

MEASUREMENT REPORT of WIRELESS MOUSE

Applicant : Silitek Corporation
Model No. : SM-2400
EUT : Wireless Mouse
FCC ID : GYUS01SM
Report No. : S5915060

Test by :

Training Research Co., Ltd.

TEL : 886-2-26935155 FAX : 886-2-26934440

2, Lane 194, Huan-Ho Street, Hsichih, Taipei Hsien 221, Taiwan, R.O.C.

CERTIFICATION

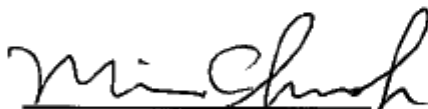
We here by verify that:

The test data, data evaluation, test procedures and equipment configurations shown in this report were made mainly in accordance with the procedures given in ANSI C63.4 (1992) as a reference. All test were conducted by *Training Research Co., Ltd.*, 2, Lane 194, Huan-Ho Street, Hsichi, Taipei Hsien 221, Taiwan, R.O.C. Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is in compliance with the technical requirements set forth in the FCC Rules Part 15 Subpart C Section 15.249.

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Prepared by:



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I. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of Applicant in support of a Cordless Telephone certification in accordance with Part 2 Subpart J and Part 15 Subpart A and C of the Commission's Rules and Regulations.

1.2 Description of EUT

EUT	:	Wireless Mouse
Model No.	:	SM-2400
FCC ID	:	GYUS01SM
Frequency Range	:	2454.40 – 2469.90 MHz
Support Channel	:	32 Channel
Power Type	:	Powered by battery: AAA size, 1.5V * 2
Applicant	:	Silitek Corporation 10F, No. 25, Tung Hwa South Rd., Taipei, Taiwan

1.3 Description of Support Equipment

PC	:	HP Brio 85xx 6/350
Model No.	:	D6928A
Serial No. :		SG91801432
FCC ID	:	N/A (Doc Approved)
檢磁	:	3872H013
Power type	:	100 ~ 230VAC / 50 ~ 60Hz, 5A, Switching
Power cord	:	Non-shielded, 2.33m long, Plastic, No ferrite core

Monitor : **HP 15' Color Monitor**
Model No. : D2827A
Serial No. : KR91161719
FCC ID : C5F7NFCMC1518X
檢磁 : 3872B039
Power type : 110 ~ 240 VAC / 50 ~ 60 Hz, Switching
Power cord : Shielded, 1.83m long, No ferrite core
Data cable : Shielded, 1.46m long, with two ferrite cores

Keyboard : **HP**
Model No. : SK-2501K
Serial No. : MR80700789
FCC ID : GYUR38SK
檢磁 : 3862A621
Power type : By PC
Data cable : Shielded, 1.73m long, with ferrite core

