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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 15, Subpart C Specifications for an Intentional Radiator and FCC Part 15, Subpart B Specifications for a Receiver on the Mercury Photographic Model: MicroSync MS0100

FCC ID: QHIMS0100

GRANTEE: Mercury Photographic
305 Sherwood Way
Menlo Park, CA 94025

TEST SITE: Elliott Laboratories, Inc.
684 W. Maude Avenue
Sunnyvale, CA 94086

REPORT DATE: July 16, 2003

FINAL TEST DATE: April 2, 2003

AUTHORIZED SIGNATORY: _____
Mark Briggs
Director of Engineering

ACCREDITED

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SCOPE

An electromagnetic emissions test has been performed on the Mercury Photographic model MicroSync MS0100 pursuant to Subpart C of Part 15 of FCC Rules for intentional radiators and Subpart B of Part 15 of FCC Rules for receivers. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992 as outlined in Elliott Laboratories test procedures.

The transceiver above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the Mercury Photographic model MicroSync MS0100 and therefore apply only to the tested sample. The sample was selected and prepared by Wade McNary of Mercury Photographic.

OBJECTIVE

The primary objective of the manufacturer is compliance with Subparts B and C of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators and receivers. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

STATEMENT OF COMPLIANCE

The tested sample of Mercury Photographic model MicroSync MS0100 complied with the requirements of Subpart C of Part 15 of the FCC Rules for low power intentional radiators and the requirements of Subpart B of Part 15 of the FCC Rules for receivers operating between 30 MHz and 960 MHz.

Maintenance of FCC compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

EMISSION TEST RESULTS

The following emissions tests were performed on the Mercury Photographic model MicroSync MS0100 transmitter and MicroSync MS0100 receiver. The actual test results are contained in an exhibit of this report.

LIMITS OF CONDUCTED INTERFERENCE VOLTAGE

Both the receiver and the transmitter are battery powered. The requirements of 15.107 (receiver) and 15.207 (transmitter) do not apply.

LIMITS OF RADIATED FIELD STRENGTH –INTENTIONAL RADIATOR

The transmitter complied with the limits detailed in FCC Rules Part 15 Section 15.231a and 15.209 in the case of emissions falling within the frequency bands specified in Section 15.205.

The following measurement was extracted from the data recorded during the radiated electric field emissions scan and represents the highest amplitude emission relative to the specification limit. The actual test data and any correction factors are contained in an exhibit of this report.

Fundamental Signal

Frequency MHz	Level dBuV/m	Pol v/h	15.231(a) Limit	15.231(a) Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
433.895	64.7	h	100.8	-36.1	Pk	200	1.0	

Spurious Emissions

Frequency MHz	Level dBuV/m	Pol v/h	15.231(a) Limit	15.231(a) Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
1735.580	42.3	h	60.8	-18.5	Pk	205	1.0	

BANDWIDTH

The transmitter complied with the limits detailed in FCC Rules Part 15 Section 15.231(c). The 20dB bandwidth was 240 kilohertz.

DUTY CYCLE CALCULATION

The transmitted signal is a series of 6 pulses in a 60ms period. Each pulse has a nominal duration of 50us. The duty cycle of the transmitted signal in a 100mSperiod is, therefore, (12 x 0.050) / 100, which is 1%.

PERIOD OF OPERATION

The transmitter complied with the limits detailed in FCC Rules Part 15 Section 15.231(a) for control signals. The device stops transmitting within 100ms of the manual button being released when operated in the manual mode. In automatic mode (when transmission is triggered from the camera hot-shoe or flash switch) the device makes a single transmission burst

LIMITS OF RADIATED FIELD STRENGTH –RECEIVER

The receiver tested complied with the limits detailed in FCC Rules Part 15 Section 15109.

The following measurement was extracted from the data recorded during the radiated electric field emissions scan and represents the highest amplitude emission relative to the specification limit. The actual test data and any correction factors are contained in an exhibit of this report.

