RFI / EMI TEST REPORT

APPLICANT : EVERSPRING INDUSTRY CO., LTD.

E U T Type : D.S.S. Wireless Hands-free Kit (Earphone set)

MODEL NO. : FE004

FCC ID : FU5FE004

REGULATION : CFR 47 , Part 15 Subpart C , **Class B**

TEST SITE : PEP Testing Laboratory

TEST ENGINEER : Jason Gong

TEST DATE : 05-29-2001

ISSUED DATE : 06-13-2001

REPORT NO. : E900429

VERIFICATION

WE HEREBY VERIFY THAT:

The EUT listed below has completed RFI testing by PEP Testing Laboratory and it does comply with the limitation of FCC Part 15, Section 15.247 limitations .

The tested configurations and the facility complies with the radiated and AC line conducted test site criteria in ANSI C63 . 4 - 1992 .

Any data in this RFI report is **“ reference “** only .

APPLICANT : EVERSPRING INDUSTRY CO., LTD. *
PRODUCT : D.S.S. Wireless Hands-free Kit for Earphone set *
FCC ID : FU5FE004 *
MODEL : FE004 *

M. Y. TSUI / President

PEP Testing Laboratory
12-3FL., NO. 27-1, Lane 169, Kang-Ning St.,
Hsi-Chi, Taipei Hsien, Taiwan, R. O. C.
TEL : 886-2-6922097 FAX : 886-2-6956236

FCC ID : FU5FE004

TABLE OF CONTENTS

FCC ID ： FU5FE004

I. General Information

The EUT is Earphone set model FE004 of DIGITALKI Wireless Hands-free kit system, it is a very low power communication device and defined as a direct sequence spread spectrum intentional radiators system employing 20 channels and operating within the 902 – 928MHz band, it does comply with the provisions of FCC Section 15.247, its complete system includes one earphone set model FE004 , one interface base unit FB004, one AC Adapter model DCU120030, one Dual-Plug charging cable, and one charger model FA004 to enhance your mobile communication. For more detail specification about the EUT, please refer to the user's manual.

1.1 Description of EUT

EUT Type : D.S.S. Wireless Hands-free Kit for Earphone set
FCC ID : FU5FE004
EUT Model No. : FE004

Frequency Range : 904.2 – 925.8 MHz
Support Channel : 20 channels
Modulation : TDMA / Spread Spectrum
Antenna Type : Comply with FCC Part 15, Section 15.203; Build-in Microphone Line , can't be removed by the user
Power Supply : a. Plug-in type AC Linear Adapter model DCU120030 input rated 120Vac 9W, output rated 12Vdc 300mA for Charger
b. DC Charger Box Model FA004, output rated 4.8Vdc for FE004
c. Li-Polymer recharging battery rated 3.6-4.5Vdc for Earphone Unit model FE004
Power Cord : Non-shielded for Charger input

1.2 Supporting Devices for EUT testing

FCC ID ： FU5FE004

No.	Subject	MFR.	Model	FCC ID	Serial No.	I/P Rating	Power Cord	Data Cable
1	PC	Asus		DoC		115V 2A	Non-shielded	N/A
2	Monitor	SAMSUNG	550S	E5XKB	DP15H8W KB10383B	AC100-240V 1.2A	Non-Shielded	Shielded, 1.5m Non-detachable
3	KB	BTC	5121W	5121WT H0110	H0260889 9	DC+5V 170mA	N/A	Shielded, 1.6m Non-detachable
4	Printer	HP	C2642E	DoC	TH926185 HY	120V 0.22A	Non-Shielded	Shielded, 1.2m Non-detachable
5	Modem	ACEEX	1414	IFAXDM 1414	9038526	120V 12W	Non-Shielded	Shielded, 1.2m Non-detachable
6	Mouse	Logitech	M-CAA43	DoC	LEE02553 536	DC+5V 2.5mA	N/A	Shielded, 1.8m Non-detachable

1.3 EUT Test Setup Configuration

A) Test Procedure: As required by ANSI C63.4 (1992)

B) Channel Verification: In order to force selection of the typical channels for testing, one special module was connected between the EUT and control PC through RS232 interface and using the driver “FCCV3V.exe” , supplied from Rockwell, under Win98 to force the channel selection by control PC, then set the EUT in high power and continuously transmitting mode for detecting the operating frequency, the test result for 20 channels is operating within 904.2 – 925.8 MHz band.

C) Measurement Procedure: As required by FCC Part15, Section 15.31(m) measurements on intentional radiators or receiver should be performed at three frequencies for operating frequency over 10MHz, one near top, one near middle and one near bottom.

D) Test Channel: Due to the support channels are 20 channels, the selected three frequencies for testing would be 904.2MHz near top for CH 1, 915MHz near middle for CH 11 and 925.8MHz near bottom for CH 20.

