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January 23, 2001

AmericanTCB, Inc.  
6731 Whittier Avenue  
McLean, VA 22101

Gentlemen:

The enclosed documents constitute a formal submittal and application for a Grant of Equipment Authorization pursuant to Subpart C of Part 15 of FCC Rules (CFR 47) regarding intentional radiators. Data within this report demonstrates that the equipment tested complies with the FCC limits for intentional radiators.

Elliott Laboratories, as duly authorized agent prepared this submittal. A copy of the letter of our appointment as agent is enclosed.

If there are any questions or if further information is needed, please contact Elliott Laboratories for assistance.

Sincerely,

A handwritten signature in blue ink, appearing to read "Mark E. Hill", is enclosed in a rectangular box.

Mark E. Hill  
Manager, EMC Consulting Services

MEH/dmg

Enclosures:      Agent Authorization Letter  
                         Emissions Test Report with Exhibits



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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 on the  
Gyraton, Inc.  
Model: Projector RF Remote Control***

FCC ID: JJ4TCG001

GRANTEE: Gyraton, Inc.  
12930 Saratoga Avenue, Suite C-6  
Saratoga, CA. 95070

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

REPORT DATE: January 23, 2001

FINAL TEST DATE: January 18, 2001

AUTHORIZED SIGNATORY:

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Mark E. Hill  
Manager, EMC Consulting Services

This report shall not be reproduced, except in its entirety, without the written approval of Elliott Laboratories, Inc.

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**SCOPE**

An electromagnetic emissions test has been performed on the Gyration, Inc. model Projector RF Remote Control pursuant to Subpart C of Part 15 of FCC Rules for intentional radiators. 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 intentional radiator 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 Gyration, Inc. model Projector RF Remote Control and therefore apply only to the tested sample. The sample was selected and prepared by Dan DeVaul of Gyration, Inc.

**OBJECTIVE**

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators. 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 Gyration, Inc. model Projector RF Remote Control complied with the requirements of Subpart C of Part 15 of the FCC Rules for low power intentional radiators.

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 Gyration, Inc. model Projector RF Remote Control. The actual test results are contained in an exhibit of this report.

**LIMITS OF CONDUCTED INTERFERENCE VOLTAGE**

The EUT was not tested to the limits detailed in FCC Rules Part 15 Section 15.207 as the unit is battery operated.

**LIMITS OF RADIATED INTERFERENCE FIELD STRENGTH**

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.247 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**

Frequency MHz	Level dBuV/m	Pol v/h	FCC 15.235 Limit	Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
49.825	53.8	v	80.0	-26.2	QP	0	1.0	

**Harmonics**

Frequency MHz	Level dBuV/m	Pol v/h	FCC 15.235 Limit	Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
149.475	13.4	v	43.5	-30.1	QP	60	1.0	

---

**MEASUREMENT UNCERTAINTIES**

ISO Guide 25 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	$\pm 2.4$
Radiated Emissions	30 to 1000	$\pm 3.2$

**EQUIPMENT UNDER TEST (EUT) DETAILS****GENERAL**

The Gyration, Inc. model Projector RF Remote Control is a computer/projector, which is designed to control a computer and projector display. Normally, the EUT would be hand held at tabletop level. The EUT was, therefore, treated as tabletop equipment during testing to simulate the end user environment. The electrical rating of the EUT battery operated at 6V.

The sample was received on January 18, 2001 and tested on January 18, 2001. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number
Gyration RRMCG1631CESA Remote	-

**ENCLOSURE**

The EUT enclosure is primarily constructed of non-conductive polycarbonate plastic. It measures approximately 6.2 in. (15.7 cm) long by 1.7 in.(4.4cm) wide at the widest point by 1.3 in. (3.5 cm) high.

**MODIFICATIONS**

The EUT did not require modifications during testing in order to comply with the emission specifications.

**SUPPORT EQUIPMENT**

No support equipment was used during emissions testing.