Radiated Spurious Emissions, 30MHz – 1GHzl

Frequency MHz	Level dBuV/m	Pol v/h	15.109 Limit	15.109 Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
84.000	21.8	h	40.0	-18.2	QP	250	1.8	

MEASUREMENT UNCERTAINTIES

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with NAMAS document NIS 81.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.6

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Mercury Photographic model MicroSync MS0100 is a camera radio sync transmitter and associated receiver that are designed to remotely activate strobe lighting. Normally, the transmitter would be affixed to a camera during operation and the receiver would be connected to the trigger input of a strobe light. The transmitter was tested in a stand-alone mode and the receiver was connected to a strobe light during testing.

Both the transmitter and the receiver are designed to operate from internal batteries.

The samples were received and tested on April 2, 2003.

The EUT consisted of the following components:

Manufacturer	Model	Description	Serial Number	FCC ID
Mercury Photographic	MicroSync MS0100	Photography Radio Slave (transmitter)	N/A	QHIMS0100
Mercury Photographic	MicroSync MS0100	Photography Radio Receiver	N/A	N/A

ENCLOSURE

The transmitter enclosure measures approximately 27 x 51 x 11mm and the receiver measures approximately 35 x 111 x 22mm. They are primarily constructed of plastic.

SUPPORT EQUIPMENT

Manufacturer	Model	Description	Serial Number	FCC ID
Comet	Twinkle 04	Strobe Light	N/A	N/A

EXTERNAL I/O CABLING

The receiver connected directly to the strobe unit. The transmitter connects directly to a camera hot shoe or can be hand held.

EUT OPERATION

The transmitter was configured to continuously transmit its pulsed code by holding the transmit button down using a cable-tie. The receiver was in receive mode. The two devices were tested separately.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on April 2, 2003 at the Elliott Laboratories Open Area Test Site #1 located at 684 West Maude Avenue, Sunnyvale, California. The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Commission.

The FCC recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent FCC requirements.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4-1992. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the entire 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

ANSI C63.4 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The FCC requires that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4, and the worst-case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters. The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain. Emissions, which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

CONDUCTED EMISSIONS SPECIFICATION LIMITS, SECTION 15.207 & 15.107(a)

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

Frequency (MHz)	Average Limit (dBuV)	Quasi Peak Limit (dBuV)
0.150 to 0.500	Linear decrease on logarithmic frequency axis between 56.0 and 46.0	Linear decrease on logarithmic frequency axis between 66.0 and 56.0
0.500 to 5.000	46.0	56.0
5.000 to 30.000	50.0	60.0

FUNDAMENTAL AND HARMONIC LIMITS 15.231 (b)

The table below shows the limits for both the Fundamental and Harmonic emissions for each frequency band of operation detailed in Section 15.231 (b) for control signals.

Operating Frequency (MHz)	Field strength (microvolts/m)	Harmonics (microvolts/m)
70 - 130	1250	125
130 - 174	1250 - 3750	125 - 375
174 – 260	3750	375
260 – 470	3750 – 12,500	375 - 1250
Above 470	12,500	1250

FUNDAMENTAL AND HARMONIC LIMITS 15.231 (e)

The table below shows the limits for both the Fundamental and Harmonic emissions (that do not fall in restricted bands) for each frequency band of operation detailed in Section 15.231 (e) for data signals.

Operating Frequency (MHz)	Field strength (microvolts/m)	Harmonics (microvolts/m)
70 - 130	500	50
130 - 174	500 - 1500	50 - 150
174 – 260	1500	150
260 – 470	1500 – 5000	150 - 500
Above 470	5000	500

RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.209

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands.

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.109(a) (RECEIVER)

The table below shows the limits for emissions from the receiver.

