MEASUREMENT REPORT
of
FIRESTORM
WIRELESS GAMEPAD

Applicant	**:**	Thrustmaster S.A.
Model No.	**:**	2970022, 2969061, 2969064
EUT	**:**	FIRESTORM WIRELESS GAMEPAD
FCC ID	**:**	PU4FSWIRELESS
Report No.	**:**	C3115525

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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Test Date	:	August 21, 2001

Prepared by: *MIRO CHUEH* **Approved by:** *FRANK TSAI*

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Tables of Contents

TABLES

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	**:**	Firestorm Wireless Gamepad
Model No.	**:**	2970022, 2969061, 2969064
FCC ID	**:**	PU4FSWIRELESS
Frequency Range	**:**	910.20 – 912.70 MHz
Support Channel	**:**	4 Channel
Power Type	**:**	Powered by battery: AAA size, 1.5V * 2
Applicant	**:**	Thrustmaster S.A. BP2 – La Gacilly Cedex – 56204, FRANCE

1.3 Description of Support Equipment

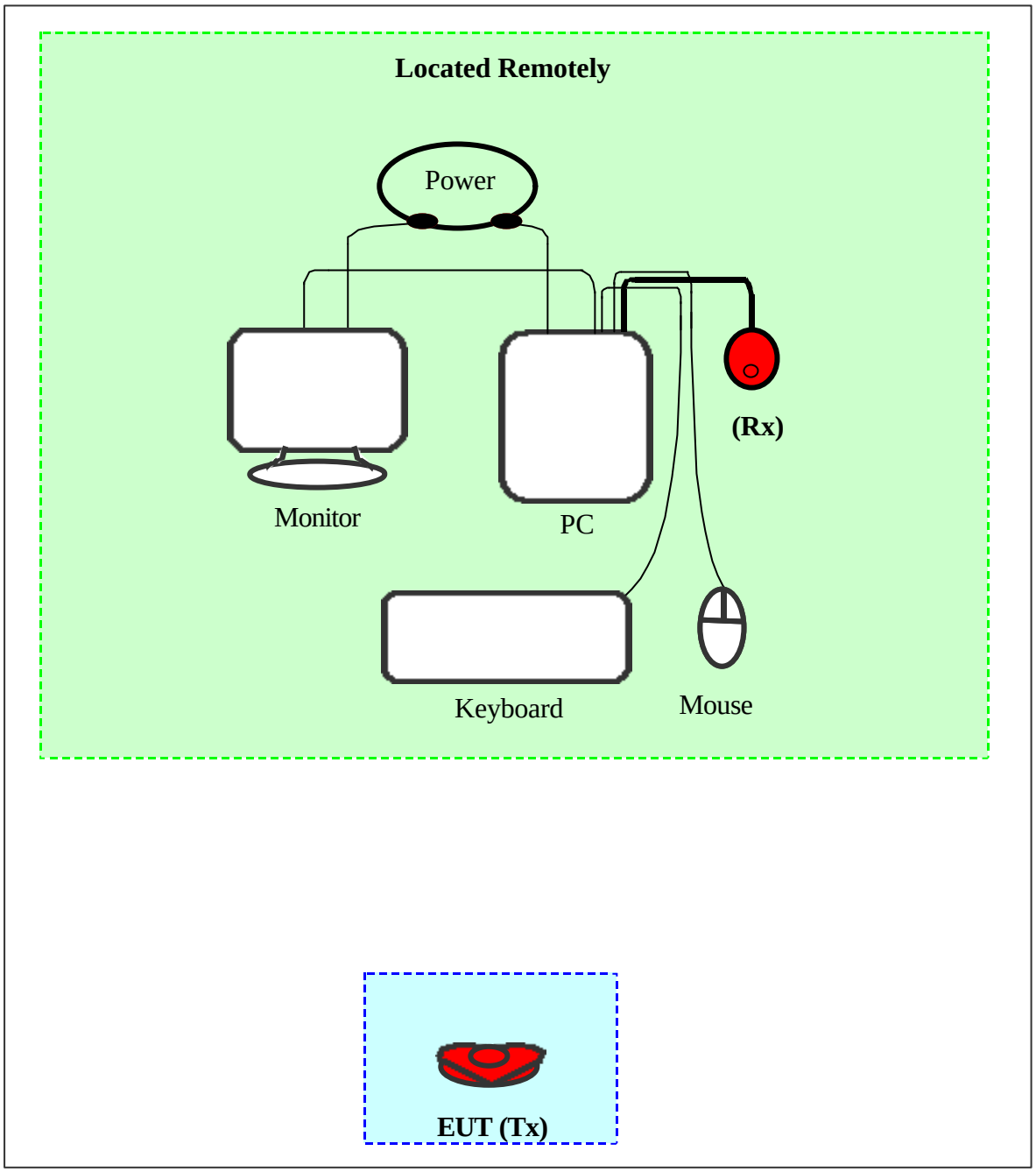
PC	**:**	**HP Brio 85xx 6/350**
Model No.	:	D6928A
Serial No.	:	SG91801432
FCC ID	:	N/A (Doc Approved)
檢磁	:	3872H013
Power type	:	100 ~ 230VAC / 50 ~ 60Hz, 5A, Switching
Power cord	:	Non-shielded, 2.33m long, Plastic, No ferrite core

