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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 Gyration Model: GyroRemote

FCC ID:	JJ4-GP241-001
GRANTEE:	Gyration 12930 Saratoga Avenue, Suite C-6 Saratoga, CA. 95070
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	November 13, 2000
FINAL TEST DATE:	October 24 and October 26, 2000

AUTHORIZED SIGNATORY: _____

Mark R. Briggs
Manager, EMC Consulting Services

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SCOPE

An electromagnetic emissions test has been performed on the Gyration, Inc. model GyroRemote 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 GyroRemote and therefore apply only to the tested sample. The sample was selected and prepared by Glenn Zimmermann of TUV

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 model GyroRemote 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 GyroRemote. The actual test results are contained in an exhibit of this report.

LIMITS OF CONDUCTED INTERFERENCE VOLTAGE

Conducted emissions were not performed as the EUT is powered from internal batteries only.

LIMITS OF RADIATED INTERFERENCE FIELD STRENGTH – SPURIOUS EMISSIONS

The EUT tested complied with the limits detailed in FCC Rules Part 15 Sections 15.209 and 15.235 for emissions outside of the allocated band of 49.82 – 49.90 MHz.

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.

30 – 1000 MHz (excluding 49.82 – 49.90 MHz +/- 10kHz)

Frequency MHz	Level dBuV/m	Pol v/h	FCC 15.235 Limit	Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
99.653	32.9	h	43.5	-10.6	QP	90	1.0	Note 2,4

Note 2: Measured on SV #3, 10-26-00 by Mark Briggs using signal substitution method.
Note 4: EUT on its back

Plots were made showing that the fundamental signal was more than 26dB below the in-band level within 10kHz of the band edges and below the 15.209 limit at frequencies more than 10kHz from the band-edge. These plots were made using a bandwidth of 1 kHz. Refer to the actual test data in the appendices of this report for details

LIMITS OF RADIATED INTERFERENCE FIELD STRENGTH – INTENTIONAL SIGNAL

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.

49.827 MHz

Frequency MHz	Level dBuV/m	Pol v/h	FCC 15.235 Limit	Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
49.827	69.7	v	80.0	-10.3	Avg	1	1.0	EUT upright

The peak field strength (70.1 dBuV/m) is equivalent to an EIRP of –25.2dBm (0.003 mW or 0.000003 Watts).

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	± 2.4
Radiated Emissions	30 to 1000	± 3.2

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Gyration, Inc. model GyroRemote is a wireless remote control for a projector. The EUT is designed to operate in the 49.82-49.9 MHz band using FSK. The actual frequencies are from 49.825 to 49.895 in 10kHz channels. Normally, the EUT would be hand-held during operation. The EUT was treated as tabletop equipment during testing to simulate the end user environment. The EUT is designed to operate from two internal AAA batteries.

The sample was received on October 24, 2000 and tested on October 24 and October 26, 2000. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number
Gyration / GP241-001 / wireless remote	US 49
Gyration / GP241-001 / wireless remote	US 49

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 5 cm wide by 3 cm deep by 19.5 cm long.

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 transmitting constantly throughout the test. For spurious emissions the transmitter was tuned to a single frequency. For band edge measurements the EUT was tuned to the highest and lowest channels.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on October 24 and October 26, 2000 at the Elliott Laboratories Open Area Test Site #2 and #3 located at 684 West Maude Avenue, Sunnyvale, California. The test sites contain 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. In addition, band edge radiated measurements were made in an anechoic chamber.

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.

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.

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 15.235

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
49.82 – 49.90	10,000	80.0

SPURIOUS RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.209

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

***** Signals within 10kHz of the 49.82 – 49.90 MHz band must be at least 26dB below the highest in band signal level.

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

Radiated Emissions, 30 - 1000 MHz, 24-Oct-00 11:25 PM
Engineer: bwright

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	Biconical Antenna, 30-300 MHz	3110B	801	11	12/1/1999	#######
EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	802	12	1/20/2000	#######
Rohde & Schwarz	Test Receiver, 0.009-2000 MHz	ESN	775	12	6/16/2000	#######