E) Test Mode: To comply with the FCC Part 15, Section 15.247, following tests are performed under the worst emission condition for all of the test conditions as listed below:

Test Items	FCC-15 Rules	FCC Limits	Test Condition	Test Software	Report Section
Channel Frequency	15.205		Transmitting (Tx-on)	FCCV3V.exe	1.4
Conducted EMI	15.207	< 48dBuV	Charging Mode	N/A	2.1
-6dB Bandwidth	15.247(a)(2)	> 500KHz	Transmitting (Tx-on)	FCCV3V.exe	3.1
O/P Power E.I.R.P	15.247(b)(1)	E.I.R.P. < 1W RBW=3MHz	Transmitting (Tx-on)	FCCV3V.exe	4.1
Spurious Radiated EMI	15.247(c) 15.209(a)	> 20dB RBW=.1MHz	1) Transmitting 2) Tx-on / Rx-on	1) N/A 2) FCCV3V	4.5
Carrier Frequency	15.247(d)	> 20dB RBW=0.1MHz	Transmitting (Tx-on)	N/A	5.1
Power Spectral Density	15.247(d)	E.R.P. < 8dBm RBW=3KHz	Transmitting (Tx-on)	N/A	6.1
Processing Gain	15.247(e)	> 10dB			7.1

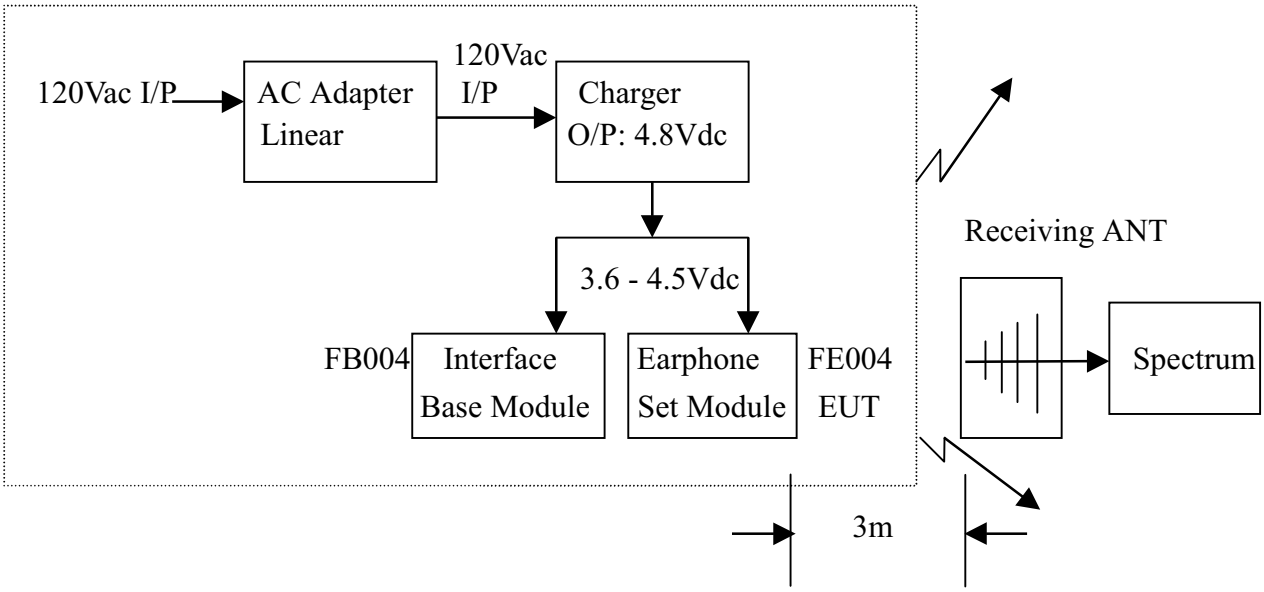
(F) At the frequencies where the peak values of the emission exceeded the quasi-peak limit, the emissions were also measured with the quasi-peak detectors. The average detector also measured the emission either (a) quasi-peak values were under quasi-peak limit but exceeded average limit, or (b) peak values were under quasi-peak limit but exceeded average limit.

(G)In this RFI test report, we provided the worst case conducted emission test data and radiated emission test data. The entire testing data was recorded and provided in this report.

1.4 Channels Verification

FCC ID : FU5FE004

Charging Mode



FCC ID : FU5FE004 **EUT Model No. FE004**

Frequency Range : 904.2 MHz to 925.8 MHz

Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	904.2	11	915.6
2	904.8	12	916.8
3	906.0	13	918.0
4	907.2	14	919.2
5	908.4	15	920.4
6	909.6	16	921.6
7	910.8	17	922.8
8	912.0	18	924.0
9	913.2	19	925.2
10	914.4	20	925.8

Note :

1. All channels located in the frequency range as below :

902 MHz --- 928 MHz ☑ Yes ☐ No

2. Typical Channel for testing :

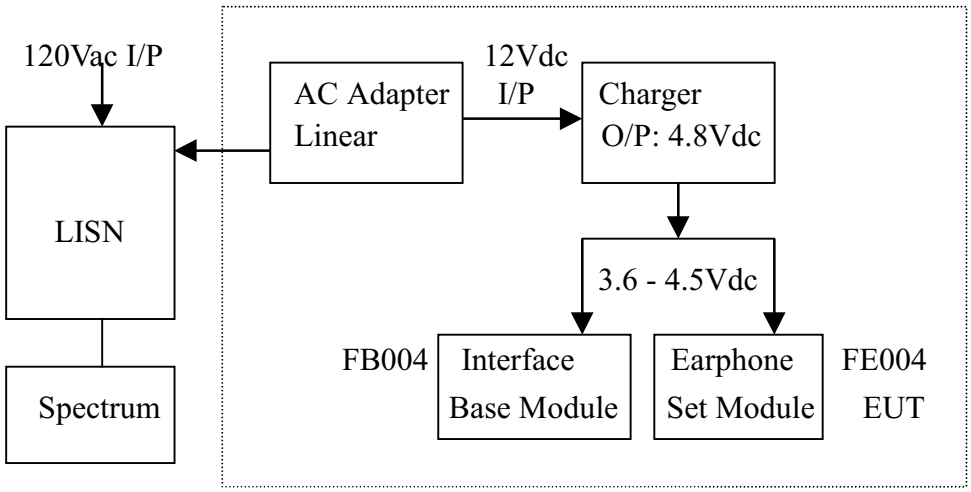
Channel	Channel Number	Frequency (MHz)
Top	1	904.2
Middle	10	914.4
Bottom	20	925.8

