

# SGS KES CO., LTD. EMC Laboratory

705, Dongchun-Ri Sooji-Eub, Yongin-Shi Kyungki-Do, KOREA

TEL82-31-263-0409 FAX.82-31-263-0454

## FCC TEST REPORT

### Manufacture :

SENEX TECHNOLOGIES

5<sup>th</sup> Fl, Seojin Bldg., 237-10, Nonhyun-Dong,  
Kangnam-Gu, Seoul, Korea

Attn : I. C. Yoo

Dates of Tests : 13 to 16 September 2002

Test Report No. : 2002KESEMC-II-0286.FCC

Test Site : SGS KES Co., Ltd. EMC site, Korea.

TYPE of EUT  
MODEL No.

**X2GATE  
GCP100**

**SENEX TECHNOLOGIES**

5<sup>th</sup> Fl, Seojin Bldg., 237-10, Nonhyun-Dong,  
Kangnam-Gu, Seoul, Korea

I. C. Yoo  
Tel./Fax. 82-2-2056-4335/82-2-548-1202

### CONTACT PERSON

FCC Rule Part(s) :

Part 15 & 2

Classification :

FCC Class B Device

Port/Connector(s) :

Speaker, To Monitor, Optic Channel, Scart Connector,  
S-Video, HD-TV Audio, HD-TV Video, From PC, PC

The device bearing the trade name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-1992.

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



Kew - Seung, Lim

EMC Lab. Manager

SGS KES CO., LTD. EMC Laboratory

FCC

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# MEASUREMENT REPORT

Scope - Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15.

Responsible Party\* : SENEX TECHNOLOGIES

Contact Person : I. C. Yoo

Tel./Fax. 82-2-2056-4335/82-2-548-1202

Manufacturer : SENEX TECHNOLOGIES

5<sup>th</sup> Fl, Seojin Bldg., 237-10, Nonhyun-Dong,  
Kangnam-Gu, Seoul, Korea

- Trade / Model: GCP100
- EUT Type: X2GATE
- Port/Connectors: Speaker, To Monitor, Optic Channel, Scart Connector, S-Video, HD-TV Audio, HD-TV Video, From PC, PC
- Classification: FCC Class B
- Rule Part(s): FCC Part 15 & Part 2
- Test Procedure(s): ANSI C63.4 (1992)
- Dates of Test: 13 to 16 September 2002
- Place of Tests: SGS KES Co., Ltd. EMC Site
- Test Report No.: 2002KESEMC-II-0286.FCC
- Order No. : SKI-02-0178/E

### Remark

The Model, GCX100 is identical to GCP100 except model name and MICOM installed Inside. GCP100 has the MICOM for PS/2 Game Machine.

GCX100 has the MICOM for XBOX Game Machine.

All other feature is identical.

	Model Name
Basic Model	GCP100
Added Model	GCX100

## INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-1992) was used in determining radiated and conducted emissions emanating from **SENEX TECHNOLOGIES** Model : **GCP100**

These measurement tests were conducted at **SGS KES CO., LTD. EMC Laboratory**.

The site address is 705, Dongchun-Ri, Sooji-Eub, Yongin-Shi, Kyungki-Do, Korea.

The area of SGS KES CO., LTD. EMC Test Site is located in a mountain area at 45 kilometers (28 miles) southeast and Seoul International Airport (Kimpo Airport), 23 kilometers (14miles) south-southeast from central Seoul.

It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.

The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992.