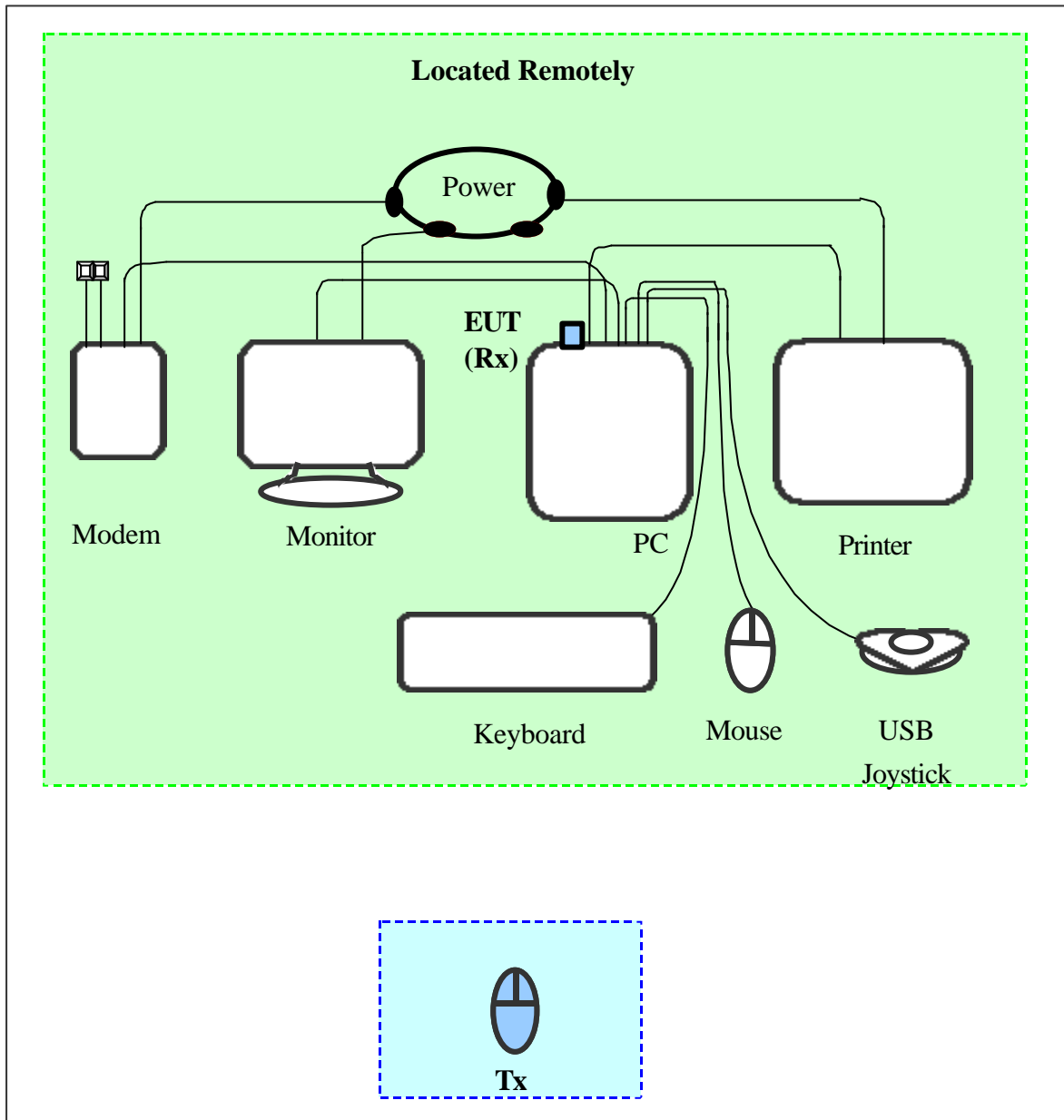
Mouse : **HP**
Model No. : M-S34
Serial No. : LZB90714106
FCC ID : DZL211029
檢磁 : 4862A011
Power type : By PC
Power cord : Non-shielded, 1.88m long, No ferrite core

Printer : **HP**
Model No. : C2184A
Serial No. : SG55T1P1KY
FCC ID : N/A, Doc Approved
Power type : Linear
Power cord : Non-shielded, 1.90m long, No ferrite core
Data cable : Shielded, 1.8m long, No ferrite core

Modem : **ACEEX**
Model No. : XDM41414
Serial No. : 964111217
FCC ID : IFAXDM1414
Power type : Linear
Power cord : Non-shielded, 1.9m long, No ferrite cord
Data cable : RS232, Shielded, 1.2m long, No ferrite core
RJ11C x 2, 7' long non-shielded, No ferrite core

USB Joystick : **Padix**
Model No. : QF-305U
Serial No. : 8100848
FCC ID : N/A, Doc Approval
Power type : Powered by PC
Power Cable : Shielded, 1.5m long, No ferrite bead data cable

1.4 Configuration of System Under Test



Connections:

Put two AAA size, 1.5V battery into the battery cell of EUT, powers the subject device.
The EUT does not be connected with any product.

1.5 Test Procedure

All measurements contained in this report were performed mainly according to the techniques described in Measurement procedure ANSI C63.4 (1992).

1.6 Location of the Test Site

The radiated emissions measurements required by the rules were performed on the **three-meter, Anechoic Chamber (Registration Number: 93906)** maintained by *Training Research Co., Ltd.* 1F., No. 2, Lane 194, Huan-Ho Street, Hsichih, Taipei Hsien 221, Taiwan, R.O.C. Complete description and measurement data have been placed on file with the commission. The conducted power line emissions tests and other test items were performed in a anechoic chamber also located at Training Research Co., Ltd. 1F, No. 2, Lane 194, Huan-Ho Street, Hsichih, Taipei Hsien 221, Taiwan, R.O.C. *Training Research Co., Ltd.* is listed by the FCC as a facility available to do measurement work for others on a contract basis.

1.7 General Test Condition

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests was chosen as that which produced the highest emission levels. However, only those conditions which the EUT was considered likely to encounter in normal use were investigated.