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

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, Hsi-chih, 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 an 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 were chosen as that which produced the highest emission levels. However, only those conditions that 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 Ch1 (912.70MHz) and Ch2 (910.20MHz) 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

				Calibration Date	
Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	06/29/01	06/29/02
RF Filter Section	85460A	H P	3448A00217	06/29/01	06/29/02
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	11/20/01

2.3 Test Result: N/A

Ⅲ. Radiated Emissions Measurements

3.1 Test Condition & Setup

The EUT was placed in an 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 emission 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. A nonconductive material surrounded the EUT to supporting the EUT for standing on **three orthogonal planes**. At each condition, 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 polarizations.

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 (dBμV/m) is determined by algebraically adding the measured reading in dBμV, the antenna factor (dB), and cable loss (dB) at the appropriate frequency.

For frequency between 30MHz to 1000MHz

FIa (dBuV/m) = FIr (dBuV) – Correction Factors

FIa : Actual Field Intensity

FIr : Reading of the Field Intensity

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

For frequency between 1GHz to 24GHz

FIa (dBuV/m) = FIr (dBuV) + Correction Factor

FIa : Actual Field Intensity

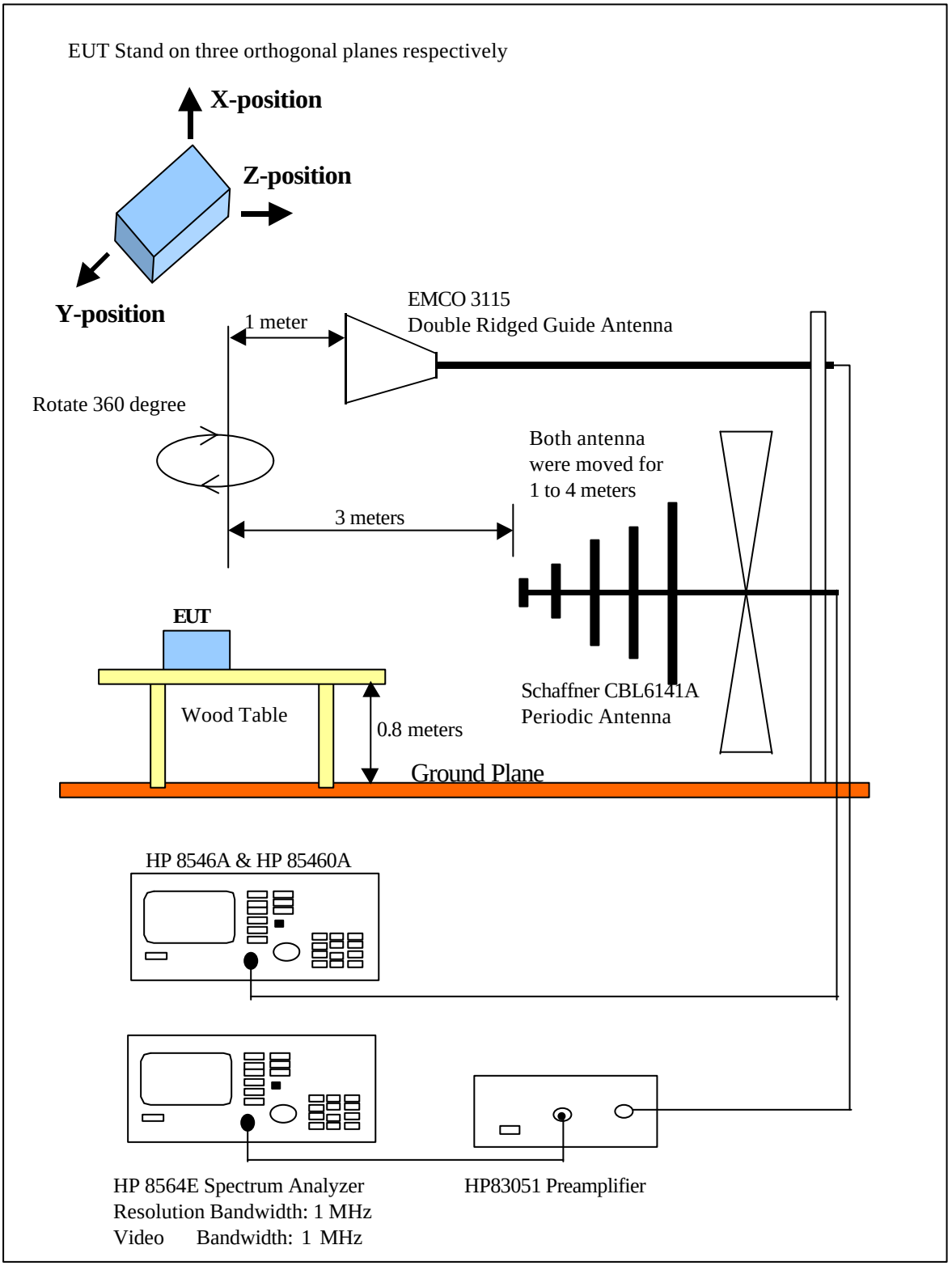
FIr : Reading of the Field Intensity

Correction Factors = Antenna Factor + Cable Loss – Amplifier Gain

3.2 List of Test Instruments

				Calibration Date	
Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	06/29/01	06/29/02
RF Filter Section	85460A	H P	3448A00217	06/29/01	06/29/02
Bi-log Antenna	CBL6141A	Schaffner	4206	03/09/01	03/09/02
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	11/20/01
Spectrum Analyzer	8564E	HP	US36433002	08/01/01	08/01/02
Microwave Preamplifier	83051A	HP	3232A00347	08/01/01	08/01/02
Horn Antenna	3115	EMCO	9704 – 5178	08/01/01	08/01/02
Anechoic Chamber (cable calibrated together)				05/20/01	05/20/02

3.3 Test Instruments Configuration



3.4 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 18GHz is same as above.

3.5 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.

EUT : FIRESTORM WIRELESS GAMEPAD

FCC ID : PU4FSWIRELESS

Open Field Fundamental Emissions

Channel	Frequency (GHz)	A.P. (H/V)	A.H. (m)	Table (degree)	Amplitude (Peak) (dBμV/m)	Limit (dBμV)	Margin (dBμV)
1	912.70	H	1.00	109	71.72	94.00	-22.28
		V	1.00	94	66.50	94.00	-27.50
2	910.20	H	1.00	20	72.31	94.00	-21.69
		V	1.00	122	64.78	94.00	-29.22