Band Edge Measurements, 25-Oct-00 12:00 PM
Engineer: Mark

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
A.H. Systems	Biconical Antenna, 20-200 MHz	SAS-200/540H	866	12	3/6/2000	3/6/2001
Hewlett Packard	EMC Recever /Analyzer	8595EM	787	12	12/2/1999	#######
Hewlett Packard	RF Preamplifier, 100 kHz - 1.3 GHz	8447D	999	12	5/3/2000	5/3/2001

Radiated Emissions, Second Harmonic, 26-Oct-00 04:54 PM
Engineer: Mark

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Elliott Laboratories	Biconical Antenna, 30-300 MHz	EL30.300	54	12	12/21/1999	#######
Rohde &Schwarz	Test Receiver, 20-1300MHz	ESVP	213, (F196)	12	5/30/2000	#######

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T40160 8 Pages

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EMC Test Data

Client:	TUV RHINELAND	Job Number:	40123
Model:	GyroRemote	T-Log Number:	40160
		Proj Eng:	Mark Briggs
Contact:	Dan Devaul		
Emissions Spec:	FCC B	Class:	B
Immunity Spec:	-	Environment:	

EMC Test Data

For The

TUV RHINELAND

Model

GyroRemote

Client:	TUV RHINELAND	Job Number:	40123
Model:	GyroRemote	T-Log Number:	40160
		Proj Eng:	Mark Briggs
Contact:	Dan Devaul		
Emissions Spec:	FCC B	Class:	B
Immunity Spec:	-	Environment:	

EUT INFORMATION

General Description

The EUT is a wireless remote control for a projector. The EUT is designed to operate in the 49.82-49.9 MHz band using FSK. Normally, the EUT would be hand-held during operation. The EUT was, treated as table-top equipment during testing to simulate the end user environment. The EUT is designed to operate from two internal AAA batteries.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Gyration	GP241-001	Wireless remote	US 49	JJ4-GP241-001
Gyration	GP241-001	Wireless remote	US 49	JJ4-GP241-001

EUT Enclosure

The EUT enclosure is primarily constructed of plastic. It measures approximately 5 cm wide by 3 cm deep by 19.5 cm long.

Modification History

Mod. #	Test	Date	Modification
1	-	-	None made

Client:	TUV RHINELAND	Job Number:	40123
Model:	GyroRemote	T-Log Number:	40160
		Proj Eng:	Mark Briggs
Contact:	Dan Devaul		
Emissions Spec:	FCC B	Class:	B
Immunity Spec:	-	Environment:	

Test Configuration #1

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 transmitting constantly throughout the test.

Client:	TUV RHINELAND	Job Number:	40123
Model:	GyroRemote	T-Log Number:	40160
		Proj Eng:	Mark Briggs
Contact:	Dan Devaul		
Spec:	FCC B	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: 10/24/2000 - 10/26/00
Test Engineer: Blair Wright / Mark Briggs
Test Location: Chamber 2, SV #2 and #3

Config. Used: 1
Config Change:
EUT Voltage: (8) 1.5V batteries

General Test Configuration

The EUT was located on the turntable for radiated emissions testing. All three orientations were tested.

Ambient Conditions:

Temperature: 16.1°C
Rel. Humidity: 53%

Summary of Results

Run #	Test Performed	Limit	Result	Margin
2	RE, Fundamental Signal Level Emissions	FCC 15.235	Pass	-10.3dB @ 49.827MHz
3	RE, 30 - 1000MHz - Spurious Emissions	FCC 15.235	Pass	-10.7dB @ 99.653MHz
4	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.

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EMC Test Data

Client:	TUV RHINELAND	Job Number:	40123
Model:	GyroRemote	T-Log Number:	40160
		Proj Eng:	Mark Briggs
Contact:	Dan Devaul		
Spec:	FCC B	Class:	B

Run #1: Fundamental Signal Level - Preliminary Measurements

Initial measurements made to determine the orinetation of the EUT that produced the highest signal level.