In test, the base and handset are tested separately. They were set in Ch00, Ch16 and Ch31 of EUT and continuously transmitting mode that controlled by test mode of EUT.

II. Conducted Emissions Measurements

2.1 Test Condition & Setup

The power line conducted emission measurements were performed in an anechoic chamber. The EUT was assembled on a wooden table, which is 80 centimeters high, was placed 40 centimeters from the backwall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and Line Impedance Stabilization Networks (LISNs). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer (or EMI receiver) was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPER quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 450 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in test result.

2.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	<u>Calibration Date</u>	
				Last time	Next time
EMI Receiver	8546A	H P	3520A00242	10/01/00	10/01/01
RF Filter Section	85460A	H P	3448A00217	10/01/00	10/01/01
LISN (EUT)	LISN-01	TRC	9912-03,04	12/09/00	12/09/01
LISN (Support E.)	LISN-01	TRC	9912-05	01/04/01	01/04/02
Switch/Control Unit (< 30MHz)	3488A	HP	N/A	11/20/00	11/20/01
Auto Switch Box (< 30MHz)	ASB-01	TRC	9904-01	11/20/00	11/20/21

Test Result: N/A

. Radiated Emissions Measurements

3.1 Test Condition & Setup

The EUT was placed in a anechoic chamber and scanned at 3 meter distance to determine its emission characteristics. The physical arrangement of the EUT was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude, directivity, and frequency. The exact system configuration, which produced the highest emissions was noted so it could be reproduced later during the final tests. This was done to ensure that the final measurements would demonstrate the worst-case interference potential of the EUT.

Final radiation measurements were made on a three-meter, anechoic chamber. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter.

The spectrum was examined from 30MHz to 1000MHz using an Hewlett Packard 8546A & 85460A EMI Receiver, SCHAFFNER whole range Bi-Log antenna (Model No.: CBL6141A) is used to measure frequency from 30 MHz to 1GHz. The final test is used the spectrum HP 8546A & 85460A and spectrum was examined from 1 GHz to 24 GHz using an Hewlett Packard 8564E Spectrum Analyzer, EMCO Horn Antenna for 1G to 24 G Hz.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. There are two spectrum analyzers use on this testing , HP 8546A & 85460A for frequency 30MHz to 1000MHz, and 8564E for frequency 1 GHz to 24 GHz. No post-detector video filters were used in the test. The spectrum analyzer's 6 dB bandwidth was set to 120 KHz (spectrum was examined from 30 MHz to 1000 MHz), the spectrum analyzer's 6 dB bandwidth was set to 1 MHz (spectrum was examined from 1 GHz to 24 GHz) and the analyzer was operated in the maximum hold mode.

The actual field intensity in decibels referenced to 1 microvolt per meter ($\text{dB } \mu\text{V/m}$) is determined by algebraically adding the measured reading in $\text{dB } \mu\text{V}$, the antenna factor (dB), and cable loss (dB) at the appropriate frequency.

For frequency between 30MHz to 1000MHz
$$F_{Ia} \text{ (dBuV/m)} = F_{Ir} \text{ (dBuV)} - \text{Correction Factors}$$
F_{Ia} : Actual Field IntensityF_{Ir} : Reading of the Field Intensity

Correction Factor = Antenna Factor + (Cable Loss – Amplitude Gain)

For frequency between 1GHz to 24GHz
$$F_{Ia} \text{ (dBuV/m)} = F_{Ir} \text{ (dBuV)} + \text{Correction Factor}$$
F_{Ia} : Actual Field IntensityF_{Ir} : Reading of the Field Intensity

Correction Factors = Antenna Factor + Cable Loss – Amplifier Gain

3.2 List of Test Instruments

<u>Instrument Name</u>	<u>Model No.</u>	<u>Brand</u>	<u>Serial No.</u>	<u>Calibration Date</u>	
				<u>Last time</u>	<u>Next time</u>
EMI Receiver	8546A	H P	3520A00242	10/01/00	10/01/01
RF Filter Section	85460A	H P	3448A00217	10/01/00	10/01/10
Bi-log Antenna	CBL6141A	Schaffner	4151	07/04/00	07/04/01
Switch/Control Unit	3488A	HP	N/A	11/20/00	11/20/01
(> 30MHz)					
Auto Switch Box	ASB-01	TRC	9904-01	11/20/00	11/20/01
(> 30MHz)					
Spectrum Analyzer	8564E	HP	US36433002	08/03/00	08/03/01
Microwave Preamplifier	83051A	HP	3232A00347	08/04/00	08/04/01
Horn Antenna	3115	EMCO	9704 – 5178	08/09/00	08/09/01
Horn Antenna	3160-09	EMCO	961505-003	08/09/00	08/09/01

3.3 Test Configuration of Radiated Emission



Picture 1 Front View of the Test Configuration



Picture 2 Rear View of the Test Configuration

The test configuration for frequency between 1GHz to 24GHz is same as above.