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

3.6 Test Result of Spurious Radiated Emissions

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

Table 1 Radiated Emissions for 30MHz to 1GHz [Horizontal, channel 1]

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

Table 2 Radiated Emissions for 30MHz to 1GHz [Vertical, channel 1]

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

Note:

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

Table 3 Radiated Emissions for 30MHz to 1GHz [Horizontal, channel 2]

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

Table 4 Radiated Emissions for 30MHz to 1GHz [Vertical, channel 2]

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

Note:

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

Table 5 Radiated Emissions for 1GHz to 18GHz [Horizontal, channel 1]

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3 M)	
Frequency (GHz)	Amplitude (dBμV/m)	Ant. H. (cm)	Table (°)	(dB)	***Peak*** (dBμV/m)	***Average*** (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1.815	50.14	1.00	354	-8.67	41.47	---	74.00	-32.53
*2.725	47.47	1.00	115	-6.84	40.63	---	54.00	-13.37

Table 6 Radiated Emissions For 1GHz to 18GHz [Vertical, channel 1]

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3 M)	
Frequency (GHz)	Amplitude (dBμV/m)	Ant. H. (cm)	Table (°)	(dB)	***Peak*** (dBμV/m)	***Average*** (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1.815	48.97	1.00	46	-8.67	40.30	---	74.00	-33.70
*2.725	49.14	1.00	174	-6.84	42.30	---	54.00	-11.70

Note:

1. Margin = Corrected – Limit.
2. Peak Amplitude + Correction Factor = Corrected
3. The " * " means restricted bands

Table 7 Radiated Emissions for 1GHz to 18GHz [Horizontal, channel 2]

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3 M)	
Frequency (GHz)	Amplitude (dBμV/m)	Ant. H. (cm)	Table (°)	(dB)	***Peak*** (dBμV/m)	***Average*** (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1.821	48.14	1.00	94	-8.67	39.47	---	74.00	-34.53
*2.731	47.81	1.00	261	-6.84	40.97	---	54.00	-13.03

Table 8 Radiated Emissions For 1GHz to 18GHz [Vertical, channel 2]

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3 M)	
Frequency (GHz)	Amplitude (dBμV/m)	Ant. H. (cm)	Table (°)	(dB)	***Peak*** (dBμV/m)	***Average*** (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1.821	47.97	1.00	276	-8.67	39.30	---	74.00	-34.70
*2.731	47.14	1.00	49	-6.84	40.30	---	54.00	-13.70

V. Verify Frequencies and Channels

This is for sure that all frequencies are in 910.20MHz to 912.70MHz that verifies the frequency as follow

Transmitter			
Channel	Frequency	SW1	SW2
1	912.70 MHz	2	1
2	910.20 MHz	1	2
3	910.70 MHz	1	1
4	912.20 MHz	2	2

