FCC PART 15.227
EMI MEASUREMENT AND TEST REPORT

For

EZKEY CORP.

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FCC ID: MWIERGORF

2004-01-27

This Report Concerns:	**Equipment Type:**
☒ Original Report	Transmitter, Wireless Mouse

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Report No.:	R0312233(T)
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *EZKEY CORP.* 's product, model *ERGO* or the "EUT" as referred to in this report is a Wireless Mouse. The EUT is measured approximately 5.0" L x 3.2" W x 1.7" H.

** The test data gathered are from production sample, serial number:EGRO01, provided by the manufacturer.*

Objective

This Type approval report is prepared on behalf of *EZKEY CORP.* in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules, sec 15.209 and sec 15.227.

Related Submittal(s)/Grant(s)

No Related Submittals.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2001, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2001.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, CISPR 22: 1997, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT was configured for testing according to ANSI C63.4-2001.

The final qualification test was performed with the EUT operating at normal mode

Equipment Modifications

No modifications were made to the EUT.

Test Setup Configuration

Mouse Transmitter

SUMMARY OF TEST RESULTS

Results reported relate only to the product tested, serial number: EGRO01.

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna requirement	Compliant
§15.205	Restricted Band	Compliant
§15.209	Radiated Emission Limit	Compliant
§15.207	Conducted	Compliant
§15.227	Frequency of Operation	Compliant
§15.227(a)	Field Strength	Compliant
§15.227(b)	Band Edge	Compliant

§15.203 - ANTENNA REQUIREMENT

Standard Applicable

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Refer to statement below for compliance.

“The antenna for this device is an integral antenna that the end user cannot access. Furthermore the device is for outdoor use as detailed in the Users Manual and Operational Description”.

Antenna Connected Construction

The antenna connector is designed with permanent attachment and no consideration of replacement.

§15.209(a) - RADIATED EMISSION DATA

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is ±4.0 dB.

The fundamental data was recorded in average detection mode: set the VBW AVE on, then record the data.

EUT Setup

The radiated emission tests were performed in the open area 10-meter test site, using the setup accordance with the ANSI C63.4-2001. The specification used was the FCC Part 15 Subpart C limits.

Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33, the EUT emissions were investigated from 27 to 1000 MHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Range	***RBW***	***Video B/W***
Below 30MHz	10kHz	10kHz
30 – 1000MHz	100kHz	100kHz
Above 1000MHz	1MHz	1MHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	8568B	2601A02165	2003-07-03
HP	Amplifier (0.1-1300MHz)	8447E	2944A10187	2003-09-23
HP	Quasi-Peak Adapter	85650A	3019A05393	2003-06-13
HP	Spectrum Analyzer	8565EC	3946A00131	2003-06-30
HP	Amplifier (1-26.5GHz)	8449B	3147A00400	2003-03-14
HP	Spectrum Analyzer Display	85662A	3026A20081	2003-06-13
EMCO	Biconical Antenna	3110B	9309-1165	2003-10-11
ETS	Logperiodic Antenna	3148	0004-1155	2003-10-11
COM-Power	Loop Antenna	AL-130	17043	2003-04-03
Agilent	Amplifier(0.1-1300MHz)	8447D	2944A10198	2003-09-23
Electro-Metrics	Biconical Antenna	EM-6912	585	2003-04-17
Electro-Metrics	Logperiodic Antenna	EM-6950	788	2003-04-15

