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Atlas Compliance & Engineering, Inc.

FCC
Test Report

FCC CFR 47 Part 15.207(d) and 15.249 COMPLIANCE

Mad Catz
7480 Mission Valley Rd. Suite 101
San Diego, CA 92108 USA

Product:
Xbox RF Controller
Model:
4556

Test Report Number: 0241aMDC4556c_subc
Date of Report: October 7, 2002

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General Information

Test Report Number:	0241aMDC4556c_subc
Date Product Tested:	October 1, 2002
Date of Report:	October 7, 2002
Applicant:	Mad Catz 7480 Mission Valley Rd. Suite 101 San Diego, CA 92108 USA
Contact Person	Dave Preller
Equipment Tested:	Xbox RF Controller
Trade Name:	4556 Controller
Model:	4556
Purpose Of Test:	To demonstrate the compliance of the Xbox RF Controller, 4556, with the requirements of FCC CFR 47 Part 15 Rules and Regulations to the limits of Subpart C 15.207(d) and 15.249 using the procedure stated in ANSI C63.4-1992.
Frequency Range Investigated:	30 MHz to 10,000 MHz
FCC ID:	P25HEMC4556A4002C
Test Site Locations:	Field Strength Measurement Facility: Atlas Compliance & Engineering, Inc. 726 Hidden Valley Road Royal Oaks, California 95076 Conducted Interference and Immunity Measurement Facility: Atlas Compliance & Engineering, Inc. 675 Sycamore Drive Milpitas, California 95035
Test Personnel:	Bruce Smith EMC Engineer

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Test Equipment

The following list contains the test equipment that was utilized in making the measurements in this report.

Description _ Model	Serial	Manufacturer	Calibrated	Calibration Due
BiLog Antenna_CBL6112B	2783	Schaffner	9/25/02	9/25/03
Horn Antenna _ 3115	9003-3340	EMCO	1/23/02	1/23/03
Pre amp 9 kHz – 2 GHz _ CPA9231A	3323	Schaffner	5/24/02	5/24/03
Pre amp 1 – 26.5 GHz _ 8449B	3008A00910	HP	5/31/02	5/31/03
EMI Test Receiver 9 kHz - 2500 MHz _ ESPC	DE15934	Rohde & Schwarz	6/11/02	6/11/03
EMI Receiver 100 Hz – 22 GHz _ 8566B	2542A13058 (IF) 2637A03426 (RF)	HP	5/28/02	5/28/03

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Test Configuration

Customer:	Mad Catz
Test Date:	October 1, 2002
Specification:	FCC CRF 47 Part 15.249 Limits, ANSI C63.4-1992 Methods

EUT Description / Note:

The EUT, 4556, a Xbox RF Controller, was powered up with new batteries and in a continuous transmitting mode. The EUT is battery powered therefore no conducted emissions testing was performed. EUT frequencies of operation are 905.75, 907.80, 909.85, 911.89, 913.94, 915.99, 918.04, 920.09, 922.13 and 924.18 MHz

EUT Support Program

The EUT was constantly at 905.75 MHz. The other frequencies between 905.75 MHz and 924.18 MHz were tested to find maximum emissions, 905.75 MHz was where the maximum emission level was observed. Band edge measurement was taken with the EUT operating at 905.75 MHz and 924.18 MHz with FSK modulation.

EUT Modifications for Compliance

There were no modifications performed on the EUT. The test results state the emission levels of the EUT in the condition as it was received on October 1, 2002.

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EUT Support Devices

Table 1 - Support Equipment Used For Test

Model:	Description:	S/N	FCC ID#
US Xbox	Microsoft Xbox Video Game System	3230175 22102	DoC
14AF-41	Toshiba Color TV	15611401 A	DoC

I/O Ports and Cables

Table 2 - EUT Port Termination's

I/O Port	Cable Type	Length	Connector	Termination
Battery	N/A	N/A	N/A	New Batteries (3-AA)

Table 3 - Host Port Termination's

I/O Port	Cable Type	Length	Connector	Termination
AV	Triple Coax, Ferrite Bead	8 FT	RCA (3x)	Monitor
Power	Non-Shielded	7 FT	IEC	Power Mains

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Equipment Under Test

The photographs below show the condition of the EUT for test.