Frequency	Level	Pol	FCC 15.235		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
49.827	70.1	v	100.0	-29.9	Pk	1	1.0	EUT upright
49.827	63.3	h	100.0	-36.7	Pk	85	3.4	EUT on its side
49.827	62.0	h	100.0	-38.0	Pk	83	3.6	EUT on its back
49.827	60.2	v	100.0	-39.8	Pk	1	1.0	EUT on its side
49.827	56.8	v	100.0	-43.2	Pk	171	1.0	EUT on its back
49.827	48.1	h	100.0	-51.9	Pk	1	1.2	EUT upright

Run #2: Fundamental Signal Level - Maximized Measurements

Frequency	Level	Pol	FCC 15.235		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
49.827	69.7	v	80.0	-10.3	Avg	1	1.0	EUT upright
49.827	70.1	v	100.0	-29.9	Pk	1	1.0	EUT upright

Note that a field strength of 69.7dBuV/m at a 3m distance correspdonds to an EIRP of -25.5dBm (0.000003 Watts)

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EMC Test Data

Client:	TUV RHINELAND	Job Number:	40123
Model:	GyroRemote	T-Log Number:	40160
		Proj Eng:	Mark Briggs
Contact:	Dan Devaul		
Spec:	FCC B	Class:	B

Run #3: Radiated Spurious Emissions, 30-1000 MHz
The EUT was tested in all three orthogonal orientations.

Frequency	Level	Pol	FCC 15.235		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
99.653	32.9	h	43.5	-10.6	QP	90	1.0	Note 2,4
99.653	31.6	v	43.5	-11.9	QP	0	1.0	Note 2,3
298.800	29.6	v	46.0	-16.4	QP	1	1.0	Note 3
298.800	27.7	h	46.0	-18.3	QP	120	1.5	Note 3
298.800	27.5	v	46.0	-18.5	QP	1	1.0	Note 4
298.800	27.5	h	46.0	-18.5	QP	1	1.4	Note 4
298.800	27.5	h	46.0	-18.5	QP	1	1.5	Note 1
298.800	27.4	v	46.0	-18.6	QP	1	1.5	Note 1
249.000	25.0	v	46.0	-21.0	QP	1	1.9	Note 4
249.000	25.0	v	46.0	-21.0	QP	1	1.8	Note 1
249.000	24.7	h	46.0	-21.3	QP	1	3.0	Note 4
249.000	24.6	h	46.0	-21.4	QP	1	3.0	Note 1
249.000	24.3	v	46.0	-21.7	QP	1	1.0	Note 3
249.000	24.0	h	46.0	-22.0	QP	1	1.0	Note 3
149.400	17.4	h	43.5	-26.1	QP	176	1.5	Note 4
149.400	17.3	v	43.5	-26.2	QP	1	1.0	Note 4
149.400	17.3	v	43.5	-26.2	QP	1	1.0	Note 1
149.400	17.3	v	43.5	-26.2	QP	1	1.0	Note 3
149.400	17.3	h	43.5	-26.2	QP	1	1.0	Note 3
149.400	17.0	h	43.5	-26.5	QP	1	1.4	Note 1

Note 1:	EUT on its side
Note 2:	Measured on SV #3, 10-26-00 by Mark Briggs using signal substitution method.
Note 3:	EUT upright
Note 4:	EUT on its back

Elliott

EMC Test Data

Client:	TUV RHINELAND	Job Number:	40123
Model:	GyroRemote	T-Log Number:	40160
		Proj Eng:	Mark Briggs
Contact:	Dan Devaul		
Spec:	FCC B	Class:	B

Band Edge Considerations:

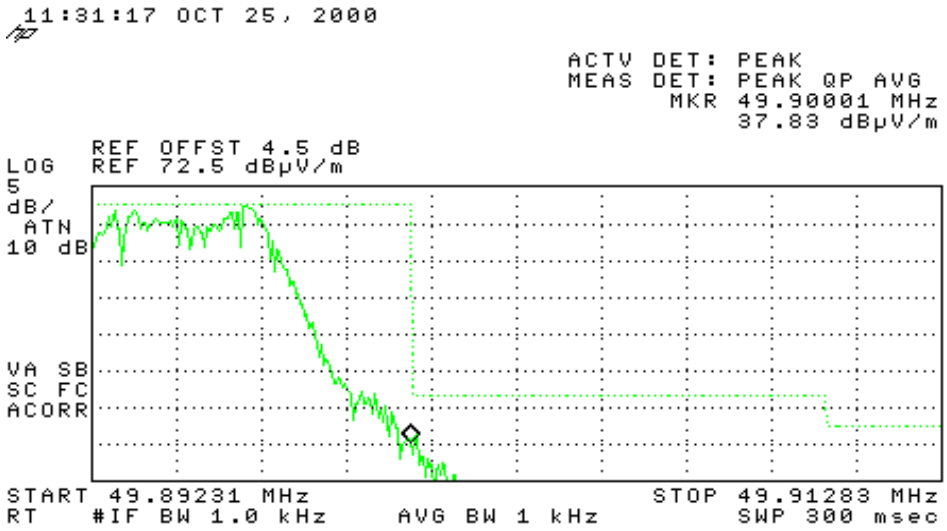
All signals outside of the allocated band (49.82 - 49.90 MHz) by more than 10kHz must be below the FCC 15.209 radiated emissions limit. Out-of-band signals within 10kHz of the band edge must be either below the 15.209 limit or 26dB below the fundamental, unmodulated level.