*** Statement of Traceability: BACL Corp.** certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

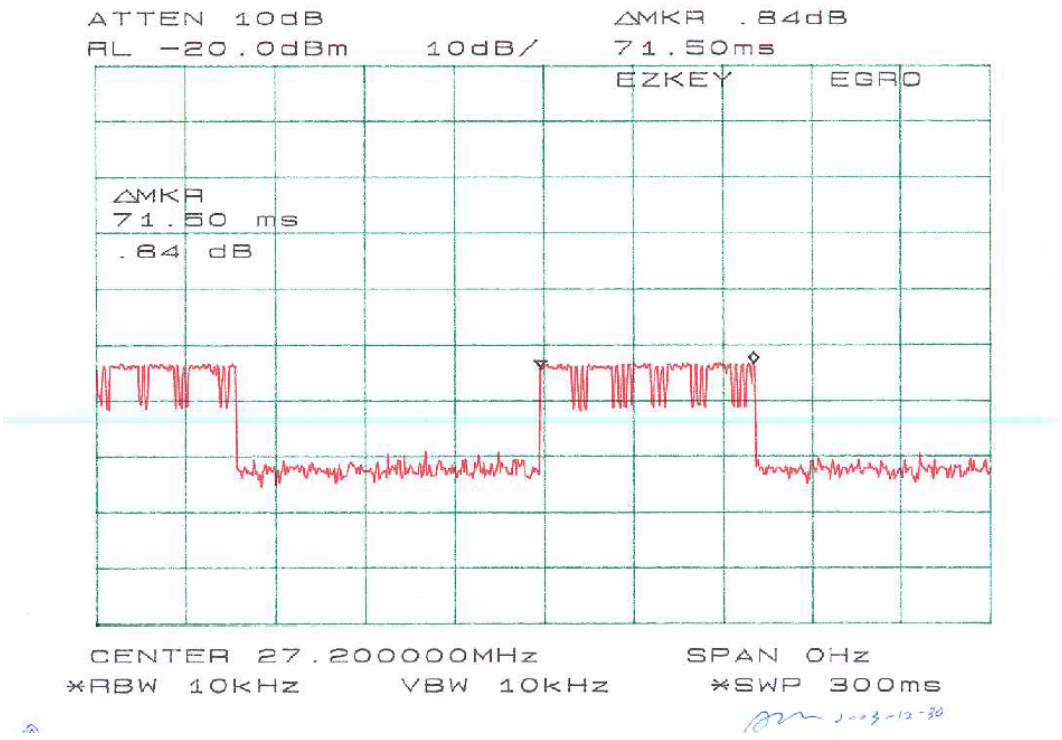
Maximizing procedure was performed on the six (6) highest emissions in the described configurations.

According to FCC rules 15.33 (c) and ANSI C63.4-2001 Annex I.4, when average detector function limits are specified for a pulse-modulated transmitter, the average level of emission may be found by measuring the peak level of the emissions and correcting them with the duty cycle as follows:

1) Turn on the transmitter, and set it to transmit the pulse train continuously.
2) Tune a spectrum analyzer to the transmitter, carrier frequency, and set the spectrum analyzer resolution bandwidth wide enough to encompass all significant spectral components. The video bandwidth should be at least as wide as the resolution bandwidth.
3) Set the spectrum analyzer vertical scale (amplitude) to the linear mode and the analyzer frequency scan to 0Hz.
4) Calculate the duty cycle = Tx on / (Tx on + Tx off) = 71.5 / 174 = 41%
5) Multiply the peak-detector field strength (expressed in uV/m) of an emission from a transmitter using pulsed modulation by the duty cycle just measured to determine the average detector field strength of that emission for comparison to the average detector limit.

   Please refer to the plots in next page for duty cycle.

Other data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dBμV of specification limits), and are distinguished with a "**Qp**" in the data table.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RL -20.0dBm
10dB/
ΔMKR .84dB
71.50ms
EZKEY
EGRO
ΔMKR
71.50 ms
.84 dB
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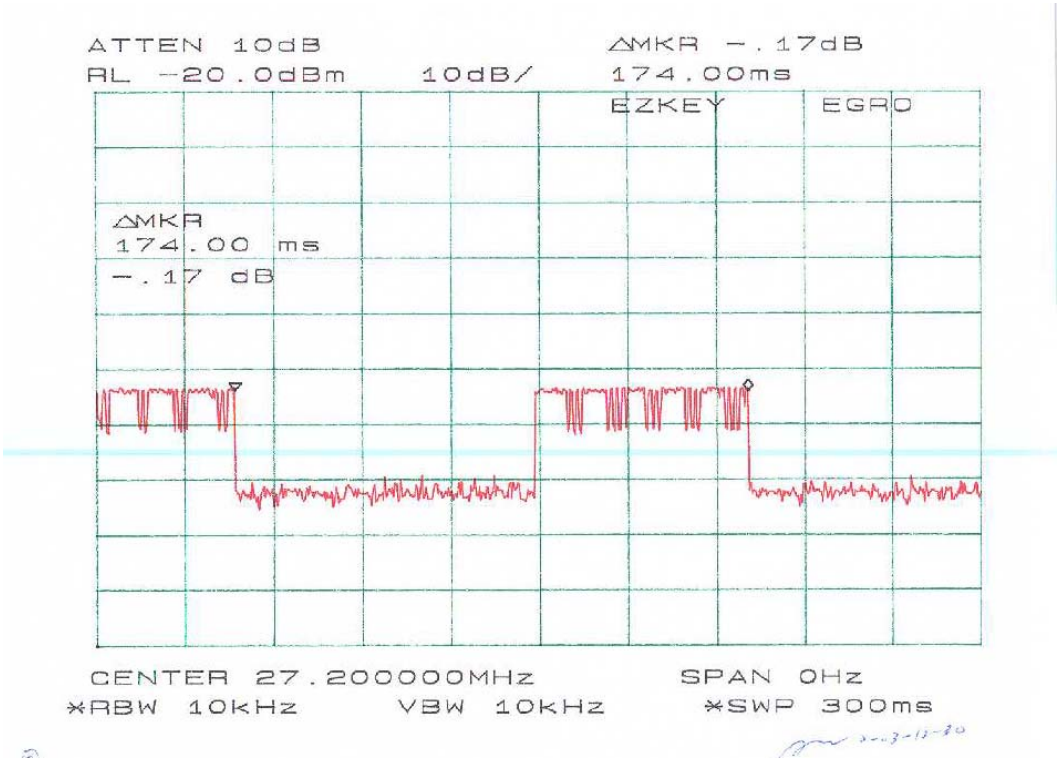
SPAN 0Hz
*RBW 10kHz
VBW 10kHz
*SWP 300ms