II . Power Line Conducted Emission Test

FCC ID : FU5FE004

2.1 Testing Description

Charging Mode



2.2 Software Using

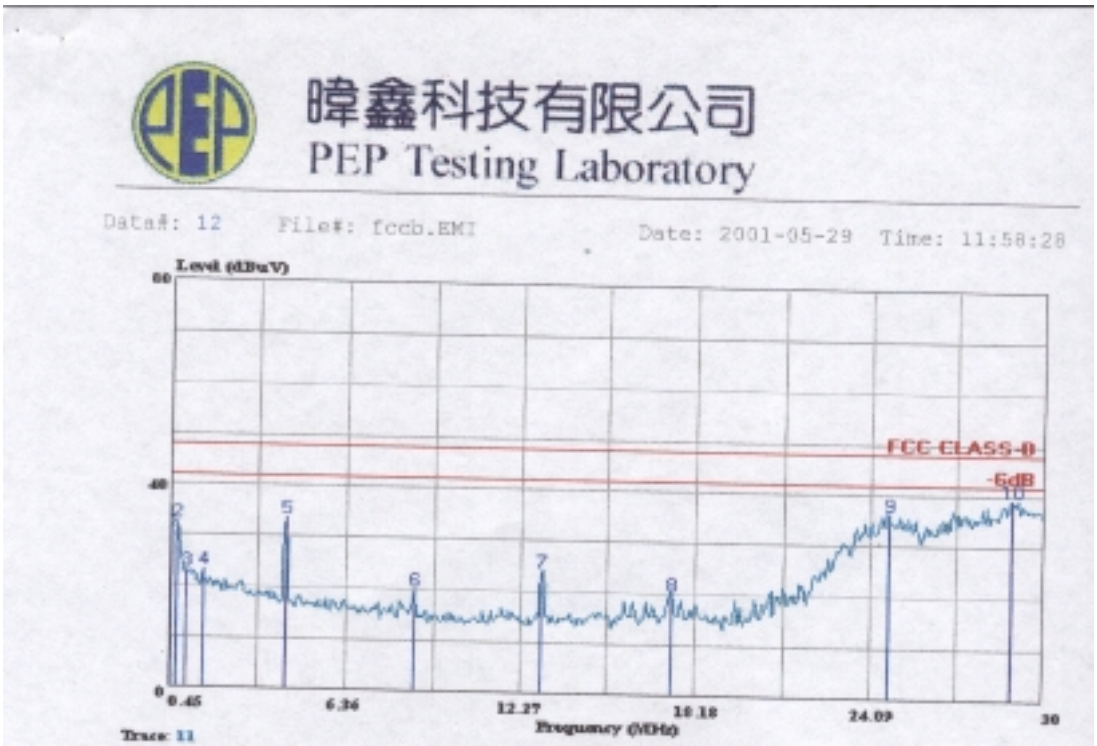
The EUT was assembled on a wooden table which is 80cm in height, and placed 40cm from the back-wall.

It was scanned from 450KHz to 30MHz during charging mode as shown above. The physical arrangement of the EUT System was varied to get the worst case.