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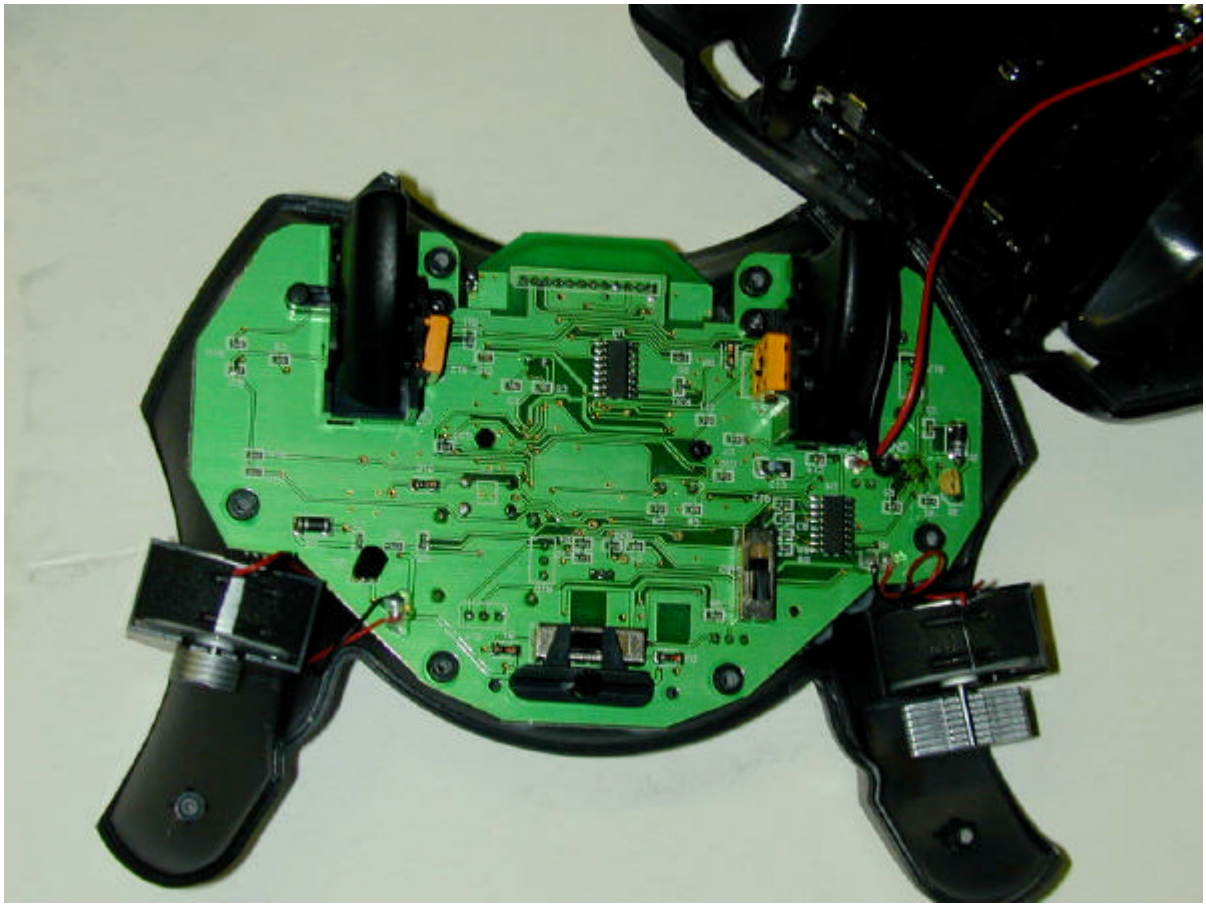

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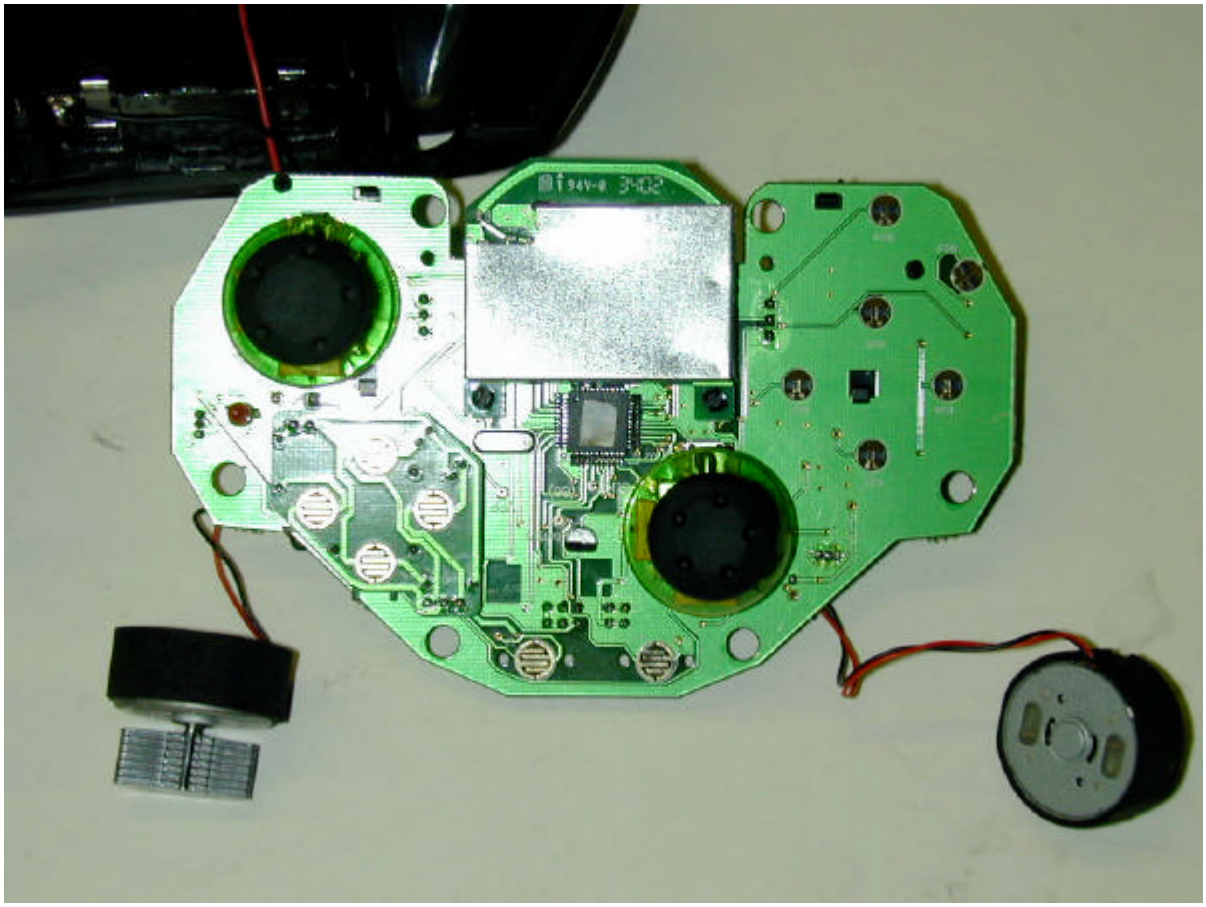