Appendix A

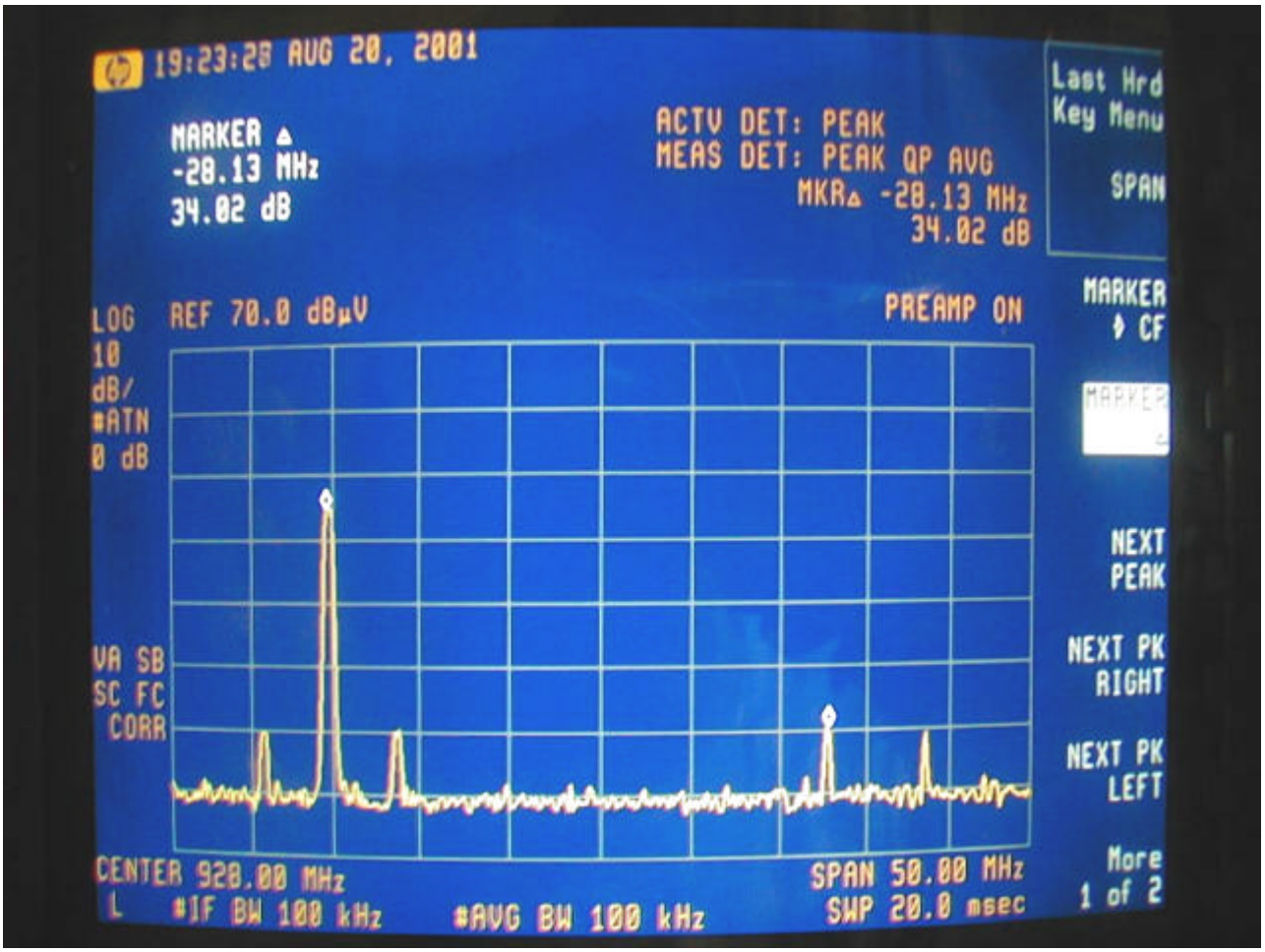
The antenna of the device is solder inside the device, the user can not remove it freely without any tools from outside the device. This is comply with the FCC rules part 15.203

