Sekonic Corporation	**Test Sample:**	Exposure Meter RF Module	**Job No:**	R-4664N-1
Model No:	RT-32 FCC Module	**Serial No:**	JQ42-000001	**Technician:**	T. Hannemann
Test Specification:	FCC Part 15, Subpart C	15.231(c)		**Date:**	07/26/2006
Operating Mode:	Installed in a Model L-358, Flash Master Continuously transmitting				
Notes:	Transmit Frequency 344.0375752				



RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

Test Method:	**Occupied Bandwidth**				
Customer:	Sekonic Corporation	**Test Sample:**	Exposure Meter RF Module	**Job No:**	R-4664N-1
Model No:	RT-32 FCC Module	**Serial No:**	JQ42-000001	**Technician:**	T. Hannemann
Test Specification:	FCC Part 15, Subpart C		15.231(c)	**Date:**	07/26/2006
Operating Mode:	Installed in a Model L-358, Flash Master Continuously transmitting				
Notes:	Transmit Frequency 353.511523				



RETLIF TESTING LABORATORIES

EMISSIONS DATA SHEET

Test Method:	99% Bandwidth				
Customer:	Sekonic Corporation	**Test Sample:**	Exposure Meter RF Module	**Job No:**	R-4664N-2
Model No:	RT-32 FCC Module	**Serial No:**	JQ42-000001	**Technician:**	T. Hannemann
Test Specification:	RSS-210			**Date:**	08/08/2006
Operating Mode:	Installed in a Model L-358, Flash Master Continuously transmitting				
Notes:	Fundamental Frequency: 344 MHz