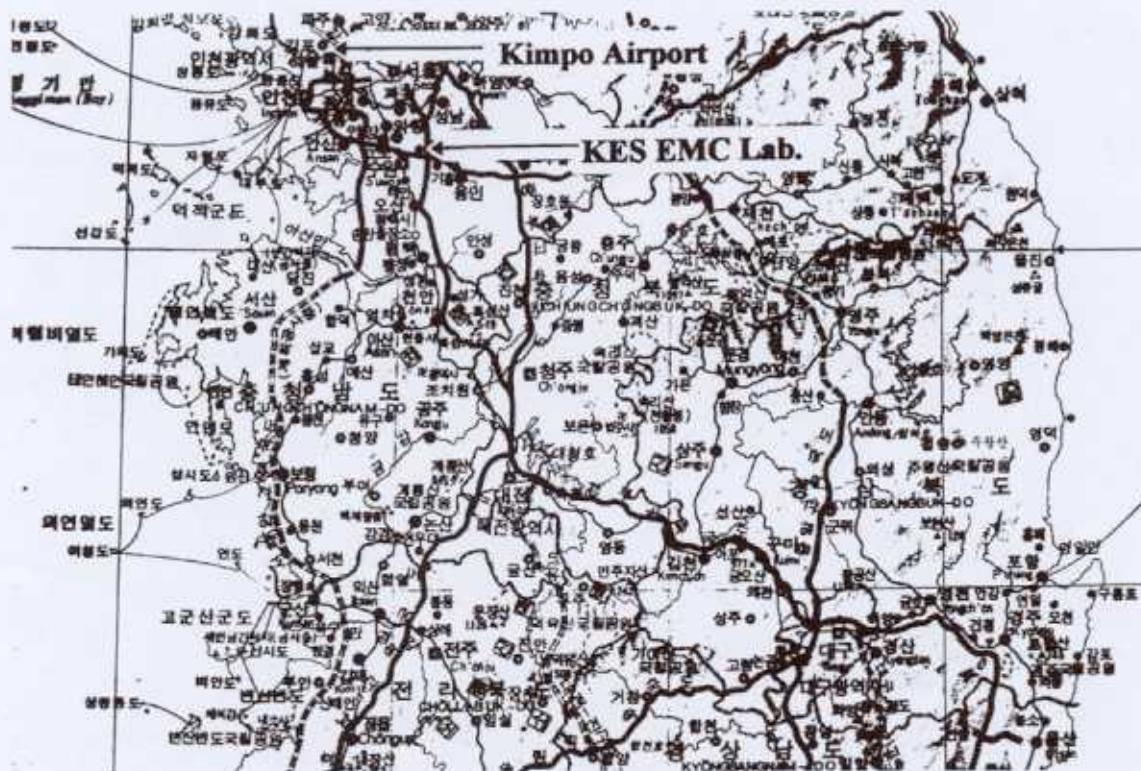


Fig. 1. The map above shows the Seoul in Korea vicinity area.  
The map also shows SGS KES CO., LTD. EMC Lab and Kimpo Airport.

## PRODUCT INFORMATION

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### Equipment Description:

The Equipment Under Test (EUT) is the **SENEX TECHNOLOGIES**

Model : **GCP100**

Clock : 27MHz, 11.0592MHz

Port(s) : Speaker, To Monitor, Optic Channel, Scart Connector,  
S-Video, HD-TV Audio, HD-TV Video, From PC, PC

Power

Consumption : DC 5V from PC or Game Machines

Main Board :

Model : N/A

S/N : N/A

(N/A)

EMI suppression device(s) added and/or modified during testing:

- none

## DESCRIPTION OF TESTS

### Conducted Emissions

The line-conducted facility is located inside a 3.0x6.0x2.5 shielded enclosure. It is manufactured by Daeil EMC Engineering. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-6. A 1mx1.5m. wooden table 0.8m. height is placed 0.4m. away from the vertical wall and 1.5m away from the side wall of the shielded room. PMM L3-25, L1-150 and EMCO Model 3825-2 (10kHz-30MHz) 50 $\Omega$  /50  $\mu$ H Line Impedance Stabilization Networks (LISNs) are bonded to the shielded room. The EUT is powered from the PMM LISN and the support equipment is powered from the EMCO LISN. Power to the LISNs are filtered by a high-current high-insertion loss Sangshin power line filters (100dB 14kHz-10GHz). The purpose of the filter is to attenuate ambient signal interference and this filter is also bonded to the shielded enclosure. All electrical cables are shielded by braided tinned copper zipper tubing with inner diameter of 1/2". If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the PMM LISN. LISN schematic diagram is shown in Figure 2. All interconnecting cables more than 1 meter were shortened by non-inductive bundling (serpentine fashion) to a 1-meter length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT. The spectrum was scanned from 450 kHz to 30 MHz with 20 msec sweep time. The frequency producing the maximum level was reexamined using EMI/Field Intensity Meter and Quasi-Peak adapter. The detector function was set to CISPR quasi-peak mode. The bandwidth of the receiver was set to 10 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission. Each emission was maximized by: switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; which ever determined the worst-case emission. Photographs of the worst-case emission can be seen in Appendix C. Each EME reported was calibrated using the R/S SMG signal generator.

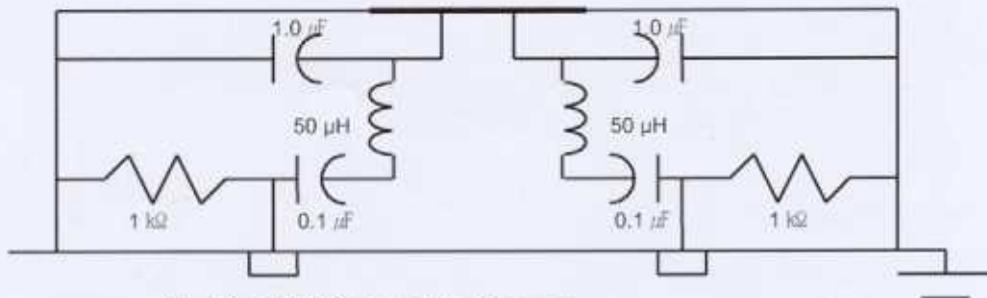


Fig. 2. LISN Schematic Diagram

## Radiated Emissions

Preliminary measurements were made indoors at 1 meter using broadband antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were note for each frequency found. The spectrum was scanned from 30 to 300 MHz using biconical antenna and 300 to 1000 MHz using log-periodic antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used.

Final measurements were made outdoors at 3 or 10 meter test range using EMCO Dipole antennas or horn antenna. The test equipment was placed on a wooden and plastic bench situated on a 1.5x2 meter area adjacent to measurement area. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was reexamined and investigated using EMI/Field Intensity Meter and Quasi-Peak Adapter. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 100 kHz or 1 MHz depending on the frequency or type of signal.

The half-wave dipole antenna was tuned to the frequency found during preliminary radiated measurements. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1x1.5 meter table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meter and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Appendix C. Each EME reported was calibrated using the R/S SMG signal generator.

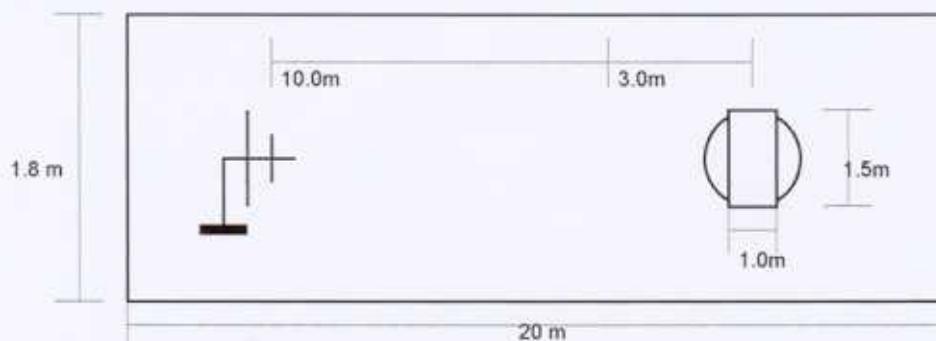


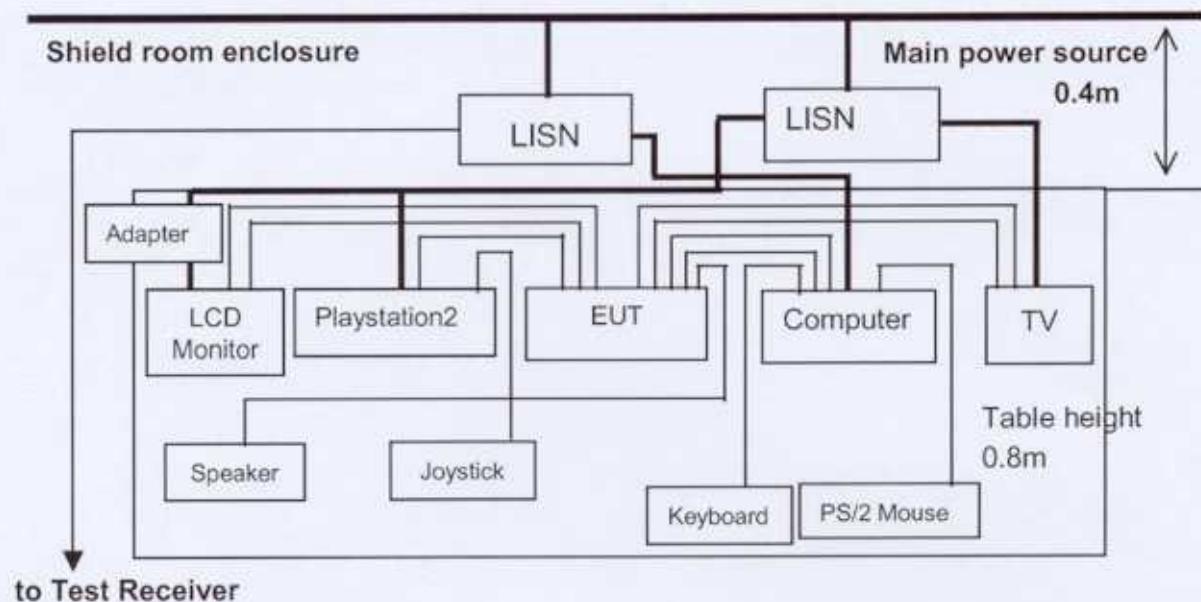
Fig. 3. Dimensions of Outdoor Test Site

**SUPPORT EQUIPMENT USED**

Description	Model	Serial No.	Manufacturer
Speaker	KY-3500	N/A	J.R Electronics
PS/2 Mouse	M-S34	LZB00207183	LOGITECH
Keyboard	SEM-DT35	06087043	SAMSUNG
TV	CT-1413	933432FH801353	SAMSUNG
LCD Monitor	CT1700	MP0128 0200	Cornea
PC	Dreamsys/BS3	N/A	TriGem Computer
Joystick	SCPH-10010	N/A	SONY
Play Station 2	SCPH-30005	M0504777	SONY
XBOX	XBOX	N/A	Microsoft

**User Interface Cable List**

Start		END		Cable Spec.	
Name	I/O Port	Name	I/O Port	Length	Shield
EUT	Scart Connector	Play Station2	AV Multi Out	0.3	Shielded
	Speaker	Speaker	-	1.5	Unshielded
	To Monitor	LCD Monitor	RGB	1.8	Shielded
	PC	PC	Speaker	1.5	Unshielded
	From PC	PC	VGA	1.8	Shielded
	S-Video	LCD Monitor	S-Video	1.5	Shielded
	HD-TV Audio	TV	Audio IN	1.5	Unshielded
	HD-TV Video	TV	Video IN	1.5	Unshielded
PC	Speaker	EUT	PC	1.5	Unshielded
	VGA	EUT	From PC	1.8	Shielded
	Keyboard	Keyboard	-	1.7	Shielded
	PS/2 Mouse	PS/2 Mouse	-	1.8	Shielded
	AC IN	LISN	-	1.0	Unshielded

Test set-up for Mains terminal Disturbance Voltage test

## TEST DATA

## Conducted Emissions

Model No. : GCP100

Date of Test : 13 September 2002

Measure Bandwidth : 9kHz

Temperature : 24 °C

Humidity : 50%

Atmospheric Pressure : 99.0kPa

### Mode : Game

FREQ (MHz)	LEVEL(dB $\mu$ N)	LINE	LIMIT( $\mu$ N)	Result( $\mu$ N)	MARGIN*(dB)
7.12	37.5	H	250	74.99	10.5
7.32	40.0	N	250	100.00	8.0
12.00	44.0	N	250	158.49	4.0
12.01	42.0	H	250	125.89	6.0
15.90	41.0	H	250	112.20	7.0
20.17	41.0	H	250	112.20	7.0

Table 1. Line Conducted Emissions Tabulated Data

**NOTES:**

#### • Measurements using CISPR quasi-peak mode

Tested by See - Ho, Lee

## TEST DATA

## Conducted Emissions

Model No. : GCP100

Date of Test : 13 September 2002

Measure Bandwidth : 9kHz

Temperature : 23°C      Humidity : 52%      Atmospheric Pressure : 99.3kPa

Mode : PC

FREQ (MHz)	LEVEL(dB $\mu$ V)	LINE	LIMIT( $\mu$ V)	Result( $\mu$ V)	MARGIN*(dB)
15.45	43.5	N	250	149.62	4.5
15.61	42.0	H	250	125.89	6.0
15.95	44.0	N	250	158.49	4.0
16.11	44.0	H	250	158.49	4.0
16.37	44.0	N	250	158.49	4.0
16.76	43.0	H	250	141.25	5.0

Table 2. Line Conducted Emissions Tabulated Data

**NOTES:**

- Measurements using CISPR quasi-peak mode

Tested by See - Ho, Lee

**TEST DATA****Radiated Emissions**

Model No. : GCP100

Date of Test : 16 September 2002

Temperature : 20°C      Humidity : 52%

Atmospheric Pressure : 101.2kPa

Measure Bandwidth : 120kHz

Mode : Game

Freq. (MHz)	Level (dB $\mu$ V)	AF* (dB)	CL** (dB)	POL (H/V)	Limit ( $\mu$ V)	F/S ( $\mu$ V/m)	Margin*** (dB)
44.24	20.90	10.99	1.30	H	100	45.66	6.81
108.00	24.00	10.55	2.14	H	150	68.34	6.81
233.32	22.90	10.48	3.80	H	200	72.26	8.82
331.31	20.70	13.72	4.78	H	200	91.22	6.80
533.31	14.50	18.78	6.46	H	200	97.11	6.25
666.36	13.80	20.37	7.53	H	200	121.62	4.30

Table 3. Radiated Measurements at 3meters.

**NOTES:**

1. All modes of operation were investigated the worst-case emission are reported.
2. The radiated limits are shown on Figure 4.

Above 1GHz the limit is 500  $\mu$ V/m.

Fig. 4. Limits at 3 meters

\* AF = Antenna Factor.

\*\* CL = Cable Loss.

\*\*\* Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

Tested by   
See - Ho, Lee

**TEST DATA****Radiated Emissions**

Model No. : GCP100

Date of Test : 16 September 2002

Temperature : 20°C Humidity : 52%

Atmospheric Pressure : 101.2kPa

Measure Bandwidth : 120kHz

Mode : PC

Freq. (MHz)	Level (dB $\mu$ W)	AF* (dB)	CL** (dB)	POL (H/V)	Limit ( $\mu$ W)	F/S ( $\mu$ W/m)	Margin*** (dB)
44.25	21.00	10.99	1.30	H	100	46.18	6.71
108.00	23.10	10.55	2.14	H	150	61.62	7.71
244.30	19.90	11.72	3.93	H	200	59.92	10.45
331.33	19.00	13.72	4.78	H	200	75.00	8.50
533.16	15.20	18.78	6.46	H	200	105.26	5.55
665.19	11.80	20.38	7.52	H	200	96.56	6.30

Table 4. Radiated Measurements at 3meters.

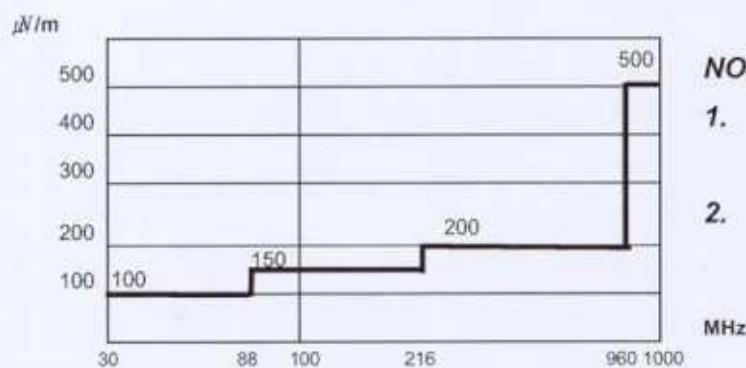


Fig. 4. Limits at 3 meters

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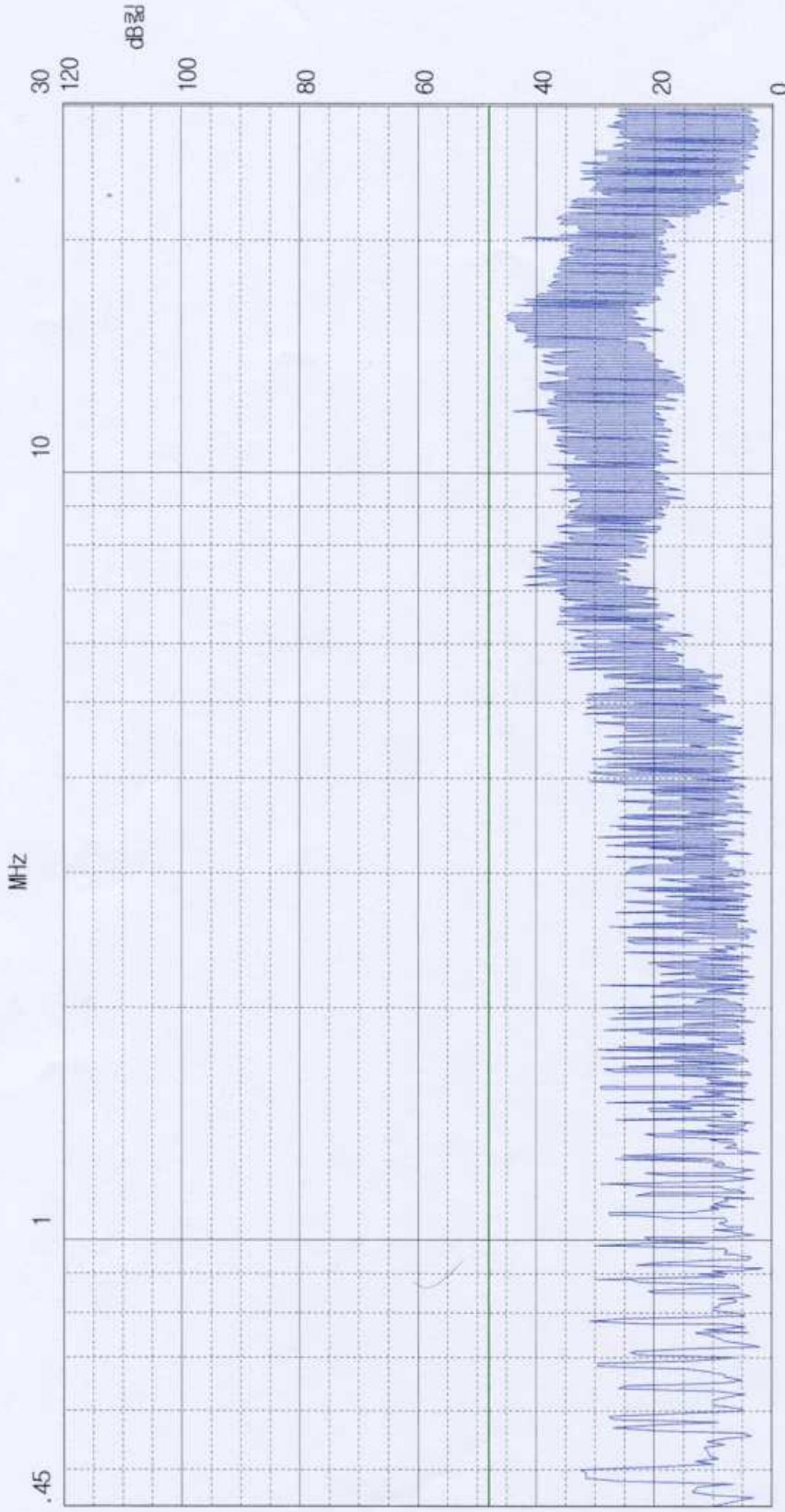
Tested by  See - Ho, Lee

## PLOTS OF EMISSIONS

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PM 8010 for windows

Name: Date: 02-09-13 Time: 11:26



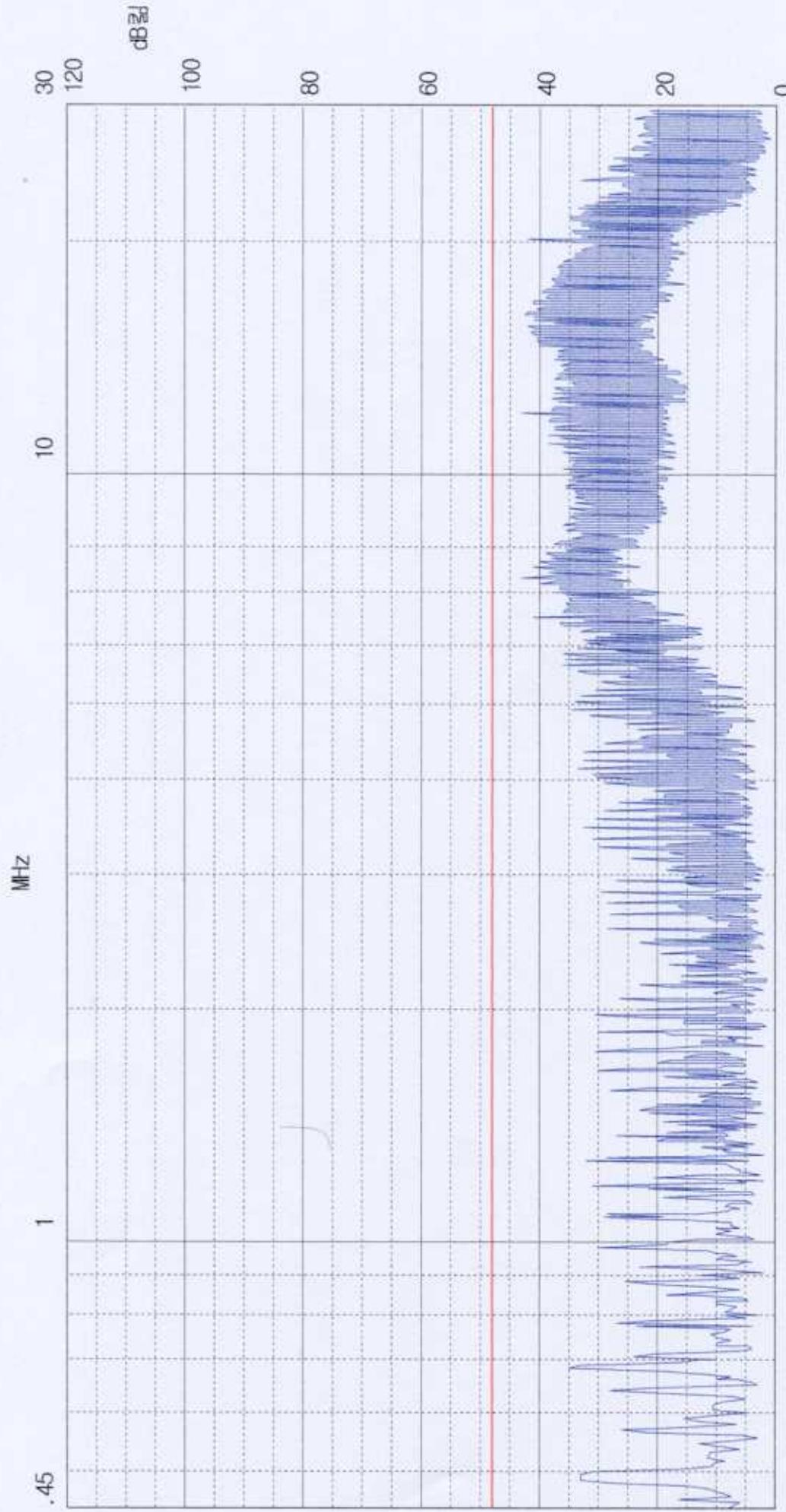
Limit : Fcc\_15\_b Detector: Peak Input: None

MODEL : GCP 100  
MODE: GAME  
LINE : NEUTRAL  
OPERATOR: S.H.LEE

6

P M M 8 0 1 0 for Windows

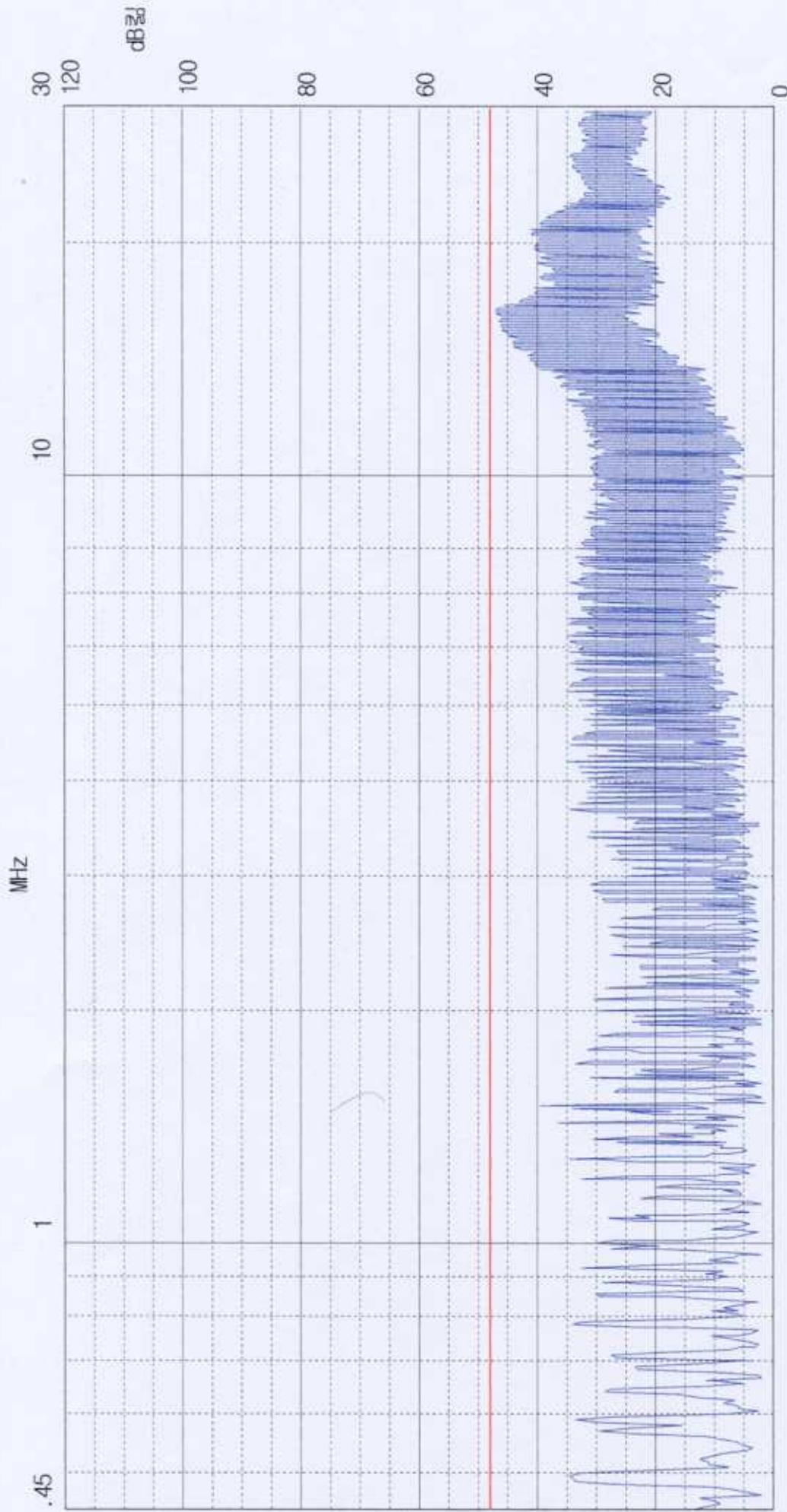
Name: I178fh Date: 02-09-13 Time: 19:11



*8*

P M M 8 0 1 0 for windows

Name: Date: 02-09-16 Time: 11:53

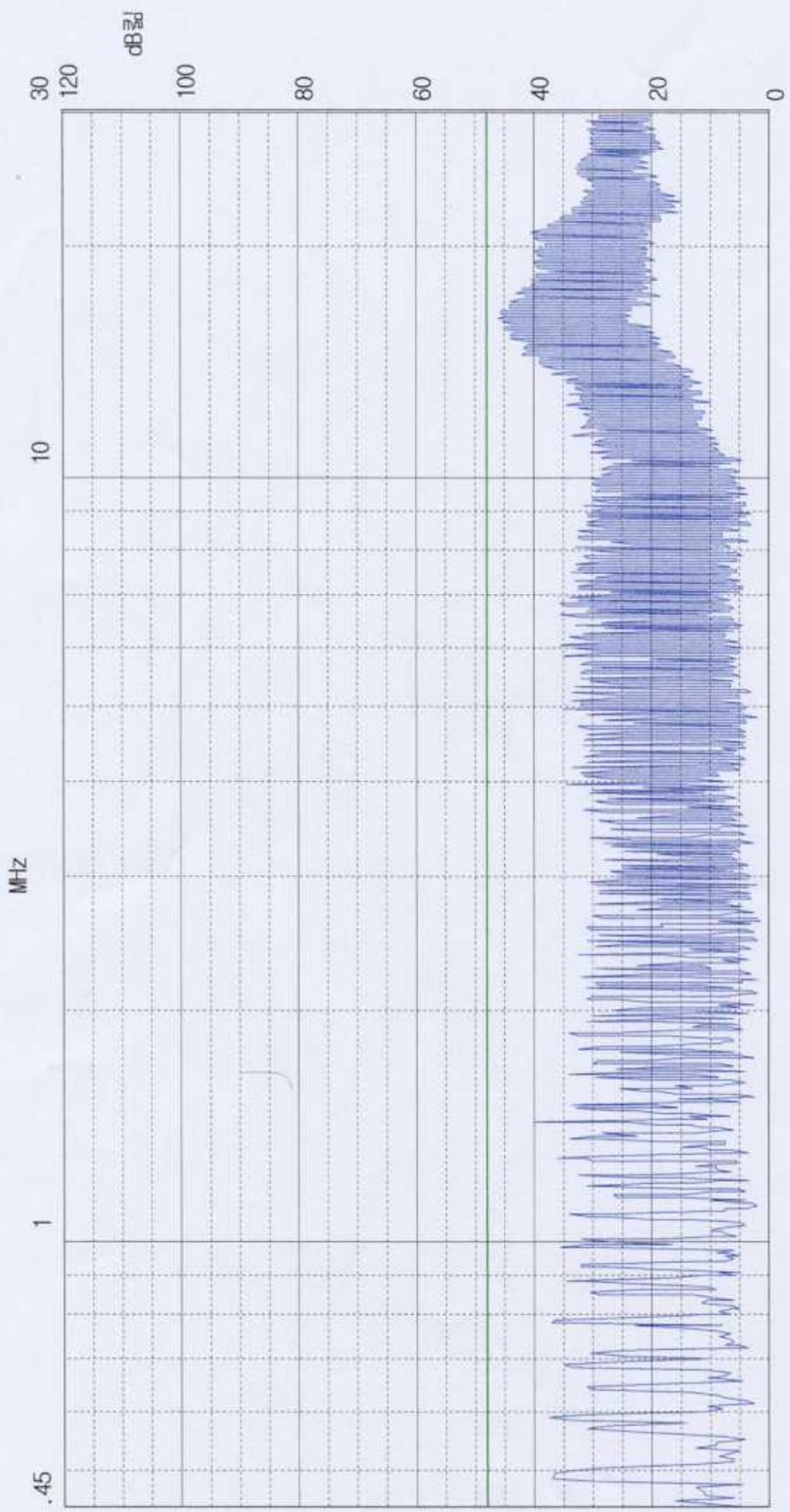


MODEL: GCP 100  
MODE: PC  
LINE: NEUTRAL  
OPERATOR: S.H. LEE

*Handwritten signature*

PM 8 0 1 0 for Windows

Name: Date: 02-09-13 Time: 11:40



MODEL: GCP 100  
MODE: PC  
LINE: HOT  
OPERATOR: S.H.LEE

*[Handwritten signature]*

**SAMPLE CALCULATIONS**

$$\text{dB } \mu\text{V} = 20 \log_{10} (\mu\text{V}/\text{m})$$

$$\mu\text{V} = 10^{(\text{dB } \mu\text{V}/20)}$$

**EX. 1.**

@20.3 MHz

Class B limit = 250  $\mu\text{V} = 48.0 \text{ dB } \mu\text{V}$ Reading = 40.8 dB  $\mu\text{V}$  (calibrated level)

$$10^{(40.8/20)} = 109.64 \text{ } \mu\text{V}$$

$$\text{Margin} = 48.0 - 40.8 = 7.2$$

7.2 dB below limit

**EX. 2.**

@57.7 MHz

Class B limit = 100  $\mu\text{V}/\text{m} = 40.0 \text{ dB } \mu\text{V}/\text{m}$ Reading = 19.1 dB  $\mu\text{V}$  (calibrated level)

Antenna factor + Cable Loss = 10.12 dB

Total = 29.22 dB  $\mu\text{V}/\text{m}$ 

$$\text{Margin} = 40.0 - 29.22 = 10.78$$

10.78 dB below the limit

## ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 with the confidence level of 95%

Contribution	Distribution	Uncertainties	
		3 m	10 m
Field Strength Monitor	Gaussian (2s)	+/- 0.5	+/- 0.5
Field Strength Variation	Rectangular	+/- 1.2	+/- 1.5
Random	Gaussian (1s)	+/- 0.7	+/- 0.7
Total Uncertainty@95% min. confidence probability		+/- 1.91	+/- 2.11

Measurement Uncertainty Calculations:

$$U = 2 \sqrt{S^2 \ s1 + S^2 \ s2 + \dots + S^2 \ sr}$$

**TEST EQUIPMENT****Conducted Emission**

<b>Equipment</b>	<b>Manufactory</b>	<b>Model</b>	<b>Cal. Date</b>
Test Receiver	PMM	8010	Sep. 2002
LISN	PMM	L3-25	Jun. 2002
LISN	EMCO	3825/2	Nov. 2001
Pulse Limiter	PMM	PL-01	Jul. 2002
Shielded Room	Daeil	N/A	-

**Radiated Emission**

<b>Equipment</b>	<b>Manufactory</b>	<b>Model</b>	<b>Cal. Date</b>
Test Receiver	R & S	ESVS30	Nov. 2001
Spectrum Analyzer	H.P	E4411A	Dec. 2001
RF Amplifier	H.P	8447F	May. 2002
Bilog Antenna	Scaffner	CBL6111C	Apr. 2002
RF Select s/w	DAIWA	CS201	Nov. 2001

## RECOMMENDATION/CONCLUSION

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- The data collected shows that the **SENEX TECHNOLOGIES**

Model : **GCP100** complies with § 15.107 and 15.109 of the FCC Rules.

Mode : Game

The highest emission observed was at 12.0MHz conducted emissions with a margin of 4.0dB and at 666.36MHz radiated emissions with a margin of 4.30dB.

Mode : PC

The highest emission observed was at 15.95MHz & 16.11MHz & 16.37MHz conducted emissions with a margin of 4.0dB and at 533.16MHz radiated emissions with a margin of 5.55dB.

## APPENDIX A – SAMPLE LABEL

### New Labelling Requirements

The sample label shown shall be *permanently affixed* at a conspicuous location on the device and be readily visible to the user at the time of purchase.