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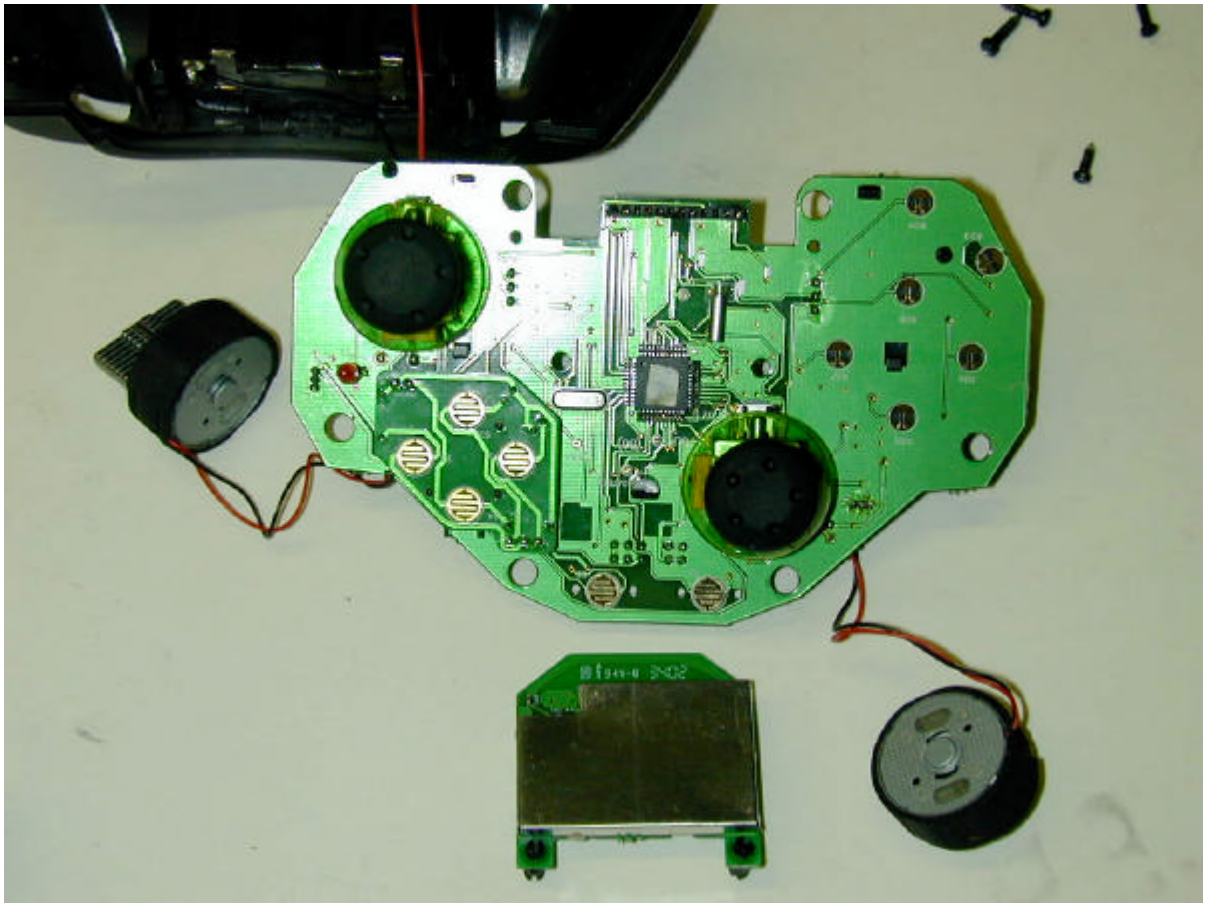