2.3 Test Result

FCC ID： FU5FE004

EUT Model No. FE004 **LINE**

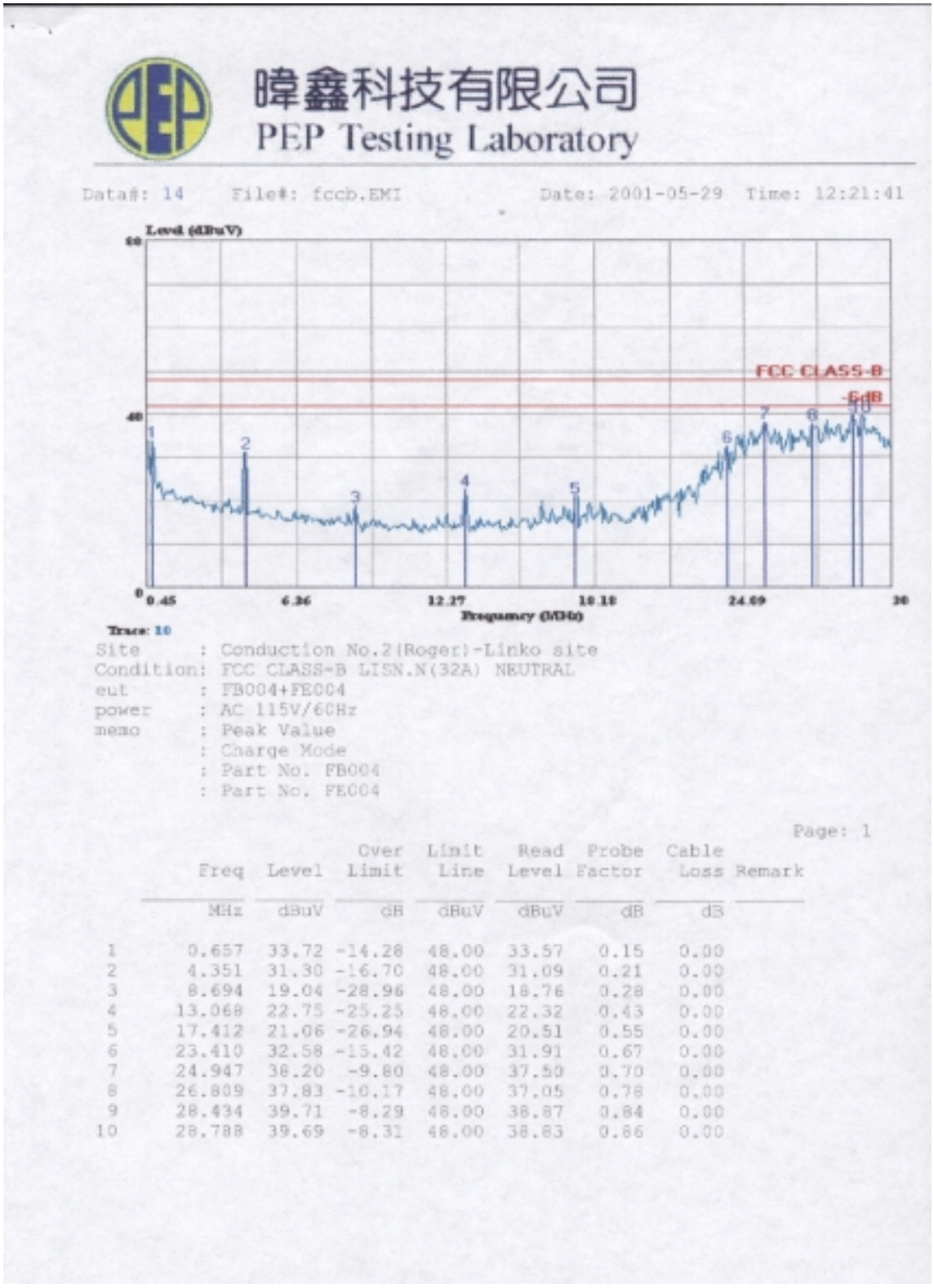


Site : Conduction No.2(Roger)-Linko site
Condition: FCC CLASS-B LISN.L(32A) LINE
eut : F004U
power : AC 115V/60Hz
memo : Peak Value
: Charge Mode
: Part No. FB004
: Part No. FE004

Page: 1

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.480	31.84	-16.16	48.00	31.72	0.12	0.00	
2	0.657	32.32	-15.68	48.00	32.17	0.15	0.00	
3	0.952	22.94	-25.06	48.00	22.75	0.19	0.00	
4	1.543	23.13	-24.87	48.00	22.93	0.20	0.00	
5	4.351	33.50	-14.50	48.00	33.29	0.21	0.00	
6	8.694	19.90	-28.10	48.00	19.62	0.28	0.00	
7	12.979	23.84	-24.16	48.00	23.41	0.43	0.00	
8	17.412	19.75	-28.25	48.00	19.10	0.65	0.00	
9	24.711	36.26	-11.74	48.00	35.27	0.99	0.00	
10	28.877	39.26	-8.74	48.00	37.95	1.31	0.00	

EUT Model No. FE004 **NEUTRAL**



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Data#: 14 File#: fccb.EMI Date: 2001-05-29 Time: 12:21:41

Trace: 10
Site : Conduction No.2(Roger)-Linko site
Condition: FCC CLASS-B LISN.N(32A) NEUTRAL
eut : FB004+FE004
power : AC 115V/60Hz
memo : Peak Value
: Charge Mode
: Part No. FB004
: Part No. FE004

Page: 1

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.657	33.72	-14.28	48.00	33.57	0.15	0.00	
2	4.351	31.30	-16.70	48.00	31.09	0.21	0.00	
3	8.694	19.04	-28.96	48.00	18.76	0.28	0.00	
4	13.068	22.75	-25.25	48.00	22.32	0.43	0.00	
5	17.412	21.06	-26.94	48.00	20.51	0.55	0.00	
6	23.410	32.58	-15.42	48.00	31.91	0.67	0.00	
7	24.947	38.20	-9.80	48.00	37.50	0.70	0.00	
8	26.809	37.83	-10.17	48.00	37.05	0.78	0.00	
9	28.434	39.71	-8.29	48.00	38.87	0.84	0.00	
10	28.788	39.69	-8.31	48.00	38.83	0.86	0.00	

2.4 Conducted Emission Test Photo.

FCC ID : FU5FE004

EUT Model No. FE004

< FRONT VIEW >

III . § 15.247(a)(2) : -6dB bandwidth for Direct Sequence Systems

3.1 Test result of bandwidth

FCC ID : FU5FE004

EUT Model No. FE004

Top Channel : 1
Frequency : 904.199 MHz
6dB bandwidth : 875 KHz > 500 KHz

Middle Channel : 10
Frequency : 914.402 MHz
6dB bandwidth : 854 KHz > 500 KHz

Bottom Channel : 20
Frequency : 925.800 MHz
6dB bandwidth : 868 KHz > 500 KHz

Spectrum Plot Data FCC ID : FU5FE004

EUT Model No. FE004

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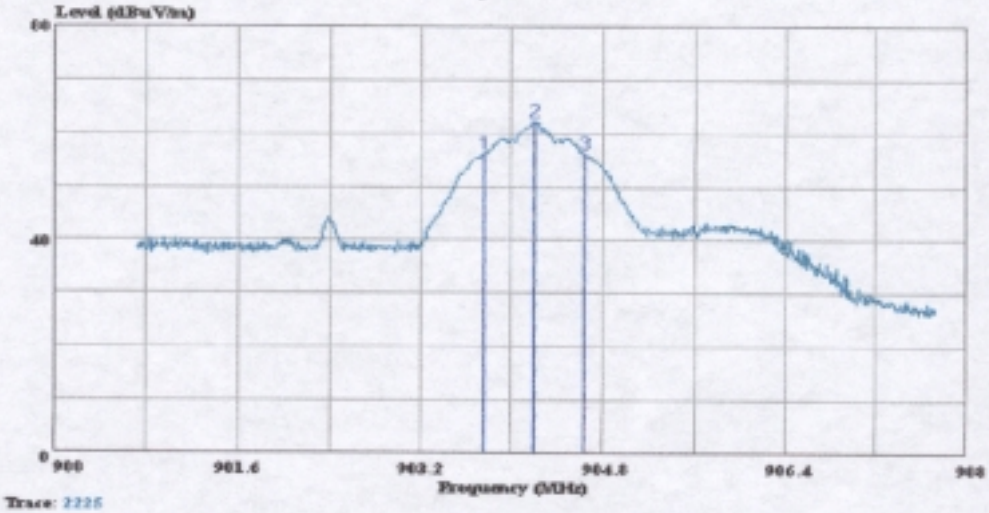
Data#: 2227 File#: E2000.emi Date: 2001-05-28 Time: 14:21:14



Trace: 2225

Site : Chamber No.3(Jason Kung)-Linko Site
Condition: 3m ANT.3M(H) HORIZONTAL
eut : F004U
power : AC 115V / 50Hz
memo : Peak Value
: Channel 1: 904.2MHz
: Part No. FE004
: Test BW>=500KHz

Page: 1

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB
1	903.765	56.22	------	------	49.91	23.52	2.79	20.00
2	904.199	62.16	------	------	55.63	23.54	2.79	20.00
3	904.640	56.13	------	------	49.78	23.56	2.79	20.00

2-1=434KHz
3-2=441KHz ∵ 434KHz+441KHz=875KHz
∴ -6dB 之 BW=875KHz pass

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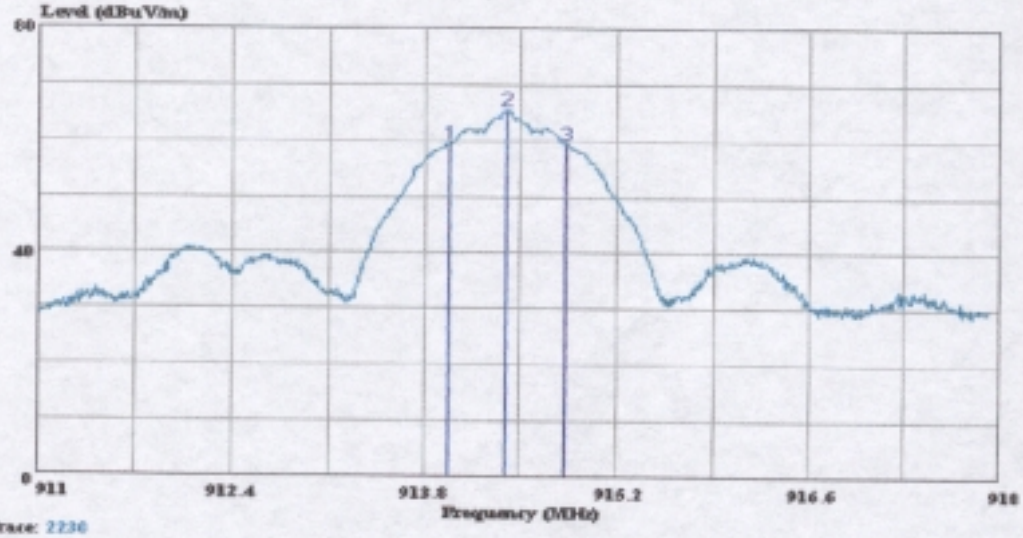
Data#: 2231 File#: E2000.emi Date: 2001-05-28 Time: 14:36:11



Trace: 2230

Site : Chamber No.3(Jason Kung)-Linko Site
Condition: 3m ANT.3M(H) HORIZONTAL
eut : FE004U
power : AC 115V / 50Hz
memo : Peak Value
: Channel 10: 914.4MHz
: Part No. FE004
: Test BW>=500KHz

Page: 1

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB
1	913.982	59.40	------	------	52.70	23.92	2.78	20.00
2	914.402	65.39	------	------	58.68	23.93	2.78	20.00
3	914.836	59.43	------	------	52.70	23.95	2.78	20.00

2-1=420KHz ∵ 420KHz+434KHz=854KHz
3-2=434KHz ∴ -6dB 之 BW=854KHz pass

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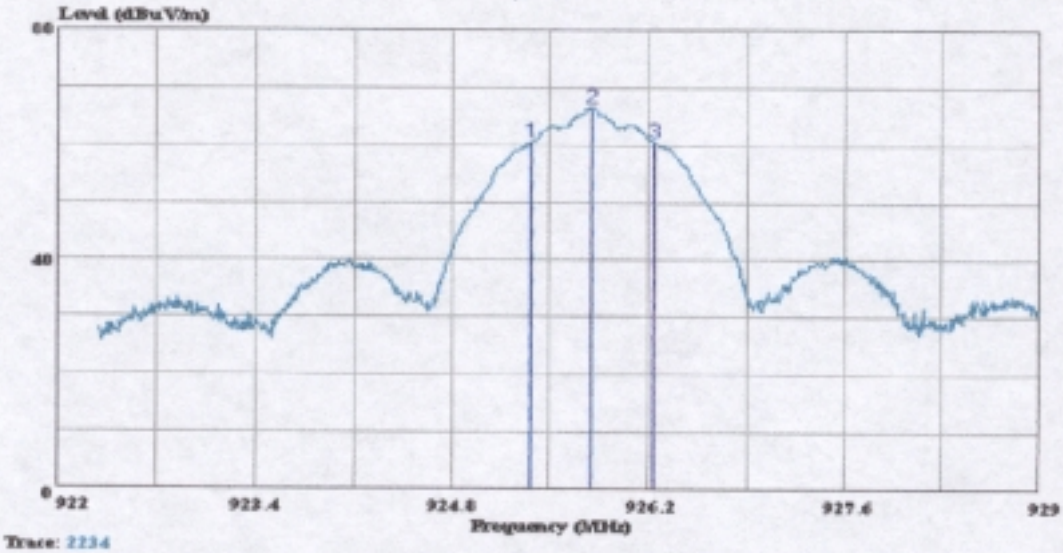
Data#: 2235 File#: E2000.emi Date: 2001-05-28 Time: 14:51:04



Trace: 2234

Site : Chamber No.3(Jason Kung)-Linko Site
Condition: 3m ANT.3M(H) HORIZONTAL
eut : F004U
power : AC 115V / 50Hz
memo : Peak Value
: Channel 20: 925.8MHz
: Part No. FE004
: Test BW>=500KHz

Page: 1

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB
1	925.373	60.55	------	------	53.41	24.37	2.77	20.00
2	925.800	66.49	------	------	59.33	24.39	2.77	20.00
3	926.241	60.46	------	------	53.29	24.40	2.77	20.00

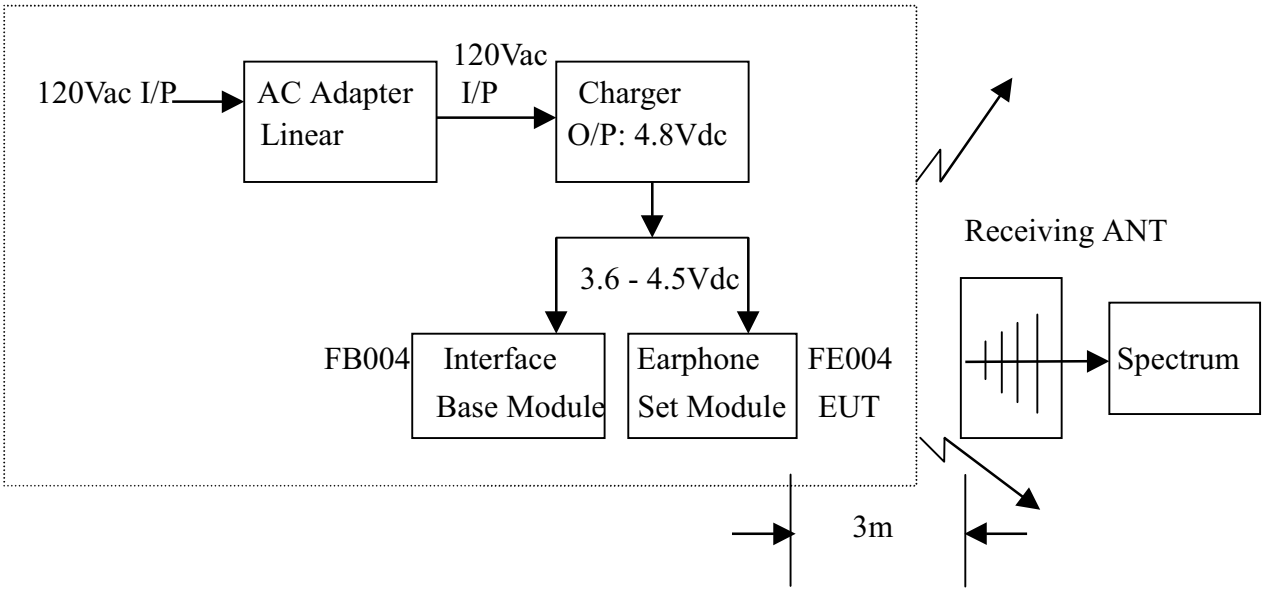
2-1 = 427KHz ∵ 427KHz+441KHz=868KHz
3-2 = 441KHz ∴ -6dB 之 BW=868KHz pass

IV. § 15.247(b) : The maximum peak output power (≦ 1watt)

4.1 Testing Description

FCC ID : FU5FE004

Charging Mode



Three channels were tested : CH01, CH10 AND CH20 Measurements were taken by using both horizontal and vertical antenna polarization, and the antenna was raised and lowered from one to four meters to find the worst emission levels.

4.2 Software Using

The driver of " FCCV3V.exe" is used to detect the support channel as mentioned on section 1.3 (b) listed above

4.3 Test Result of Fundamental Emissions

EUT Model No. FE004

FCC ID : FU5FE004

channel	Frequency (MHz)	A.P. (H/V)	S.P. Read (dBuV/m)	C.F. (dB)	Level (dBuV/m)	Turn Table Azimuth (degree)	Antenna Height (m)	E.I.R.P. (mW)
Top	904.2	H	67.05	6.33	73.38	267°	1.5	0.0075
		V	61.54	6.33	67.87	298°	1.7	0.0019
Middle	914.4	H	67.23	6.71	73.94	262°	1	0.0075
		V	62.36	6.71	69.07	240°	1.5	0.092
Bottom	925.8	H	68.09	7.16	75.25	276°	1	0.012
		V	62.62	7.16	69.78	240°	1.5	0.092

Note :

1. "A.P." means antenna polarity .
2. "S.P." Read means amplitude read by spectrum analyzer .
3. "C.F." means corrected factor = antenna factor + cable loss
   Preamplifier Gain .
4. Level means emission amplitude = S.P. + C.F. + duty cycle factor
5. Conducted output power : $P = (E\ d)^2 / 30G$
   where E (V) = Level (V)
   d (m) = measurement distance = 3m
   G = 1 (the gain of the transmitting antenna over isotropic antenna)
   P = E.I.R.P.
6. Example :
   If Level = 120 dBuV/m
   $10^{(120/20)} \text{ X } 10^{-6} = 1$ V
   E.I.R.P. = $(1 \text{ x } 3)^2 / 30 = 300$ mW

FCC ID : FU5FE004

EUT Model No. FE004

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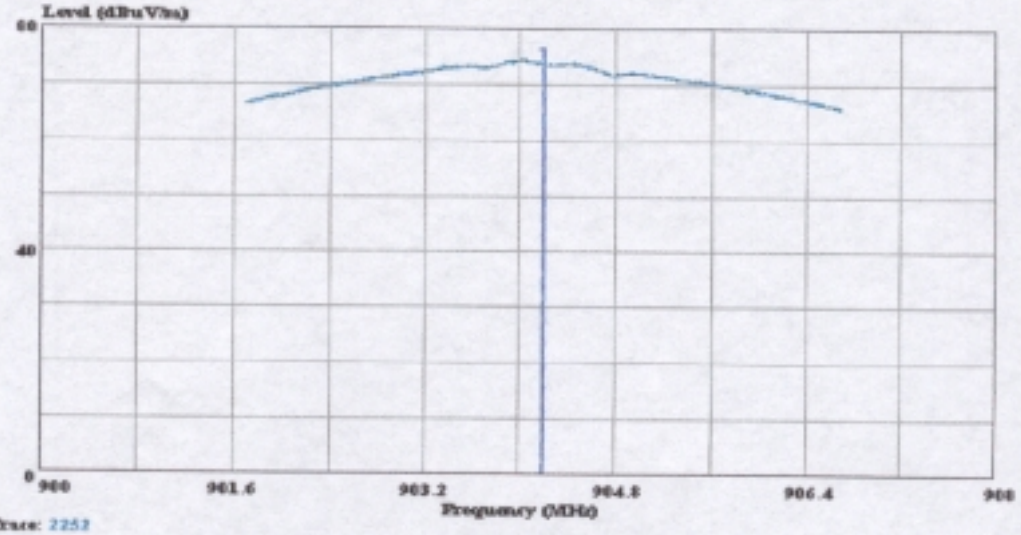
Data#: 2253 File#: E2000.emi Date: 2001-05-28 Time: 16:57:47



Trace: 2252

Site : Chamber No.3(Jason Gong)-Linko Site
Condition: 3m ANT.3M(H) HORIZONTAL
eut : F004U
power : AC 115V / 60Hz
memo : Peak Value
: Channel 1: 904.2MHz
: Part No. FE004
: Test : E.I.R.P
: RBW:3MHz;VBW:3MHz;Span:5MHz

Page: 1

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB
1	904.200	73.38	------	------	67.05	23.54	2.79	20.00

Level = 73.38
E (v/m) = $10^{[73.38/20]} \times 10^{-6} = 10^{3.7} \times 10^{-6} = 0.005$
E.I.R.P = [0.005 × 3]^2 / 30 = 0.0075mw
E.I.R.P = 0.0075mw 且< 1W 故 pass

