

FCC PART 15 SUBPART C EMI MEASUREMENT AND TEST REPORT

For

Eastern Times Technology Co., Ltd

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Futian District, Shenzhen, China 518031

FCC ID: RNKDS-2068

2003-12-02

This Report Concerns: ☒ Original Report	Equipment Type: Mini RF Wireless Optical Mouse
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Report No.: R0311122(T)	
Test Date: 2003-11-14	
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *Eastern Times Technology Co., Ltd* 's product, model *DS-2068* or the "EUT" as referred to in this report is a Mini RF Wireless Optical Mouse, transmitter part. The EUT is measured approximately 3.5" L x 1.9" W x 1.25" H.

** The test data gathered are from production sample, serial number: B0001, provided by the manufacturer.*

1.2 Objective

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

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

1.3 Related Submittal(s)/Grant(s)

No Related Submittals.

1.4 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.

1.5 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.

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

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

2.2 Schematics and Block Diagram

Please refer to Appendix D.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Test Setup Configuration

Test Setup for Transmitter



EUT

3 - SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§ 15.203	Antenna requirement	Compliant
§ 15.227 (b)	Occupied Bandwidth	Compliant
§ 15.205 § 15.209 § 15.227 (a)	Restricted Band Radiated Emission Field Strength	Compliant

4 - RADIATED EMISSIONS TEST

4.1 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.

4.2 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.

The spacing between the peripherals was 10 cm.

External I/O cables are draped over edge of test table or bundled as required.

The notebook PC was connected to a 120Vac/60Hz power source.

4.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33, the EUT was tested to 1000 MHz.

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

Start Frequency	27 MHz
Stop Frequency	1000 MHz
Sweep Speed	Auto
IF Bandwidth.....	100 kHz
Video Bandwidth	100kHz
Quasi-Peak Adapter Bandwidth.....	120 kHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth.....	100kHz

4.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8568B	2601A02165	2004-01-07
HP	Amplifier	8447E	2944A10187	2004-09-23
HP	Quasi-Peak Adapter	85650A	3019A05393	2004-06-13
EMCO	Biconical Antenna	3110B	9309-1165	2004-10-11
EMCO	Log Periodic Antenna	3146	2101	2004-10-11

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

4.5 Test Procedure

For the radiated emissions test, the power cord of the host system and all support equipment were connected to the AC floor outlet.

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

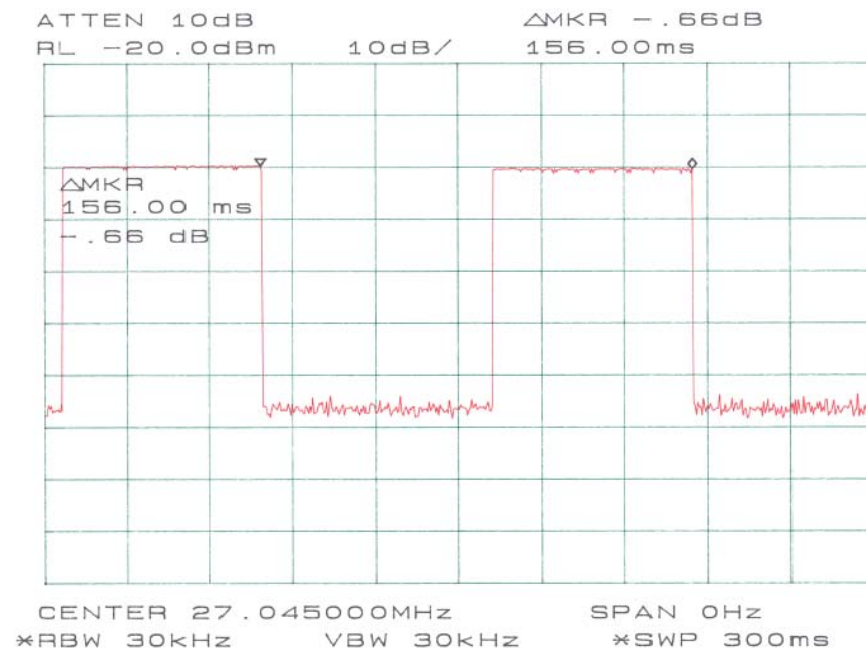
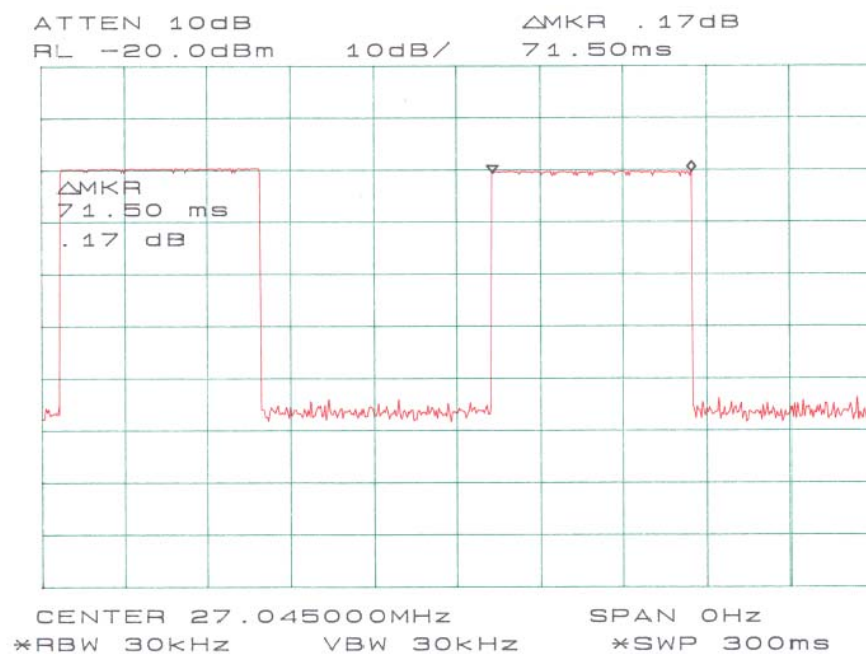
According to ANSI C63.4-2001 Annex I.4, when average detector function limits are specified for a pulse-modulated transmitter, the average level of emission may be found by measuring the peak level of the emissions and correcting them with the duty cycle as follows:

- 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 = $Tx\ on / (Tx\ on + Tx\ off) = 71.5 / 156 = 45.8\%$
- 5) Multiply the peak-detector field strength (expressed in $\mu V/m$) 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.

Example: Ave = $54.6 \times 45.8\% = 25.068\ dBm$

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 $-4\ dB\mu V$ of specification limits), and are distinguished with a "Qp" in the data table.



4.6 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:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB μ V means the emission is 7dB μ V below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

4.7 Summary of Test Results

According to the final data in section 4.8, the EUT complied with the FCC 15.227 and FCC 15.209 standards, and had the worst margin of:

-11.5 dB at 54.090 MHz in the Vertical polarization, 27-1000MHz, 3 meters, transmitter

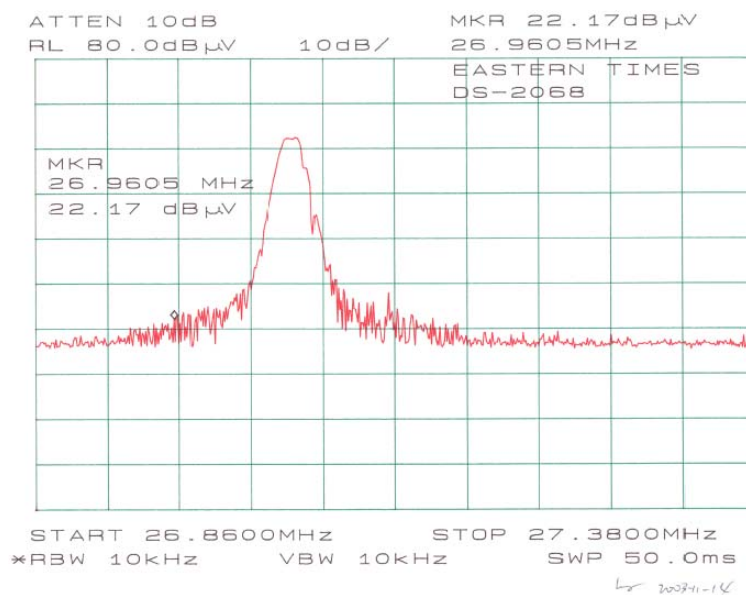
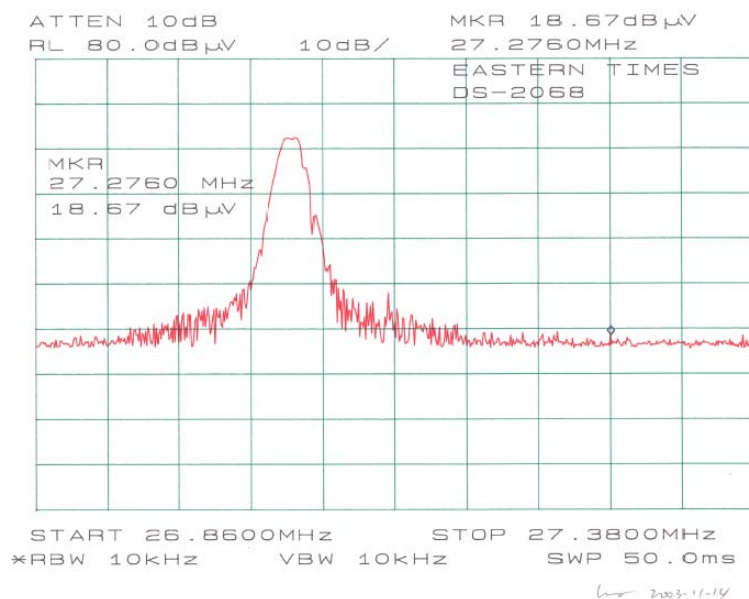
4.8 Radiated Emissions Test Result Data