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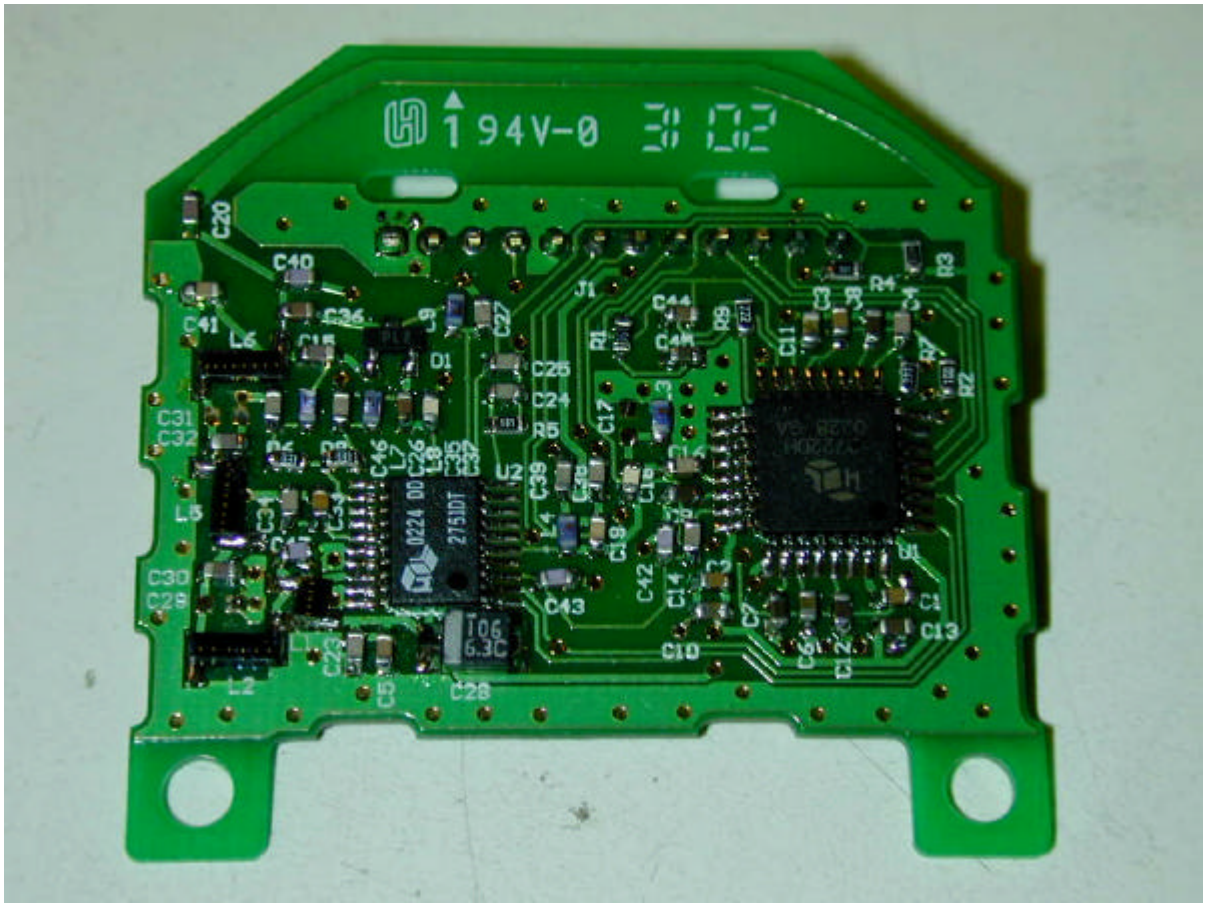

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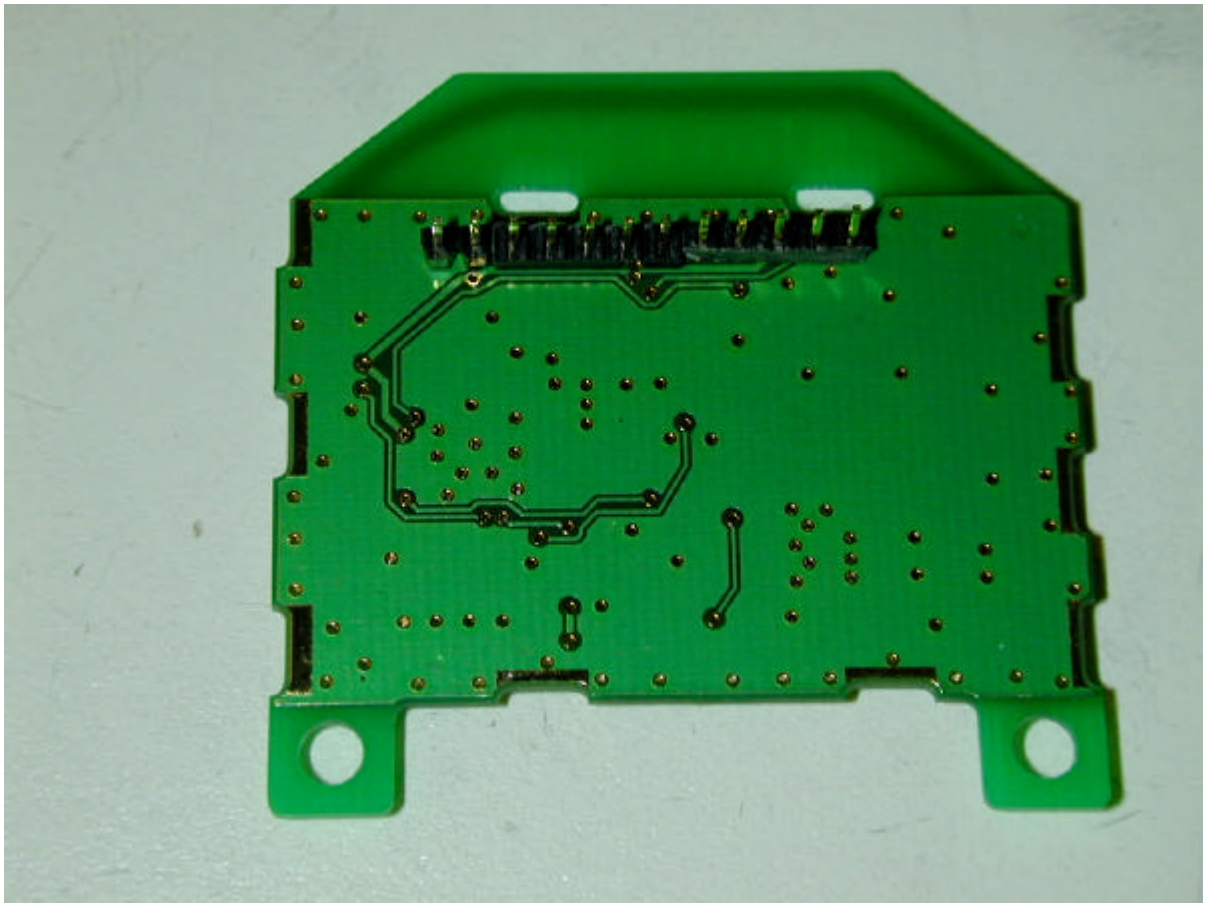

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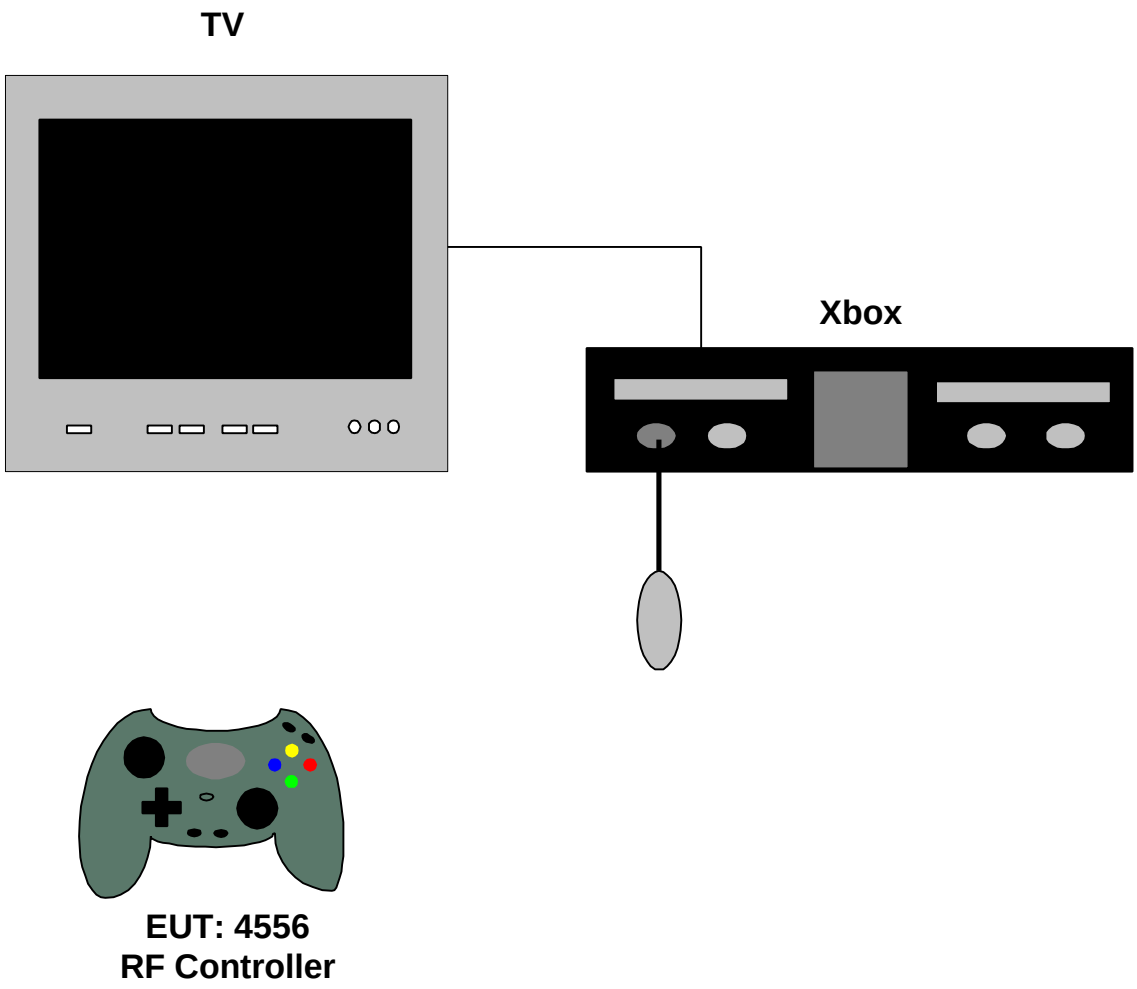
Equipment Block Diagram

Following is the block diagram of the test setup. Refer to TEST CONFIGURATION pages for port connections and information.

Figure 1 - Test Setup Diagram



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Test Setup (Radiated Emissions)

The photographs below show worst case setup for radiated emission testing.

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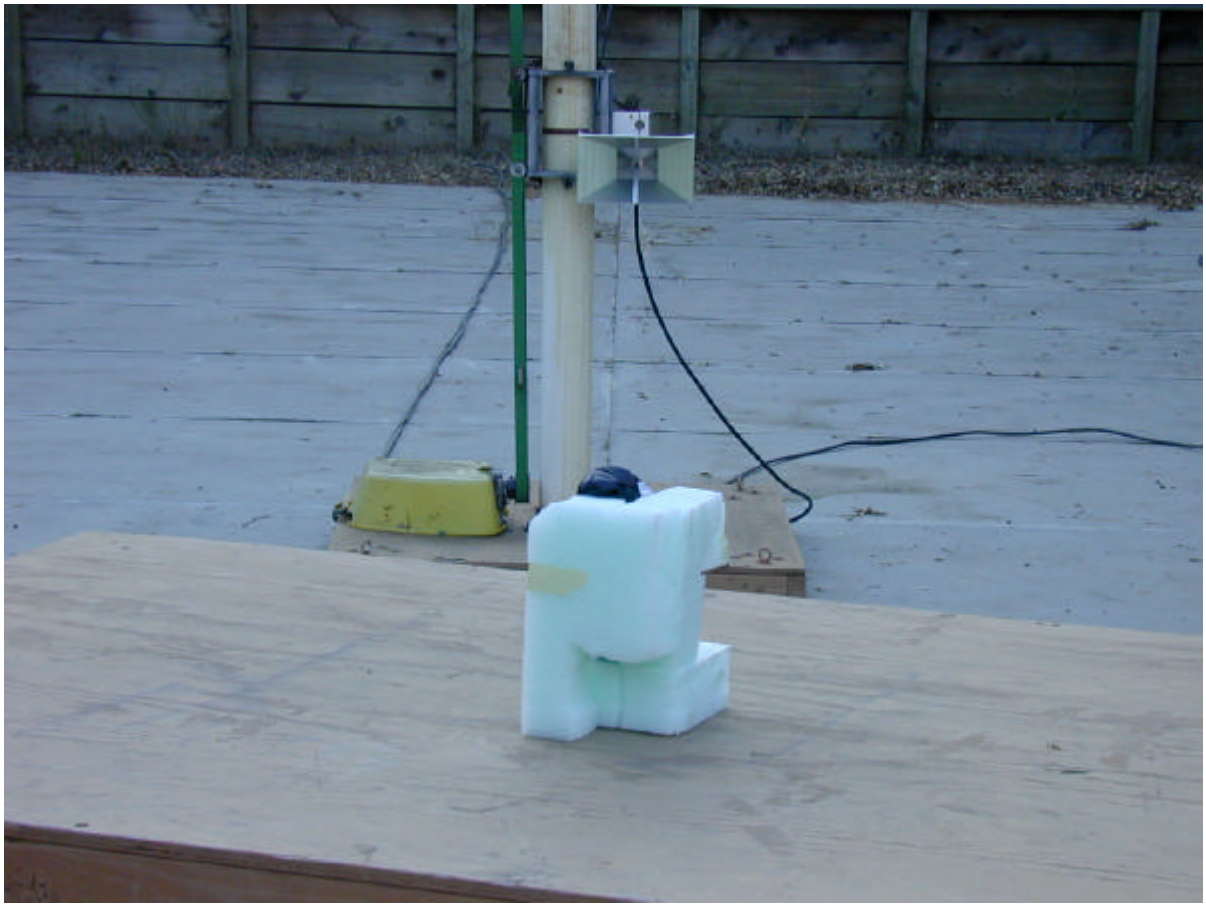

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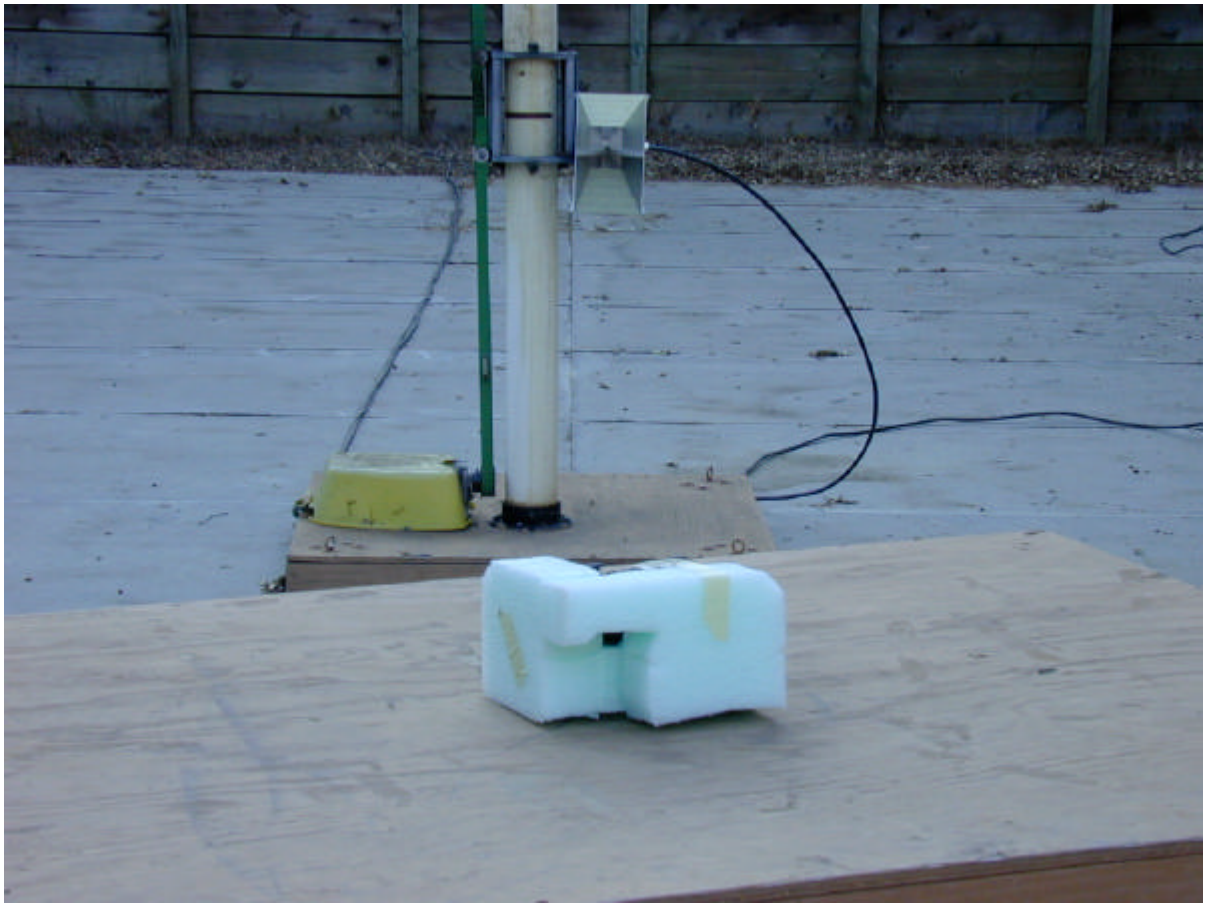

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Test Methods for Emissions

The test procedure stated in ANSI C63.4-1992 was used to collect the test data. The radiated emission data of the EUT was taken with the Rohde & Schwarz EMI Test Receiver or HP 8566B. Incorporating the application of correction factors programmed into the Test Receiver and verified for distance, antenna, cable loss, and amplifier gain, the data was reduced as shown in the Sample Calculations. These correction factors are available upon request. The corrected data was then compared to the emission limits to determine compliance.

During radiated emission testing, the EUT was placed on a nonconductive rotating table 0.8 meter above the conductive grid. The nonconductive table dimensions were 1 meter deep by 1.5 meters wide at 0.8 meter high. The EUT is centered on the tabletop and the measurement antenna was placed 3 meters from the EUT as noted in the test data. The EUT, being a hand-held device, was tested in 3 orthogonal axes to determine which attitude produced the highest emission.

For radiated emissions testing, scans in the frequency range of 30 MHz to 10000 MHz were made. Each frequency between 9 kHz and 150 kHz was measured at a bandwidth of 200 Hz, between 150 kHz and 30 MHz was measured at a bandwidth of 10 kHz, between 30 MHz and 1000 MHz was measured at a bandwidth of 120 kHz and between 1000 MHz and above was measured at a bandwidth of 1 MHz. Measurements were made employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz, and above 1GHz which employed an average detector. All readings within 10 dB of the limits were recorded, and those emissions were then measured using the appropriate detector and bandwidth for a 2-second measurement time.

Measurements were made at a distance of 3 meters.

Conducted Emission Testing

The EUT is a battery powered device therefore no conducted emission testing was performed.

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Temperature and Humidity

The ambient temperature of the actual EUT was within the range of 10° to 40° C (50° to 104° F) unless the particular equipment requirements specify testing over a different temperature range. The humidity levels were within the range of 10% to 90% relative humidity unless the EUT operating requirements call for a different level.

Sample Calculations

An example of how the EMI Test Receiver reading is converted using correction factors is given for the emissions recorded in Table 6. These correction factors are programmed into the EMI Test Receiver and verified. For radiated emissions in dBµV/m, the EMI Test Receiver reading in dBµV is corrected by using the following formula:

91.4	Meter Reading (dBµV/m)
29.5	- Pre amp Gain (dB)
8.4	+ Cable Loss (dB)
20.4	+ Antenna Factor (dB)
90.7	= Corrected Reading (dBµV/m)

This reading is then compared to the applicable specification limits and the difference will determine compliance. For conducted emissions, no correction factors are needed when a 50 µH LISN is used.

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FCC Part 15 Subpart C 15.207 and 15.249 Limits

Table 4 - Radiated Emission Limits,
Operation within the bands 902 – 928 MHz, 2400 – 2483.5 MHz,
5725 – 5875 MHz, and 24.0 – 24.25 GHz.

Frequency MHz	Field Strength of fundamental millivolts/meter	Field Strength of harmonics microvolts/meter
902 – 928	50	500
2400 – 2483.5	50	500
5725 – 5875	50	500
24000 – 24250	250	2500

NOTE:

1. Field strength limits are specified at a distance of 3 meters..
2. Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in 15.209, whichever is the lesser attenuation.
3. As shown in 15.35(b), for frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Table 5 - Conducted Limits

Frequency MHz	Limit Quasi-Peak dBmV	Limit Average dBmV
0.15-0.50	66-56	56-46
0.50-5	56	46
5-30	60	50

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Both Quasi-Peak and Average limits for power line conducted testing must be met.
3. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

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Report of Measurements Radiated Data

The following table reports the results of the radiated measurements for the Xbox RF Controller, 4556.

Table 6 - Radiated Emission Level

15.249 Limit dBµV/m	Fundamental Frequency MHz	Level dBµV/m	Detector	Test Distance	Antenna	Polarity	Margin dB
94 @ 3 meters	905.75	90.7	PK	3	BiLog	H	3.3
		90.3	PK	3	BiLog	V	3.7

15.249 Limit dBµV/m	Harmonic Frequency MHz	Level dBµV	Detector	Test Distance	Antenna	Polarity	Margin dB
54 @ 3 meters	1811.5	51.17	PK	3	Horn	H	2.83
		50.77	PK	3	Horn	V	3.23
54 @ 3 meters	2717.25	43.14	PK	3	Horn	H	10.86
		50.14	PK	3	Horn	V	3.86
54 @ 3 meters	3623	40.28	PK	3	Horn	H	13.72
		45.48	PK	3	Horn	V	8.52
54 @ 3 meters	4528.75	39.34	PK	3	Horn	H	14.66
		42.14	PK	3	Horn	V	11.86
54 @ 3 meters	5434.5	42.00	PK	3	Horn	H	12.00
		41.40	PK	3	Horn	V	12.60
54 @ 3 meters	6340.25	46.71	PK	3	Horn	H	7.29
		47.31	PK	3	Horn	V	6.69
54 @ 3 meters	7246	46.83	PK	3	Horn	H	7.17
		47.53	PK	3	Horn	V	6.47
54 @ 3 meters	8151.75	47.69	PK	3	Horn	H	6.31
		49.49	PK	3	Horn	V	4.51
54 @ 3 meters	9057.5	49.24	PK	3	Horn	H	4.76
		49.84	PK	3	Horn	V	4.16

46 @ 3 meters	Bandedge 902	31.33	QP	3	BiLog	H	14.67
46 @ 3 meters	Bandedge 928	29.91	QP	3	BiLog	H	16.09

Test Method: ANSI C63.4-1992
Spec Limit: FCC 15.249
No other emissions were observed.

Note: PK = Peak
H = Horizontal
V = Vertical

COMMENTS: System continuously running. Ambient temperature 85°F and relative humidity of 17%. Test distance of 3 meters. Quasi-peak and average detectors were not used since the peak readings were under the limits (unless noted otherwise). No emissions observed after the forth harmonic, measurements taken are baseline measurements after the forth harmonic. Band edge measurements were taken with FSK modulation.

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COMPLIANCE VERIFICATION REPORT

TEST CERTIFICATE

APPLICANT:	Mad Catz 7480 Mission Valley Rd. Suite 101 San Diego, CA 92108 USA
Trade Name:	Xbox RF Controller
Model:	4556

I HEREBY CERTIFY THAT:

The measurements shown in this report were made in accordance with the procedures indicated and that the energy emitted by this equipment, as received, was found to be within the FCC CFR 47 Part 15 Subpart C section 15.249 for Radiated emissions. Additionally, it should be noted that the results in this report apply only to the items tested, as identified herein.

I FURTHER CERTIFY THAT:

On the basis of the measurements taken at the test site, the equipment tested is capable of operation in compliance with the requirements set forth in FCC CFR 47 Part 15.207(d) and 15.249 Rules and Regulations.

On this Date: October 7, 2002

Bruce Smith
Atlas Compliance & Engineering, Inc.

Printed Name

Signature
Mad Catz Representative

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Atlas Compliance & Engineering, Inc.

FCC
Addendum Test Report

FCC CFR 47 Part 15.209 COMPLIANCE
6 MHz to 30 MHz

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Test Equipment

The following list contains the test equipment that was utilized in making the measurements in this addendum report.

Description _ Model	Serial	Manufacturer	Calibrated	Calibration Due
Active Loop Antenna_6502	9108-2669	EMCO	12/13/01	12/13/02
EMI Test Receiver 9 kHz - 2500 MHz _ ESPC	DE15934	Rohde & Schwarz	6/11/02	6/11/03

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Test Setup (Radiated Emissions)

The photographs below show worst case setup for radiated emission testing at 3-meter distance.

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The photographs below show worst case setup for radiated emission testing at 10-meter distance.

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FCC Part 15 Subpart C 15.209 Limits

Table 7 - Radiated Emission Limits, General Requirements

Frequency MHz	**Field Strength mV/m**	**Measurement Distance Meters**
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closest point of any part of the device or system.
3. The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission.
4. The emission limits shown are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

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Report of Measurements Radiated Data

Exploratory radiated emissions measurements were performed from 6 MHz to 30 MHz at 10 meter and 3 meter distances. The loop antenna was placed at 1-meter height and was rotated about its vertical axis. The EUT was also rotated 360 degrees in front of the antenna. No emissions were observed from the EUT.