3.4 Test Result of Radiated Emissions

The peak values of fundamental emissions from the EUT at various antenna heights, antenna polarization, EUT orientation, etc. are recorded on the following.

Model No. : SM-2400
EUT : Wireless Mouse

Open Field Fundamental Emissions

Channel	Frequency (GHz)	A.P. (H/V)	A.H. (m)	Table (degree)	Amplitude (Peak) (dB μ V/m)	Limit (dB μ V)	Margin (dB μ V)
00	2.4544	H	1.00	317	68.30	94.00	-25.70
		V	1.00	198	71.13	94.00	-22.87
16	2.4624	H	1.00	9	68.47	94.00	-25.53
		V	1.00	105	71.30	94.00	-22.70
31	2.4699	H	1.00	188	67.47	94.00	-26.53
		V	1.00	55	71.63	94.00	-22.37

Note:

1. A. P. means antenna polarization, horizontal and vertical.
2. A. H. means antenna height.
3. Table means turntable turning position.
4. Amplitude means the fundamental emission measured.
5. Margin = Amplitude-limit

3.5 Test Result of Spurious Radiated Emissions

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation, etc. are recorded on the following.

Model No. : SM-2400
FCC ID : GYUS01SM

Table 1 Open Field Radiated Emissions for 30MHz ~ 1GHz [Channel 0, Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dB μ V/m)	Ant. H. (m)	Table (°)			Limit (dB μ V/m)	Margin (dB)

***The emissions of EUT are all under the limits more than 20dB in Chamber.**

Table 2 Open Field Radiated Emissions for 1GHz ~ 24GHz [Channel 0, Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)	FCC Class B (3 m)	
Frequency (GHz)	Amplitude (dB μ V/m)	Ant. H. (cm)	Table (°)			Limit (dB μ V/m)	Margin (dB)
4.908	36.06	100.00	219	3.91	39.97	54.00	-14.03

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor = Corrected

Table 4 Open Field Radiated Emissions for 1GHz ~ 24GHz [Channel 0, Vertical]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)	FCC Class B (3 m)	
Frequency (GHz)	Amplitude (dB μ V/m)	Ant. H. (cm)	Table (°)			Limit (dB μ V/m)	Margin (dB)
4.908	43.39	100.00	69	3.91	47.30	54.00	-6.70

Table 5 *Open Field Radiated Emissions for 30MHz ~ 1GHz [Channel 16, Horizontal]*

[illegible]

***The emissions of EUT are all under the limits more than 20dB in Chamber.**

Table 6 Open Field Radiated Emissions For 1GHz ~ 24GHz [Channel 16, Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)	FCC Class B (3 m)	
Frequency (GHz)	Amplitude (dB μ V/m)	Ant. H. (cm)	Table (°)			Limit (dB μ V/m)	Margin (dB)
4.924	38.22	100.00	269	3.91	42.13	54.00	-11.87

Table 7 Open Field Radiated Emissions for 30MHz ~ 1GHz [Channel 16, Vertical]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dB μ V/m)	Ant. H. (m)	Table (°)			Limit (dB μ V/m)	Margin (dB)

***The emissions of EUT are all under the limits more than 20dB in Chamber.**

Table 8 Open Field Radiated Emissions for 1GHz ~ 24GHz [Channel 16, Vertical]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)	FCC Class B (3 m)	
Frequency (GHz)	Amplitude (dB μ V/m)	Ant. H. (cm)	Table (°)			Limit (dB μ V/m)	Margin (dB)
4.924	41.56	100.00	347	3.91	45.47	54.00	-8.53

Table 9 Open Field Radiated Emissions for 30MHz ~ 1GHz [Channel 31, Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dB μ V/m)	Ant. H. (m)	Table (°)			Limit (dB μ V/m)	Margin (dB)