**EXTERNAL I/O CABLING**

The I/O cabling configuration during emissions testing was as follows:

Cable Description	Length (m)	From Unit/Port	To Unit/Port
None	-	-	-

**TEST SOFTWARE**

The EUT was set to continuously transmit.



---

## TEST SITE

### GENERAL INFORMATION

Final test measurements were taken on January 18, 2001 at the Elliott Laboratories Open Area Test Site #3 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.

### 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.

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**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 and 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.

---

**POWER METER**

A power meter and thermister mount are used for all direct output power measurements from transmitters as they provide a broadband indication of the power output.

**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.

**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:

**RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.209**

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{\text{KHz}} @ 300\text{m}$	$67.6-20*\log_{10}(F_{\text{KHz}}) @ 300\text{m}$
0.490-1.705	$24000/F_{\text{KHz}} @ 30\text{m}$	$87.6-20*\log_{10}(F_{\text{KHz}}) @ 30\text{m}$
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

---

**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:

$$F_d = 20 * \text{LOG}_{10} (D_m/D_s)$$

where:

$$F_d = \text{Distance Factor in dB}$$

$$D_m = \text{Measurement Distance in meters}$$

$$D_s = \text{Specification Distance in meters}$$

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:

$$R_r = \text{Receiver Reading in dBuV/m}$$

$$F_d = \text{Distance Factor in dB}$$

$$R_c = \text{Corrected Reading in dBuV/m}$$

$$L_s = \text{Specification Limit in dBuV/m}$$

$$M = \text{Margin in dB Relative to Spec}$$

***EXHIBIT 1: Test Equipment Calibration Data***

**Radiated Emissions, 30 - 1000 MHz, 18-Jan-01 07:19 PM**

**Engineer: Rafael**

<b><u>Manufacturer</u></b>	<b><u>Description</u></b>	<b><u>Model #</u></b>	<b><u>Assett #</u></b>	<b><u>Cal interval</u></b>	<b><u>Last Calibrated</u></b>	<b><u>Cal Due</u></b>
Elliott Laboratories	Biconical Antenna, 30-300 MHz	EL30.300	54	12	12/20/2000	12/20/2001
EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	364	12	8/17/2000	8/17/2001
Rohde & Schwarz	Test Receiver, 20-1300MHz	ESVP	273	12	10/5/2000	10/5/2001



***EXHIBIT 2: Test Data Log Sheets***

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T41610 6 Pages



## *EMC Test Data*

Client:	Gyration	Job Number:	J41609
Model:	Projector RF Remote Control	T-Log Number:	T41610
		Proj Eng:	Mark Hill
Contact:	Daryl McMurrin		
Emissions Spec:	FCC	Class:	B
Immunity Spec:	-	Environment:	

# EMC Test Data

For The

**Gyration**

Model

**Projector RF Remote Control**



## EMC Test Data

Client:	Gyraton	Job Number:	J41609
Model:	Projector RF Remote Control	T-Log Number:	T41610
		Proj Eng:	Mark Hill
Contact:	Daryl McMurrin		
Emissions Spec:	FCC	Class:	B
Immunity Spec:	-	Environment:	

### EUT INFORMATION

#### General Description

The EUT is a computer/projector remote which is designed to control a computer and projector display. Normally, the EUT would be hand held at tabletop level. The EUT was, therefore, treated as table-top equipment during testing to simulate the end user environment. The electrical rating of the EUT battery operated at 6V.

#### Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Gyraton	RRMCG1631CESA	Remote Control		JJ4TCG001

#### EUT Enclosure

The EUT enclosure is primarily constructed of non-conductive polycarbonate plastic. It measures approximately 6.2 in. (15.7 cm) long by 1.7 in. (4.4cm) wide at the widest point by 1.3 in. (3.5 cm) high.

#### Modification History

Mod. #	Test	Date	Modificaiton
1			
2			
3			



## EMC Test Data

Client:	Gyraton	Job Number:	J41609
Model:	Projector RF Remote Control	T-Log Number:	T41610
		Proj Eng:	Mark Hill
Contact:	Daryl McMurrin		
Emissions Spec:	FCC	Class:	B
Immunity Spec:	-	Environment:	

### Test Configuration #1

#### Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

#### Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

#### EUT Interface Ports

EUT Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
None				

#### EUT Operation During Emissions

The EUT was set to continuously transmit.



## EMC Test Data

Client:	Gyratlon	Job Number:	J41609
Model:	Projector RF Remote Control	T-Log Number:	T41610
		Proj Eng:	Mark Briggs
Contact:	Daryl McMurrin		
Spec:	FCC	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: 1/18/2001

Config. Used: 1

Test Engineer: Rafael

Config Change:

Test Location: SVOATS #3

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 - 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: 10°C

Rel. Humidity: 61%

#### Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, Scan from Fundamental to 10th harmonic	FCC 15.235	Pass	
2	RE, Band-edge Measurements	FCC 15.235	Pass	

#### 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.



## EMC Test Data

Client:	Gyration	Job Number:	J41609
Model:	Projector RF Remote Control	T-Log Number:	T41610
Contact:	Daryl McMurrin	Proj Eng:	Mark Briggs
Spec:	FCC	Class:	B

### Run #1: Preliminary radiated emissions, 30-1000 MHz

#### Projector Remote #4

Frequency	Level	Pol	FCC 15.235		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
<b>Fundamental</b>								
49.825	53.8	v	80.0	-26.2	QP	0	1.0	
49.825	54.6	v	80.0	-25.4	PK	0	1.0	Information only
49.825	59.2	h	80.0	-20.8	QP	270	3.6	
49.825	60.4	h	80.0	-19.6	PK	270	3.6	Information only

<b>Harmonics</b>								
149.475	13.4	v	43.5	-30.1	QP	60	1.0	
249.125	16.5	v	46.0	-29.5	QP	0	1.0	Noise floor
298.950	18.5	v	46.0	-27.5	QP	0	1.0	Noise floor
149.475	18.3	h	43.5	-25.2	QP	290	1.4	
249.125	19.2	h	46.0	-26.8	QP	80	1.3	
298.950	18.2	h	46.0	-27.8	QP	0	1.0	Noise floor

### Run #2: Band-edge Measurements 49.82 - 49.90 MHz.

All signals outside of the allocated band (49.82 - 49.90 MHz) by more than 10kHz must be below the FCC 15.209 radiated emissions limit. Out-of-band signals within 10kHz of the band edge must be either below the 15.209 limit or 26dB below the fundamental, unmodulated level.

The 15.209 limit is 40dBuV/m at frequencies 10kHz from the band edges. At the band edges the signal must be more than 26dB below the fundamental level. Plots were made of the high and low channel signals (i.e. signals closest to the band edge) with limit lines placed at 40dBuV/m

A reference level offset was used to normalize the signal output level observed in the chamber (120kHz QP) with the maximum level observed on the OATS (59.2dBuV/m). The bandwidth was then reduced to 1kHz before making the plot. The offset was necessary because the bandwidth measurements were made in an anechoic chamber following the radiated emissions measurements on the OATS.



## EMC Test Data

Client: Gyration	Job Number: J41609
Model: Projector RF Remote Control	T-Log Number: T41610
Contact: Daryl McMurrin	Proj Eng: Mark Briggs
Spec: FCC	Class: B

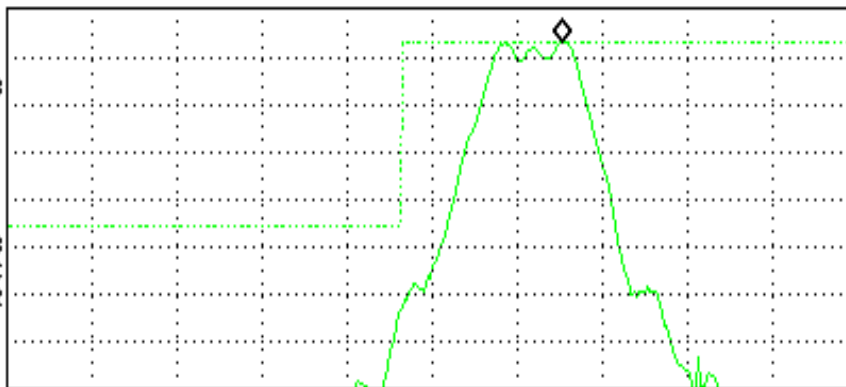
05:06:41 JAN 19, 2001  
T41610, Low Band Edge Plot

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 49.82669 MHz  
59.33 dB $\mu$ V/m

REF OFFST -4.2 dB  
REF 62.8 dB $\mu$ V/m

LOG  
5  
dB/  
ATN  
10 dB

VA SB  
SC FC  
ACORR



START 49.80385 MHz STOP 49.83885 MHz  
L #IF BW 1.0 kHz AVG BW 1 kHz SWP 300 msec

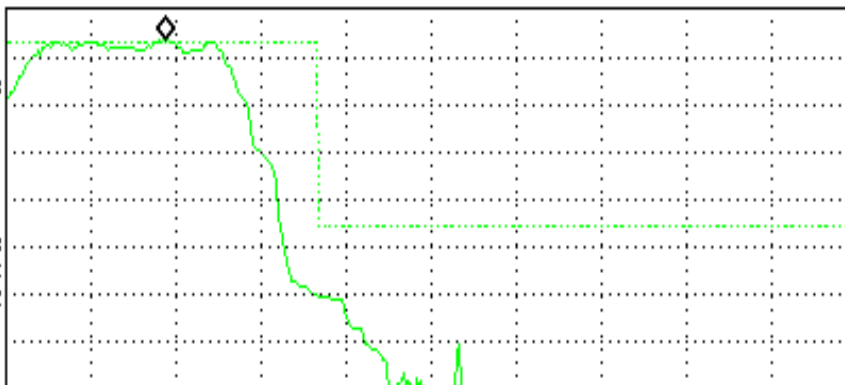
05:27:08 JAN 19, 2001  
T41610, High Band Edge Plot

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 49.89649 MHz  
59.42 dB $\mu$ V/m

REF OFFST -4.2 dB  
REF 62.8 dB $\mu$ V/m

LOG  
5  
dB/  
ATN  
10 dB

VA SB  
SC FC  
ACORR



START 49.89279 MHz STOP 49.91252 MHz  
RL #IF BW 1.0 kHz AVG BW 1 kHz SWP 300 msec

### ***EXHIBIT 3: Radiated Emissions Test Configuration Photographs***





### ***APPENDIX 3: Radiated Emissions Test Configuration Photographs***



***EXHIBIT 4: Proposed FCC ID Label & Label Location***

Label.pdf 1 page  
Label location.jpg 1 page

***EXHIBIT 5: Detailed Photographs of  
Gyratron, Inc. Model Projector RF Remote Control Construction***

Internal Pictures.pdf 2 Pages  
External Pictures.pdf 7 Pages

***EXHIBIT 6: Operator's Manual for  
Gyratron, Inc. Model Projector RF Remote Control***

Users Manual.pdf 9 Pages

***EXHIBIT 7: Block Diagram of  
Gyratron, Inc. Model Projector RF Remote Control***

Block Diagram.pdf 1 Page

***EXHIBIT 8: Schematic Diagrams for  
Gyratron, Inc. Model Projector RF Remote Control***

Schematics.pdf 3 pages

***EXHIBIT 9: Theory of Operation for  
Gyratron, Inc. Model Projector RF Remote Control***

Theory of Operations.pdf 1 Page