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 (for out-of band signals more than 10kHz from the band edge) and 44.1dBuV/m (for out-of-band signals within 10kHz of the band edge. 44.1dBuV/m corresponded to a level 26dB below the highest in-band signal level. 44.1dBuV/m alos corresponded to the highest unmodulated signal level in a 1kHz bandwidth.

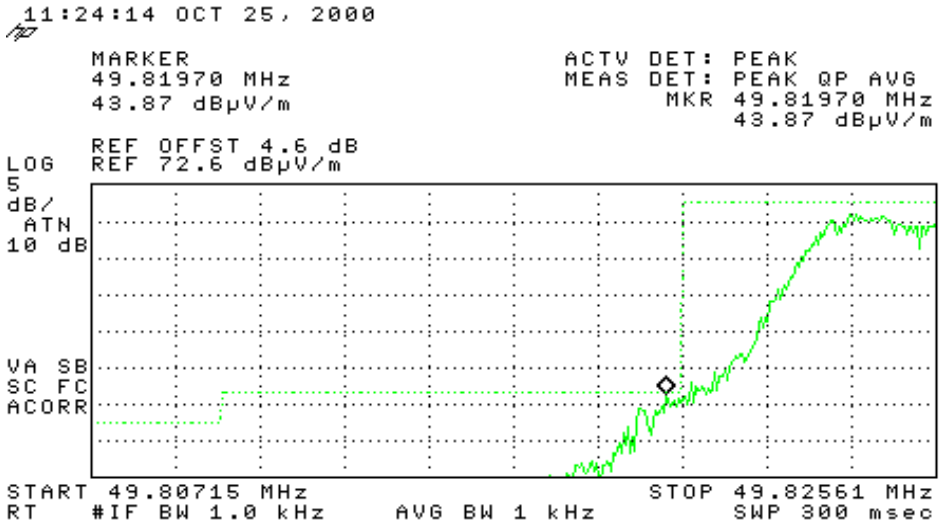
A reference level offset was used to normalize the signal output level observed in the chamber (120kHz Pk) with the maximum level observed on the OATS (70.1dBuV/m). The bandwidth was then reduced to 1kHz before making the plot. The offset was necessary because the bandwidth measurements were made in an anechoic chamber following the radiated emissions measurements on the OATS.

The plots were made on 10-25-00 in anechoic chamber #2 by Mark Briggs

Client:	TUV RHINELAND	Job Number:	40123
Model:	GyroRemote	T-Log Number:	40160
		Proj Eng:	Mark Briggs
Contact:	Dan Devaul		
Spec:	FCC B	Class:	B



Alpha Unit - High Channel. All out-of-band signals below the limit.



Alpha Unit - Low Channel. All out-of-band signals below the limit.

EXHIBIT 3: Test Configuration Photographs

EXHIBIT 4: Proposed FCC ID Label & Label Location

EXHIBIT 5: Detailed Photographs of Gyration Model GyroRemoteConstruction

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EXHIBIT 6: Operator's Manual for Gyration Model GyroRemote

9 Pages

EXHIBIT 7: Block Diagram of Gyration Model GyroRemote

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EXHIBIT 8: Schematic Diagrams for Gyration Model GyroRemote

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EXHIBIT 9: Theory of Operation for Gyration Model GyroRemote

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