Appendix B

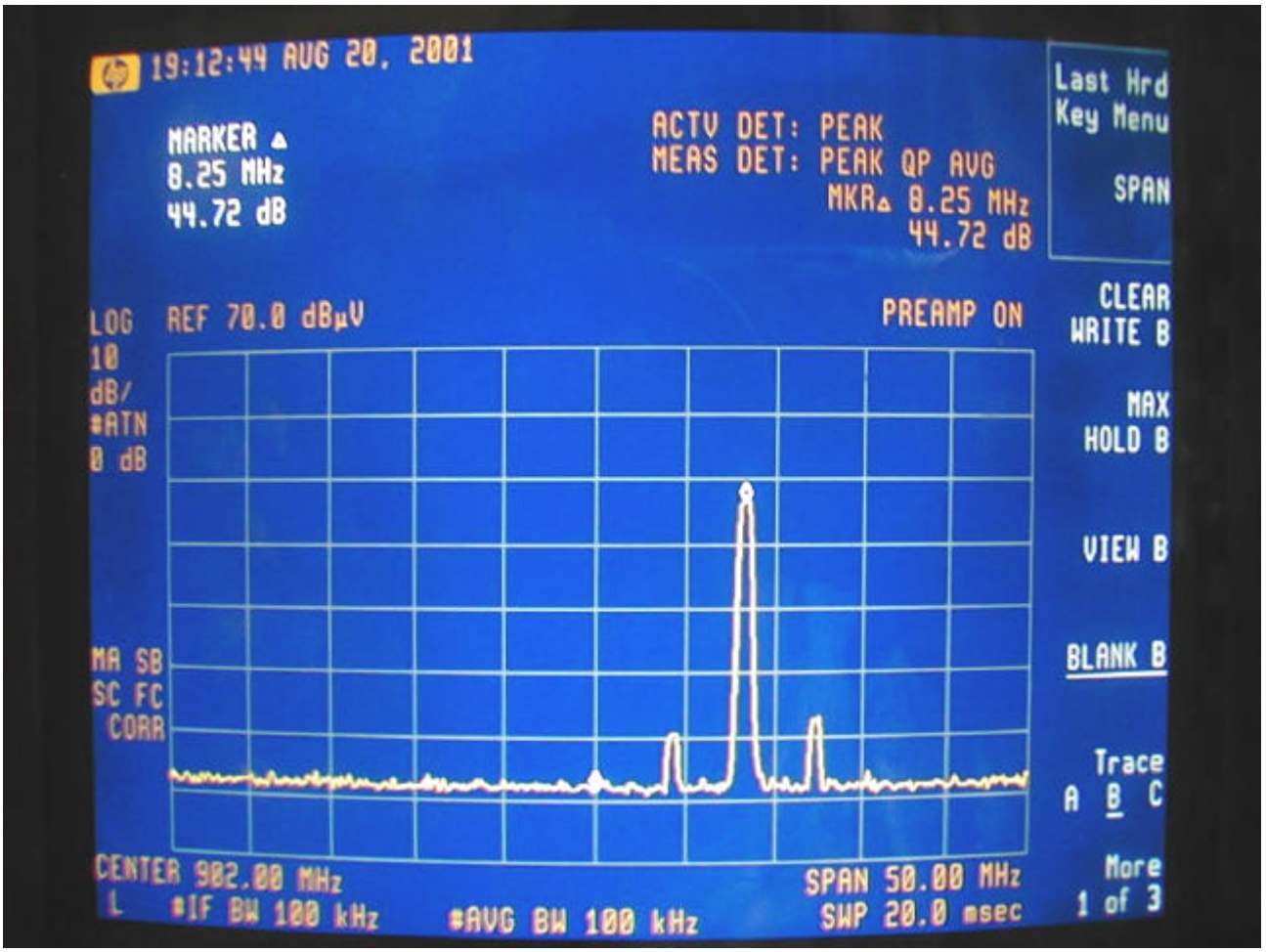
§ 15.245 (b)(3) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

See as next page.

CH 1


19:23:28 AUG 20, 2001
MARKER Δ
-28.13 MHz
34.02 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ -28.13 MHz
34.02 dB
Last Hrd Key Menu
SPAN
LOG
10
dB/
#ATN
0 dB
REF 70.0 dBμV
PREAMP ON
MARKER → CF
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
VA SB
SC FC
CORR
CENTER 920.00 MHz
#IF BW 100 kHz
#AVG BW 100 kHz
SPAN 50.00 MHz
SWP 20.0 msec

CH 2


19:12:44 AUG 20, 2001
MARKER ▲
8.25 MHz
44.72 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR▲ 8.25 MHz
44.72 dB
Last Hrd Key Menu
SPAN
LOG
10
dB/
#ATN
0 dB
REF 70.0 dBµV
PREAMP ON
CLEAR WRITE B
MAX HOLD B
VIEW B
BLANK B
MA SB
SC FC
CORR
Trace
A B C
CENTER 902.00 MHz
#IF BW 100 kHz
#AVG BW 100 kHz
SPAN 50.00 MHz
SWP 20.0 msec
More
1 of 3