ATTEN 10dB
RL -20.0dBm
10dB/
ΔMKR -.17dB
174.00ms
EZKEY
EGRO
ΔMKR
174.00 ms
-.17 dB
CENTER 27.200000MHz
SPAN 0Hz
*RBW 10kHz
VBW 10kHz
*SWP 300ms

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBµV means the emission is 7dBµV below the maximum limit for applicable limits. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Applicable Limit

Summary of Test Results

According to the final data in section 4.7, the EUT complied with the FCC 15.227 and FCC 15.209 standards, and had the worst margin of:

-69.42 dB at **54.40 MHz** in the **Vertical** polarization

Radiated Emissions Test Result Data

Environmental Conditions

Temperature:	15°C
Relative Humidity:	48%
ATM Pressure:	1100mbar

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE		FCC SUBPART C	
Frequency	Ampl.	Angle	Height	Polar	Antenna	Cable	Amp.	Corr. Ampl.	Factor	Limit	Margin
MHz	dBµV/m	Degree	Meter	H/ V	dBµV/m	dB	dB	dBµV/m	µV/m	µV/m	µV/m
54.40	47.2	210	1.6	V	10.2	1.0	28.7	29.7	30.6	100	-69.42
54.40	46.5	90	1.5	H	10.2	1.0	28.7	29.0	28.2	100	-71.78
81.60	40.7	330	1.2	V	9.50	1.2	28.8	22.6	13.5	100	-86.51
81.60	39.4	15	1.6	H	9.50	1.2	28.8	21.3	11.6	100	-88.39
161.85	33.7	0	1.5	H	12.9	1.8	28.3	20.1	10.1	150	-139.93
120.94	34.6	180	1.5	V	11.7	1.6	28.5	19.4	9.3	150	-140.70
192.43	31.2	0	1.5	H	13.7	2.1	28.2	18.8	8.7	150	-141.32
405.67	35.7	15	1.0	V	17.0	2.9	28.3	26.8	21.8	200	-178.20 Peak
459.77	33.3	30	1.0	V	18.0	3.2	28.9	25.4	18.7	200	-181.31 Peak
486.81	32.8	330	1.3	H	19.0	2.5	28.9	25.1	18.1	200	-181.95Peak
27.20	Ave = Peak * Duty cycly = 462.9*0.41 = 189.79								189.79	10000	-9768.26
27.20	Ave = Peak * Duty cycly = 275.4*0.41 = 112.91								112.91	10000	-9861.96
27.20	65.9	60	1.5	V	15.3	0.8	28.7	53.3	462.9	100000	-99537.09
27.20	61.4	30	1.2	H	15.3	0.8	28.7	48.8	275.4	100000	-99724.58

NOTES:

1) FUND: =Fundamental, AVE: = Average

2) Pulsed modulation average measurement, see page 9

The mouse transmitter was placed in continuous transmit mode for all tests.

The EUT was tested in all 3 orthogonal planes.

§15.227(b) - Out of Band Emission

The result has been complied with the 15.227(b), see the following plot: