

SGS KES Co., Ltd. EMC Laboratory

705, Dongchun-Ri Sooji-Eub, Yongin-Shi Kyungki-Do, KOREA
TEL.82-31-263-0409 FAX.82-31-263-0454

FCC Part 15 Report

Manufacture :

TELENETPIA CO., LTD.

2ndF, Sangmyung Bldg., 303-1, Kwanghui-Dong, Chung-Ku, Seoul, Korea

Attn : S. G. Park

Dates of Tests : August 16 to August 20, 2002

Test Report No. : 2002KESEMC-II-0247.FCC

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

TYPE of EUT
MODEL No.

**Wireless Earphone
Batongee(TN-301)**

TELENETPIA CO., LTD.

2ndF, Sangmyung Bldg., 303-1, Kwanghui-Dong,
Chung-Ku, Seoul, Korea

S.G. Park

Tel./Fax. : 82-2-777-7576/82-2-777-7570


CONTACT PERSON

FCC Rule Part(s) :
Classification :

Part 2 & Part 15 Sub Part C
FCC Class B Device

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

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FCC Part 15

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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 :	TELENETPIA CO., LTD.
Contact Person :	S. G. Park
	Tel./Fax. : 82-2-777-7576/82-2-777-7570
Manufacturer :	TELENETPIA CO., LTD.
	2ndF, Sangmyung Bldg., 303-1, Kwanghui-Dong, Chung-Ku, Seoul, Korea

- Trade / Model : **Batongee(TN-301)**
- Brand Name : -
- EUT Type : Wireless Earphone
- Classification : FCC Class B
- Rule Part(s) : FCC Part 2 & Part 15 Subpart C
- Test Procedure(s): ANSI C63.4 (1992)
- Dates of Test: August 16 to 20 2002
- Place of Tests: SGS KES Co., Ltd. EMC Site
- Test Report No.: 2002KESEMC-II-0247.FCC
- Order No. : MK600-02-0081
- Fundamental Frequency **900MHz(ISM BAND)**

Applicable Test Item

	Applicable Standard	Applicable	Reason
Conducted Emission	Part 15.207	Yes	This device uses AC-DC Adapter.
Radiated Emission	Part 15.209 & 15.249	Yes	The operating frequency of this device is within 902-928MHz.

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 emissions emanating from **TELENETPIA CO., LTD.**

Model : **Batongee(TN-301)**

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 from Seoul National Airport (Kimpo Airport), 23 kilometers (14 miles) 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.

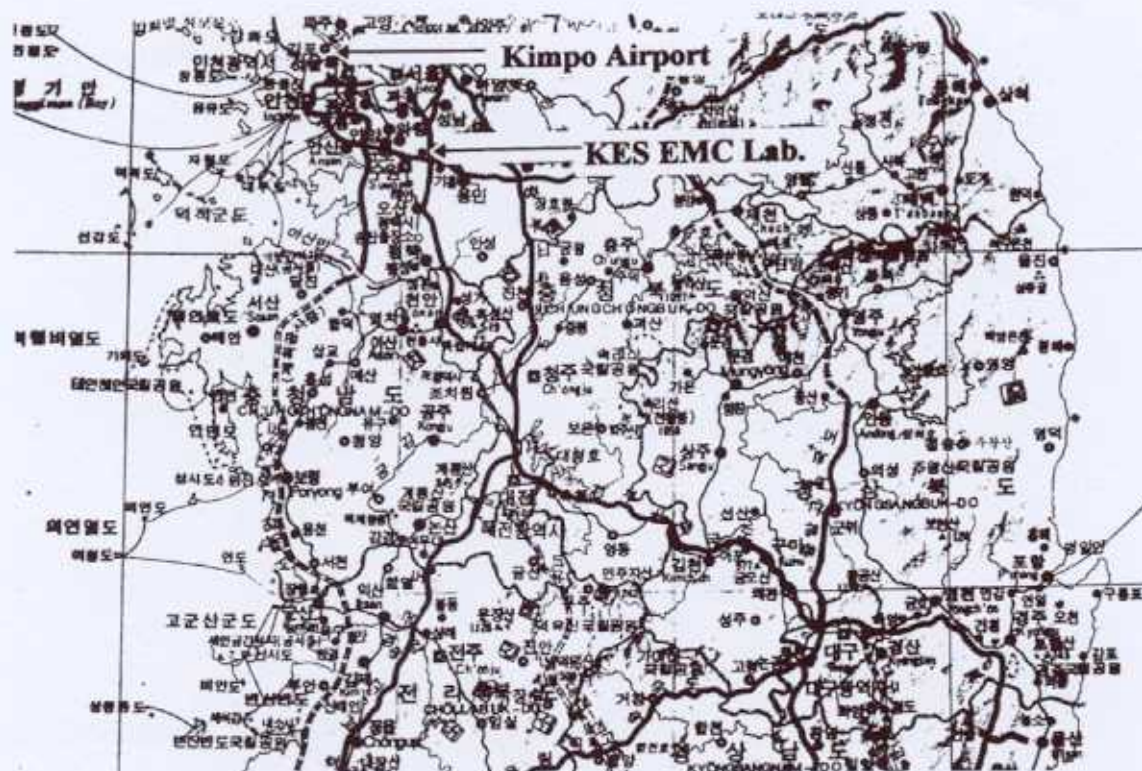


Fig. 1. The map above shows the Seoul in Korea vicinity area.
The map also shows SGS KES Co., Ltd. EMC Lab and Kimpo Airport.

PRODUCT INFORMATION

Equipment Description:

The Equipment Under Test (EUT) is the **TELENETPIA CO., LTD.**

Model : **Batongee(TN-301)**

Intentional Frequency Band :	900MHz(ISM BAND)	
Chipset :	KA8532, PIC16LC712	
Clock	12.8MHz	
Port(s) :	Phone, DC IN	
Power Consumption :	Handy Part(DC3.7V), Base Part(2.4V)	
Handy Mainboard :	Model : TN-301 (TELENETPIA CO., LTD.)	S/N : N/A
Handy Battery :	Model : 893083 (N/A)	S/N : 600016
Base Mainboard :	Model : N/A (N/A)	S/N : N/A
Base Subboard	Model : N/A (N/A)	S/N : N/A
Base Battery :	Model : 250AAAH2BX (N/A)	S/N : 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 Ω /50 μ 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.

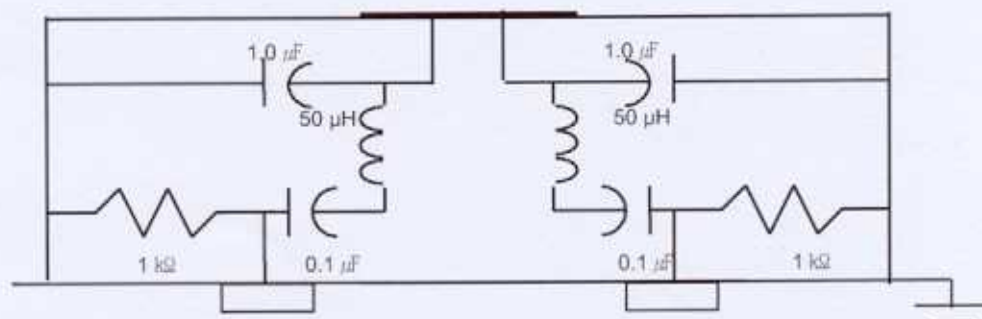


Fig. 2. LISN Schematic Diagram

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 and 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 meter test range using EMCO Dipole antennas or horn antenna . The test equipment was placed on a wooden and plastic bench situated on a 1.5 x 2 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 EUT was 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 was supplied by AC-DC Adapter. The EUT was 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: rotating the turntable containing the EUT and changing the polarity of the antenna, whichever determined the worst-case emission. Each EME reported was calibrated using the R/S SMG signal generator.