***The emissions of EUT are all under the limits more than 20dB in Chamber.**

Table 10 Open Field Radiated Emissions For 1GHz ~ 24GHz [Channel 31, Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)	FCC Class B (3 m)	
Frequency (GHz)	Amplitude (dB μ V/m)	Ant. H. (cm)	Table (°)			Limit (dB μ V/m)	Margin (dB)
4.939	37.22	100.00	55	3.91	41.13	54.00	-12.87

Table 12 Open Field Radiated Emissions for 1GHz ~ 24GHz [Channel 31, Vertical]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)	FCC Class B (3 m)	
Frequency (GHz)	Amplitude (dB μ V/m)	Ant. H. (cm)	Table (°)			Limit (dB μ V/m)	Margin (dB)
4.939	41.89	100.00	121	3.91	45.80	54.00	-8.20

. Verify Frequencies and Channels

This is for sure that all frequencies are in 2454.40MHz to 2469.90MHz that verifies the frequency as follow

Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2454.40	16	2462.40
01	2454.90	17	2462.90
02	2455.40	18	2463.40
03	2455.90	19	2463.90
04	2456.40	20	2464.40
05	2456.90	21	2464.90
06	2457.40	22	2465.40
07	2457.90	23	2465.90
08	2458.40	24	2466.40
09	2458.90	25	2466.90
10	2459.40	26	2467.40
11	2459.90	27	2467.90
12	2460.40	28	2468.40
13	2460.90	29	2468.90
14	2461.40	30	2469.40
15	2461.90	31	2469.90

Appendix A

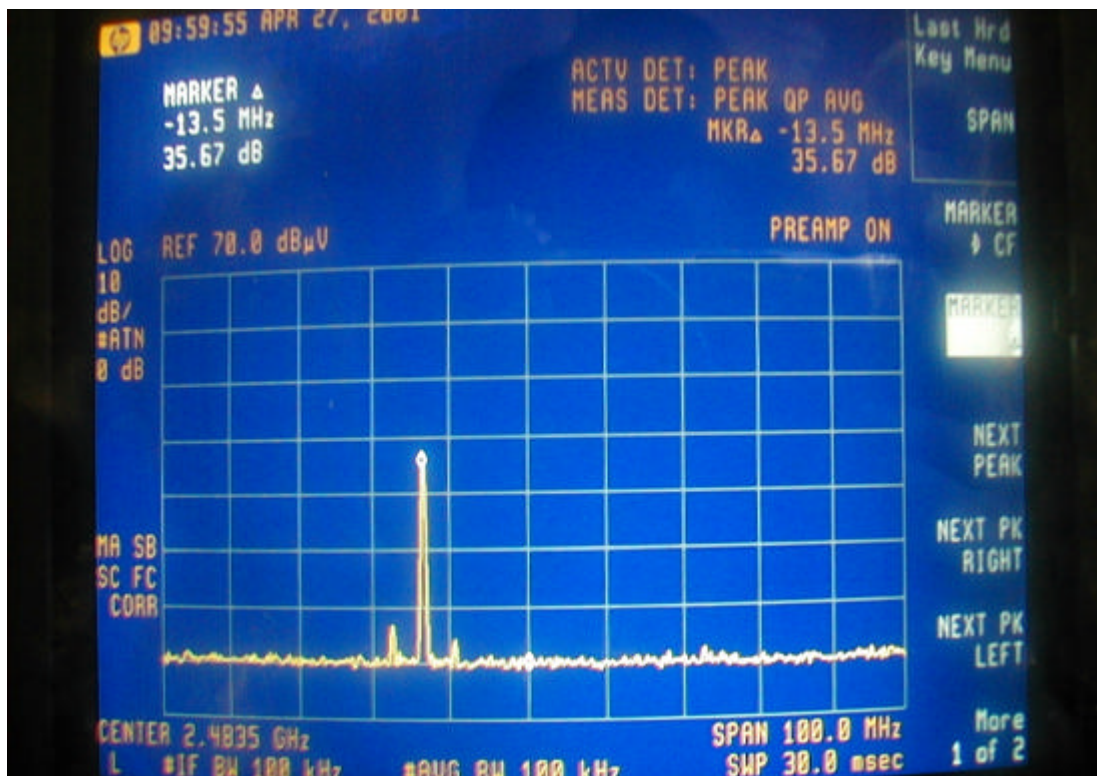
The antenna of the device is solder inside the device, the user can not remove it freely without any tools from outside the device. This is comply with the FCC rules part 15.203

Appendix B

§ 15.245 (b)(3) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

See as next page.

CH 0



CH 31