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC SUBPART C		Comments
Frequency MHz	Ampl. dB μ V/m	Angle Degree	Height Meter	Polar H/ V	Antenna dB μ V/m	Cable dB	Amp. dB	Corr. Ampl. dB μ V/m	Limit dB μ V/m	Margin dB	
Transmitter											
54.090	42.3	270	1.4	v	10.2	1.0	25.0	28.5	40	-11.5	peak
54.090	42.0	60	1.8	h	10.2	1.0	25.0	28.2	40	-11.8	peak
81.135	41.5	330	1.3	v	9.5	1.2	25.0	27.2	40	-12.8	peak
81.135	39.7	90	1.2	h	9.5	1.2	25.0	25.4	40	-14.6	peak
189.320	36.8	0	1.6	h	13.5	2.0	25.0	27.3	43.5	-16.2	peak
162.270	33.9	30	1.2	v	12.9	1.8	25.0	23.6	43.5	-19.9	peak
110.000	35.7	45	1.4	v	11.3	1.5	25.0	23.5	43.5	-20.0	peak
135.220	34.2	180	1.5	h	12.2	1.6	25.0	23.0	43.5	-20.5	peak
27.045	63.5	0	1.2	v	15.3	0.8	25.0	54.6	100	-45.4	Fund/Peak
27.045	62.7	30	1.6	h	15.3	0.8	25.0	53.8	100	-46.2	Fund/Peal
27.045								25.068	80	-54.932	Fund/ave
27.045								24.64	80	-55.36	Fund/ave

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

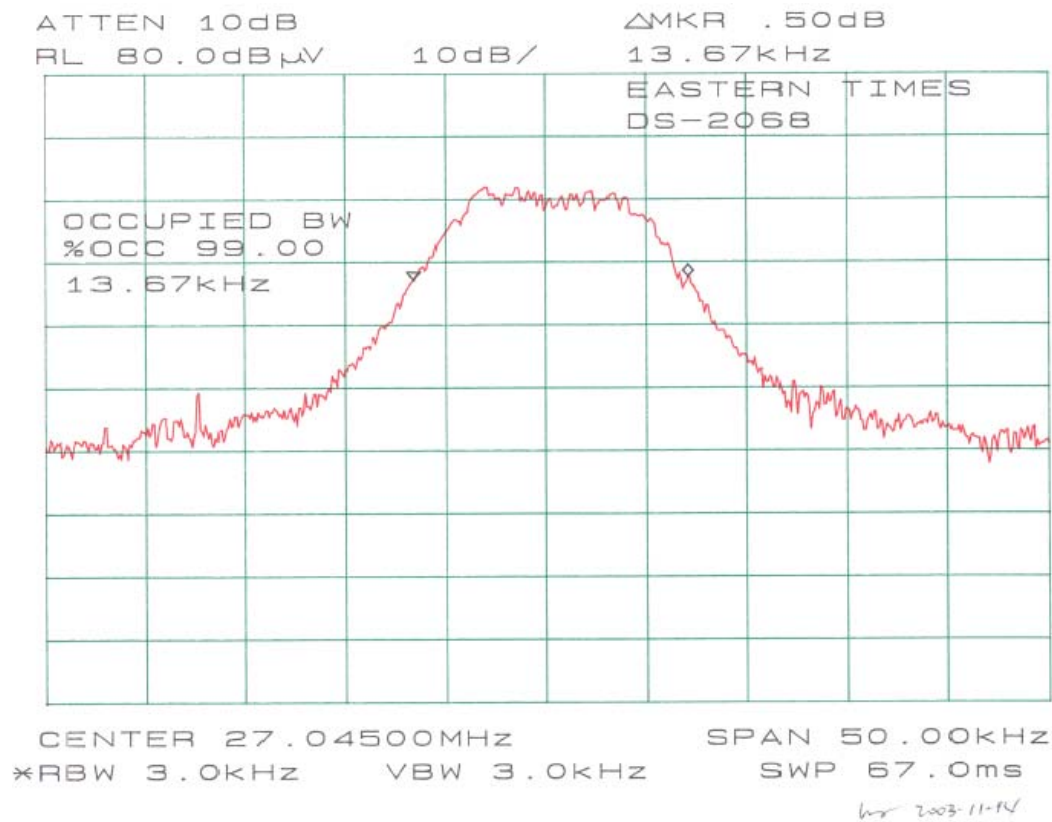
4.9 Band Edge

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



4.10 Occupied Bandwidth

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



5 - CONDUCTED EMISSIONS

Not Applicable Due to Battery Operation.