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:

R_r = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements. A distance factor, when used for electric field measurements, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 30 - 4333 MHz, 03-Apr-03
Engineer: Rafael

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	Biconical Antenna, 30-300 MHz	3110B	363	12	5/28/2002	5/28/2003
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	1242	12	10/9/2002	10/9/2003
EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	364	12	9/12/2002	9/12/2003
Filtek	High Pass Filter, 1GHz	HP12/1000-5AB	1343	12	10/17/2002	10/17/2003
Hewlett Packard	EMC Spectrum Analyzer 9kHz - 6.5GHz	8595EM	780	12	2/20/2003	2/20/2004
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	12	1/10/2003	1/10/2004
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	12	12/27/2002	12/27/2003

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T50727 10 Pages

Elliott

EMC Test Data

Client:	Mercury Photographic	Job Number:	J50695
Model:	MicroSync MS0100	T-Log Number:	T50727
		Account Manager:	Mark Briggs
Contact:	Wade McNary		
Emissions Spec:	FCC 15.231 (a) and 15.109	Class:	B
Immunity Spec:	N/A	Environment:	-

EMC Test Data

For The

Mercury Photographic

Model

MicroSync MS0100

Client:	Mercury Photographic	Job Number:	J50695
Model:	MicroSync MS0100	T-Log Number:	T50727
		Account Mangager:	Mark Briggs
Contact:	Wade McNary		
Emissions Spec:	FCC 15.231 (a) and 15.109	Class:	B
Immunity Spec:	N/A	Environment:	-

EUT INFORMATION

General Description

The EUT is a camera radio sync transmitter and receiver which is designed to remotely activate strobe lighting. Normally, the transmitter would be affixed to a camera during operation and the receiver would be connected to the trigger input of a strobe light. The transmitter was tested in a stand-alone mode and the receiver was connected to a strobe light during testing. Both the transmitter and the receiver are designed to operate form internal batteries.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Mercury Photographic	MicroSync MS0100	Photography Radio Slave	n/a	QHIMS0100
Mercury Photographic	MicroSync MS0100	Photography Radio Receiver	n/a	n/a

EUT Enclosure

The transmitter enclosure measures approximately 27 x 51 x 11mm and the receiver measures approximately 35 x 111 x 22mm. They are primarily constructed of plastic.

Modification History

Mod. #	Test	Date	Modification
1			None made

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.

Client:	Mercury Photographic	Job Number:	J50695
Model:	MicroSync MS0100	T-Log Number:	T50727
		Account Manager:	Mark Briggs
Contact:	Wade McNary		
Emissions Spec:	FCC 15.231 (a) and 15.109	Class:	B
Immunity Spec:	N/A	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Comet	Twinkle 04	Strobe Light	None	N/A

Interface Cabling and Ports

		Cable(s)		
Port	Connected To	Description	Shielded or Unshielded	Length(m)
ReceiverSync Plug	Strobe light	Direct connection	N/A	N/A

EUT Operation During Emissions

The transmitter was configured to constantly transmit by using a cable tie to hold down the transmit button. The receiver was powered and in receive mode.

Client:	Mercury Photographic	Job Number:	J50695
Model:	MicroSync MS0100	T-Log Number:	T50727
		Account Manager:	Mark Briggs
Contact:	Wade McNary		
Spec:	FCC 15.231 (a) and 15.109	Class:	B

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test:	4/2/2003	Config. Used:	1
Test Engineer:	Rafael	Config Change:	None
Test Location:	SVOATS #1	EUT Voltage:	Battery

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

On the OATS, the measurement antenna was located 3 meters from the EUT for the measurement range 30 - 1000 MHz.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature:	7 °C
Rel. Humidity:	86 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
2	RE, 30 - 1000MHz, Maximized Emissions	FCC B	Pass	-18.2dB @ 84.000MHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Elliott

EMC Test Data

Client:	Mercury Photographic	Job Number:	J50695
Model:	MicroSync MS0100	T-Log Number:	T50727
		Account Manager:	Mark Briggs
Contact:	Wade McNary		
Spec:	FCC 15.231 (a) and 15.109	Class:	B

Run #1: Preliminary Radiated Emissions, 30-1000 MHz

Frequency	Level	Pol	FCCB		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
84.000	21.8	h	40.0	-18.2	QP	250	1.8	
84.000	21.4	v	40.0	-18.6	QP	260	1.0	
270.980	26.3	v	46.0	-19.7	QP	15	1.0	
899.880	25.8	v	46.0	-20.2	QP	300	1.0	
899.880	25.5	h	46.0	-20.5	QP	200	1.0	
32.100	19.3	v	40.0	-20.7	QP	330	1.0	
266.980	23.6	v	46.0	-22.4	QP	335	1.0	
270.980	21.7	h	46.0	-24.3	QP	290	1.0	
269.110	21.5	v	46.0	-24.5	QP	0	1.0	
266.980	20.2	h	46.0	-25.8	QP	100	1.0	
269.110	19.0	h	46.0	-27.0	QP	200	1.2	
32.100	12.5	h	40.0	-27.5	QP	95	1.6	
356.860	17.8	v	46.0	-28.2	QP	345	1.0	
356.860	17.2	h	46.0	-28.8	QP	220	1.0	
441.800	16.8	v	46.0	-29.2	QP	100	1.0	
441.800	16.8	h	46.0	-29.2	QP	150	1.0	
300.000	15.4	v	46.0	-30.6	QP	80	1.0	
300.000	14.7	h	46.0	-31.3	QP	115	1.0	

Run #2: Maximized Readings From Run #1

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
84.000	21.8	h	40.0	-18.2	QP	250	1.8	
84.000	21.4	v	40.0	-18.6	QP	260	1.0	
270.980	26.3	v	46.0	-19.7	QP	15	1.0	
899.880	25.8	v	46.0	-20.2	QP	300	1.0	
899.880	25.5	h	46.0	-20.5	QP	200	1.0	
32.100	19.3	v	40.0	-20.7	QP	330	1.0	

Client:	Mercury Photographic	Job Number:	J50695
Model:	MicroSync MS0100	T-Log Number:	T50727
		Account Manager:	Mark Briggs
Contact:	Wade McNary		
Spec:	FCC 15.231 (a) and 15.109	Class:	B

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test:	4/2/2003	Config. Used:	1
Test Engineer:	Rafael Varelas	Config Change:	None
Test Location:	SVOATS #1	EUT Voltage:	Battery

General Test Configuration

The EUT was located on the turntable for radiated emissions testing.

On the OATS, the measurement antenna was located 3 meters from the EUT for the measurement range 30 - 4333 MHz.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Note, for testing above 1 GHz, the FCC specifies the limit as an average measurement. In addition, the FCC states that the peak reading of any emission above 1 GHz, can not exceed the average limit by more than 20 dB.

Ambient Conditions:

Temperature:	7 °C
Rel. Humidity:	86 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 - 4333MHz, Maximized Emissions	FCC 15.231 (a)	Pass	Refer to individual runs

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Elliott

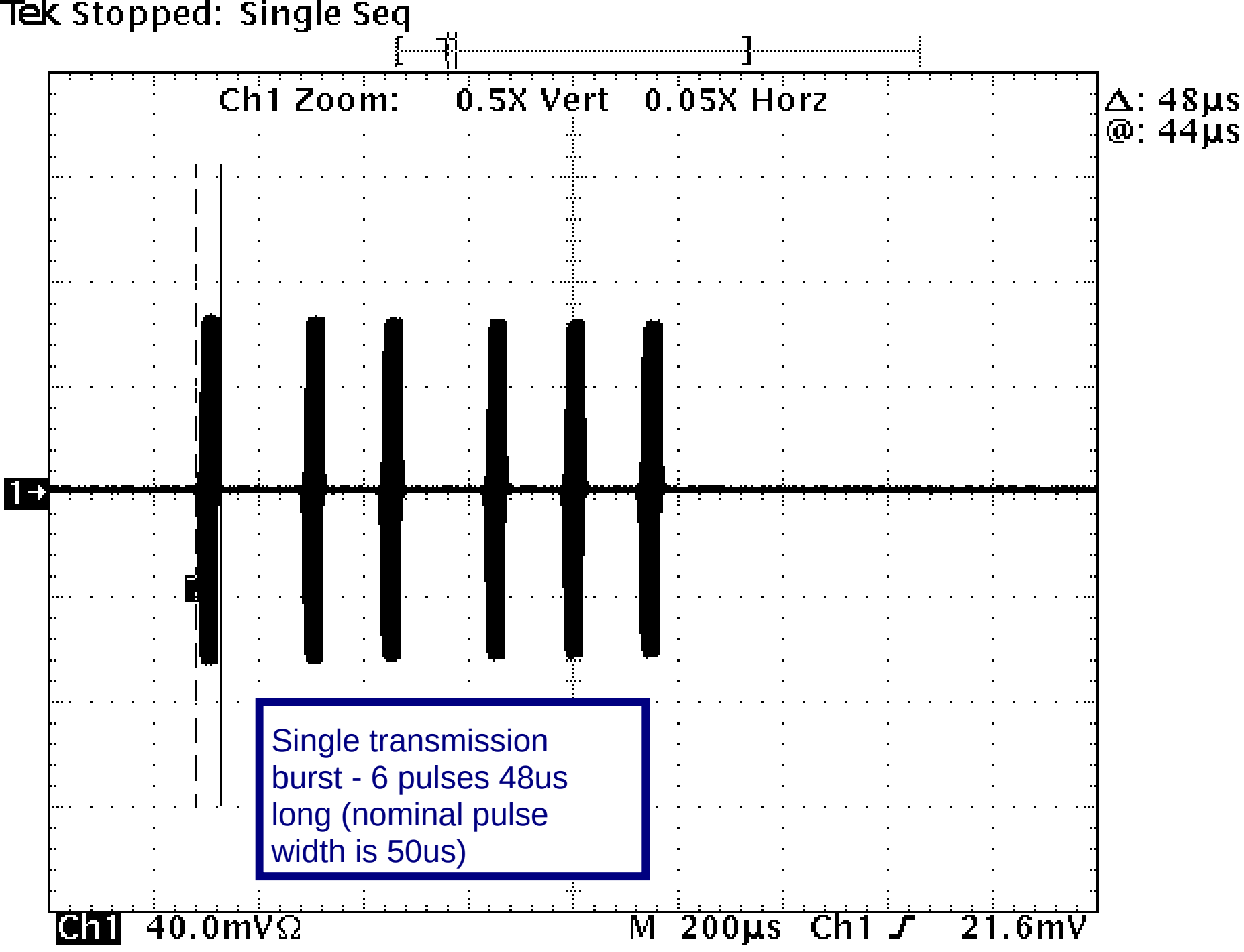
EMC Test Data

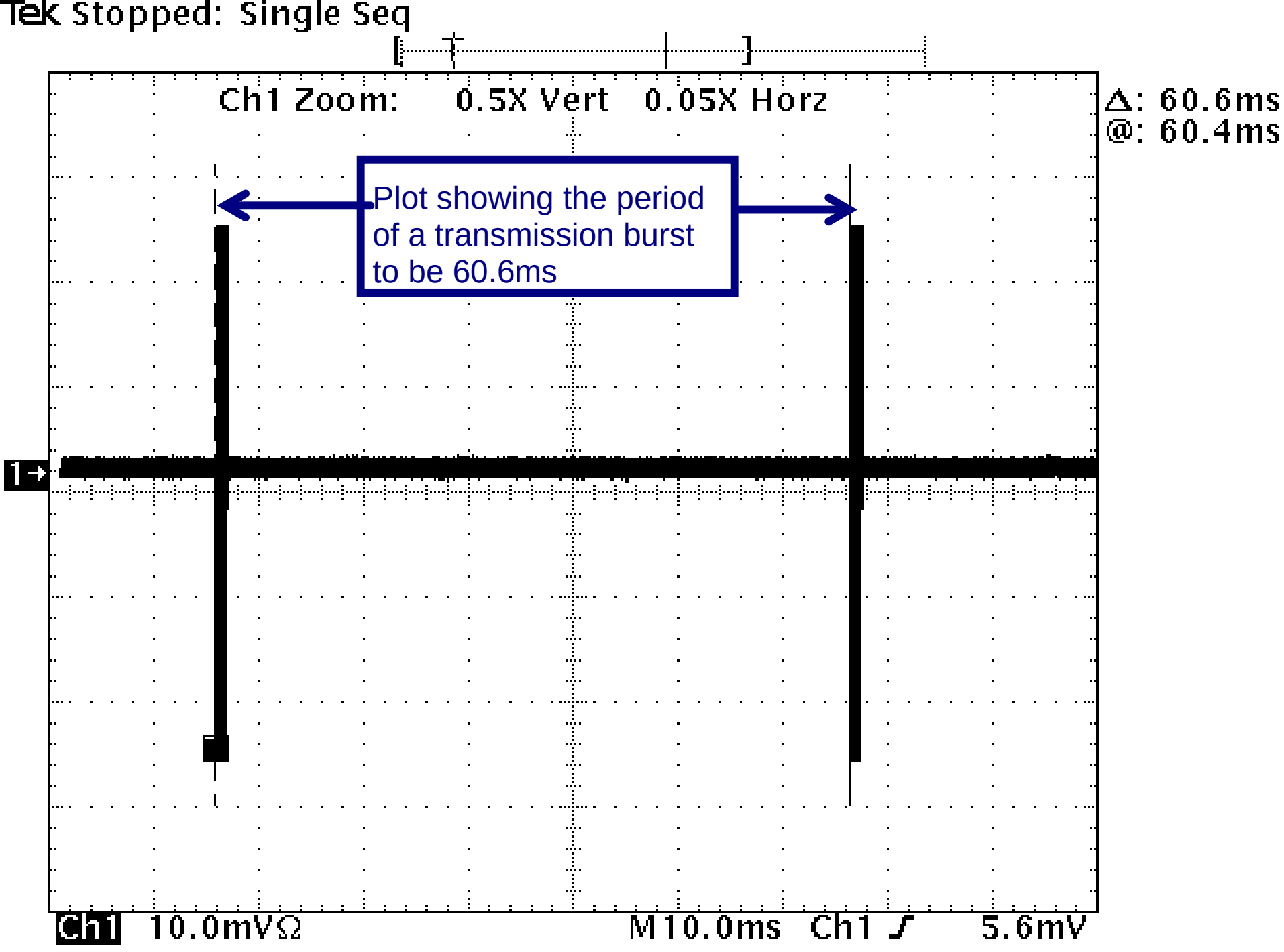
Client:	Mercury Photographic	Job Number:	J50695
Model:	MicroSync MS0100	T-Log Number:	T50727
		Account Manager:	Mark Briggs
Contact:	Wade McNary		
Spec:	FCC 15.231 (a) and 15.109	Class:	B

Duty Cycle Calculation:
Refer to plots
Each pulse train consists of 6pulses, each pulse is a nominal 50us long (measured length = 44us)
The pulse train occurs at a period of 60ms.
Total duty cycle equals (12 x 0.050)/ 100 = 0.6/60 = 0.010
The duty cycle correction to apply to the peak reading is, therefore, 20log(0.010) = -40dB.
It was confirmed that in manual mode the device stopped transmitting as soon as the button was released and that in automatic mode (with the device triggered by a camera hot shoe) only one pulse train was transmitted.

Run #1: Preliminary Radiated Emissions, 30-4333 MHz
No average measurements made - the average correction factor is -46dB so provided the peak reading is below the peak limit, the average reading will be below the average limit.

Frequency	Level	Pol	FCC 15.231(a)		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
EUT on Horizontal orientation								
1735.580	42.3	h	60.8	-18.5	Pk	205	1.0	
2169.475	41.7	h	60.8	-19.1	Pk	215	1.0	
1735.580	36.5	v	60.8	-24.3	Pk	225	1.0	
433.895	64.7	h	100.8	-36.1	Pk	200	1.0	
1301.685	34.4	h	74.0	-39.6	Pk	200	1.0	Falls in restricted band
433.895	56.4	v	100.8	-44.4	Pk	220	2.4	
EUT on Vertical orientation								
2169.475	42.3	h	60.8	-18.5	Pk	205	1.0	
1735.580	38.7	h	60.8	-22.1	Pk	230	1.0	
433.895	62.5	h	100.8	-38.3	Pk	210	1.0	
1301.685	35.7	h	74.0	-38.3	Pk	200	1.0	Falls in restricted band
433.895	60.8	v	100.8	-40.0	Pk	240	1.2	
EUT on its side								
2169.475	39.4	v	60.8	-21.4	Pk	215	1.0	
1735.580	38.2	v	60.8	-22.6	Pk	200	1.0	
2169.475	38.1	h	60.8	-22.7	Pk	230	1.0	
3905.055	49.7	v	74.0	-24.3	Pk	210	1.0	Falls in restricted band
3905.055	43.2	h	74.0	-30.8	Pk	200	1.0	Falls in restricted band
1301.685	35.9	v	74.0	-38.1	Pk	210	1.0	Falls in restricted band
433.895	62.2	v	100.8	-38.6	Pk	250	1.4	
433.895	56.0	h	100.8	-44.8	Pk	215	1.0	


Tek Stopped: Single Seq
Ch1 Zoom: 0.5X Vert 0.05X Horz
Δ: 48µs
@: 44µs
1→
Single transmission burst - 6 pulses 48us long (nominal pulse width is 50us)
Ch1 40.0mVΩ
M 200µs Ch1 ƒ 21.6mV


Tek Stopped: Single Seq
Ch1 Zoom: 0.5X Vert 0.05X Horz
Δ: 60.6ms
@: 60.4ms
Plot showing the period of a transmission burst to be 60.6ms
1→
Ch1 10.0mVΩ
M10.0ms Ch1 ƒ 5.6mV

Client:	Mercury Photographic	Job Number:	J50695
Model:	MicroSync MS0100	T-Log Number:	T50727
		Account Manager:	Mark Briggs
Contact:	Wade McNary		
Spec:	FCC 15.231 (a) and 15.109	Class:	B

Run #2: 26dB Bandwidth

Bandwidth measured to be 240kHz. Maximum permitted is 1.08MHz (0.25% of 433.

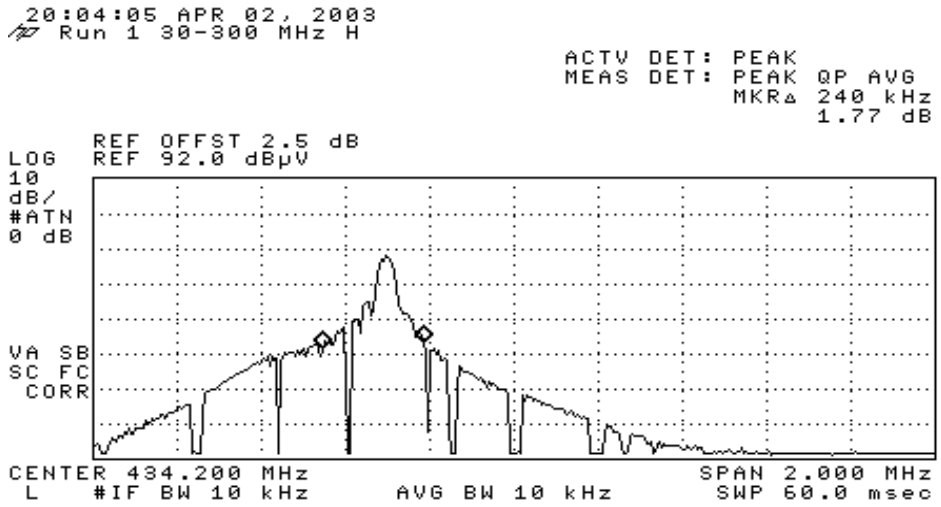


EXHIBIT 3: Test Configuration Photographs

EXHIBIT 4: Theory of Operation Mercury Photographic Model MicroSync MS0100

1 Page

EXHIBIT 5: Proposed FCC ID Label & Label Location

2 Pages

EXHIBIT 6: Detailed Photographs Mercury Photographic Model MicroSync MS0100

Pages

EXHIBIT 7: User's Guide Mercury Photographic Model MicroSync MS0100

2 Pages

EXHIBIT 8: Block Diagram Mercury Photographic Model MicroSync MS0100

1 Page

EXHIBIT 9: Schematic Diagrams Mercury Photographic Model MicroSync MS0100

1 Page