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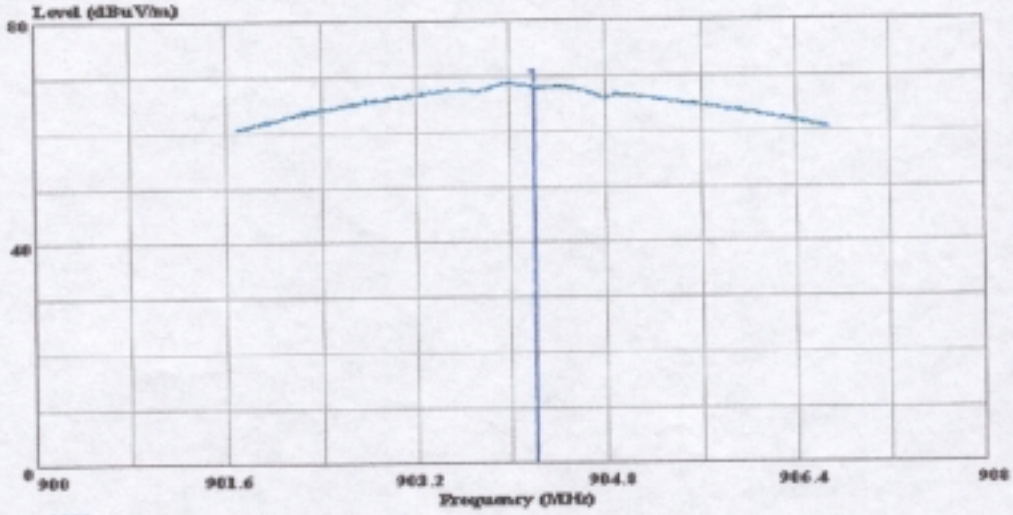
Data#: 2257 File#: E2000.emi Date: 2001-05-28 Time: 17:14:05



Trace: 2256
Site : Chamber No.3(Jason Gong)-Linko Site
Condition: 3m ANT.3M(V) VERTICAL
eut : F004U
power : AC 115V / 60Hz
memo : Peak Value
: Channel 1: 904.2MHz
: Part No. FE004
: Test : E.I.R.P
: RBW:3MHz;VBW:3MHz;Span:5MHz

Page: 1

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB
1	904.200	67.87	------	------	61.54	23.54	2.79	20.00

Level = 67.87

E (v/m) = $10^{[67.87/20]} \times 10^{-6} = 10^{3.4} \times 10^{-6} = 0.0025$

E.I.R.P = [0.0025 × 3]^2 / 30 = 0.0019mw

E.I.R.P = 0.0019mw 且< 1W 故 pass

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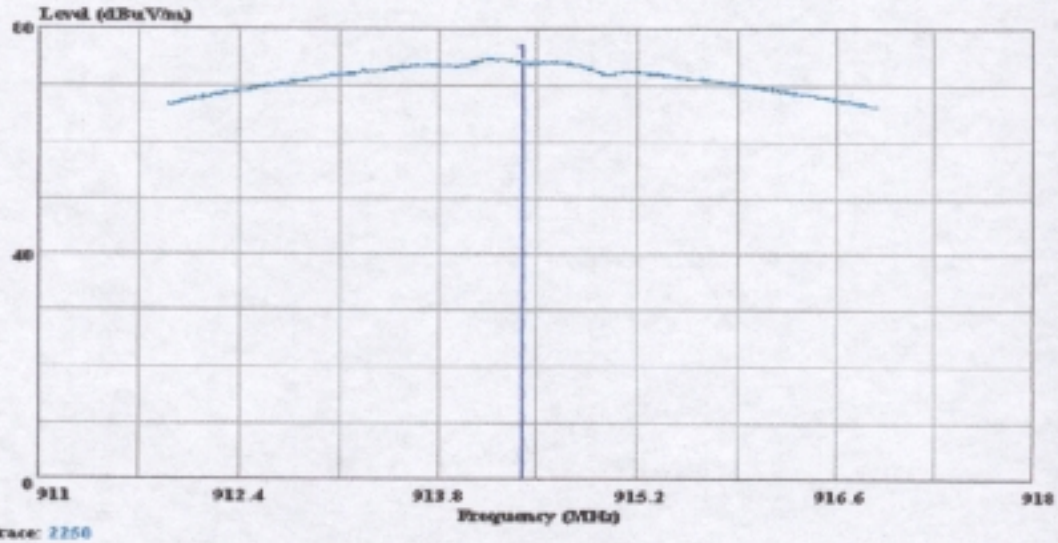
Data#: 2251 File#: E2000.emi Date: 2001-05-28 Time: 16:50:12



Trace: 2250
Site : Chamber No.3(Jason Gong)-Linko Site
Condition: 3m ANT.3M(H) HORIZONTAL
eut : F004U
power : AC 115V / 60Hz
memo : Peak Value
: Channel 1: 914.4MHz
: Part No. FE004
: Test : E.I.R.P
: RBW:3MHz;VBW:3MHz;Span:5MHz

Page: 1

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB
1	914.400	73.94	------	------	67.23	23.93	2.78	20.00

Level = 73.94
E (v/m) = $10^{[73.94/20]} \times 10^{-6} = 10^{3.7} \times 10^{-6} = 0.005$
E.I.R.P = [0.005 × 3]^2 / 30 = 0.0075mw
E.I.R.P = 0.0075mw 且< 1W 故 pass