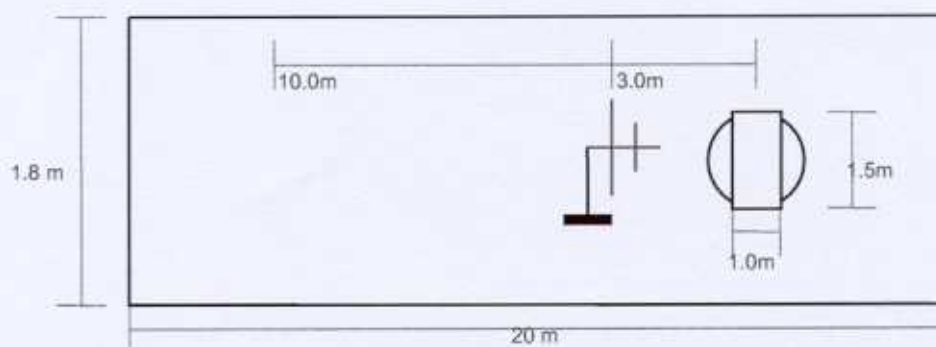


Fig. 3. Dimensions of Outdoor Test Site

SUPPORT EQUIPMENT USED

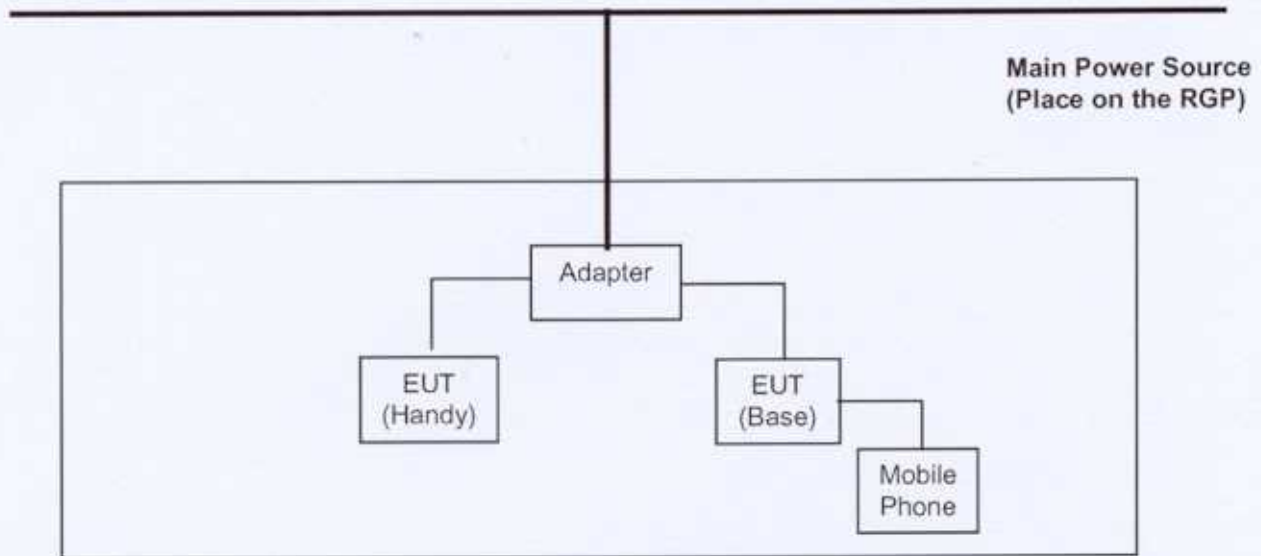
Peripheral equipment

Description	Model	Serial No.	Manufacturer
Mobile Phone	I Book	107K1087346	LG Electronics
AC-DC Adapter	N/A	N/A	ELCONSYSTEM

User Interface Cable List

Start		END		Cable Spec.	
Name	I/O Port	Name	I/O Port	Length	Shield
EUT	Phone	Mobile Phone	-	0.1	Unshielded
	DC IN	Adapter	-	1.0	Unshielded
Adapter	DC OUT	EUT	-	1.0	Unshielded
	AC IN	LISN	-	1.0	Unshielded

TEST SET UP



Operating Mode : Transmitting and Receiving Voice signals from each EUT Unit after connecting mobile phone to Base Unit.

TEST DATA

Conducted Emissions(Part 15.207)

Company : TELENETPIA CO., LTD.

Model No. : Batongee(TN-301)(FDD ID : QJLBATONGEETN301)

Date of Test : 16 August 2002

Measure Bandwidth : 9kHz

FREQ (MHz)	LEVEL(dB μ V)	LINE	LIMIT(μ V)	(μ V)	MARGIN*(dB)
0.56	19.0	N	250	8.91	29.0
0.60	19.5	N	250	9.44	28.5
0.79	18.5	N	250	8.41	29.5
0.82	18.0	H	250	7.94	30.0
0.85	20.5	N	250	10.59	27.5
0.89	19.5	N	250	9.44	28.5

Table 1. Line Conducted Emissions Tabulated Data

NOTES:

1. All modes of operation were investigated and the worst -case emission are reported. See attached Plots.
2. The limit for Class B digital device is 250 μ V from 450 kHz to 30MHz.
3. Line H = Hot Line N = Neutral

* Measurements using CISPR quasi-peak mode



Tested by See - Ho, Lee

TEST RESULTS

Radiated Emissions(Part 15.209 & 15.249)

Company : TELENETPIA CO., LTD.

Model No. : Batongee(TN-301)(FDD ID : QJLBATONGEETN301) / Handy Part

Date of Test : 20 August 2002

Measure Bandwidth : 120kHz

Freq. (MHz)	Level (dB μ V)	AF* (dB)	CL** (dB)	POL (H/V)	Limit (dB)	F/S (μ V/m)	Margin*** (dB)
443.34	10.60	16.74	5.74	V	44.00	45.11	10.91
445.72	13.10	16.76	5.76	V	44.00	60.42	8.38
463.07	15.10	17.03	5.90	V	44.00	79.73	5.97
926.16	41.90	24.64	9.61	H	94.00	6421.26	17.85
927.80	47.00	24.66	9.62	H	94.00	11580.84	12.72
1389.27	7.40	25.33	3.47	H	44.00	64.58	7.80
1783.60	3.20	24.84	3.97	H	44.00	39.85	11.99
1852.32	7.40	24.88	4.09	H	54.00	65.86	17.63
2314.35	2.80	26.60	4.84	H	44.00	51.51	9.76
2778.48	9.60	27.54	5.50	H	54.00	135.49	11.36
3240.12	3.40	28.30	6.20	H	44.00	78.49	6.10
3704.64	3.20	28.91	6.70	H	54.00	87.22	15.19
4630.80	2.70	30.90	7.80	H	54.00	117.60	12.59

Table 1. Radiated Measurements at 3meters.

* AF = Antenna Factor.

** CL = Cable Loss.

*** Margin=Each Frequency Limit Level(dBuV) - (Level+AF+CL)

Remark : This is measured by Qusi-Peak Detector from 30-1000MHz and the frequencies above 1GHz is by Average Detector.

Note : All Frequency from 30MHz to 10GHz was scanned and the worst cases are reported in the above table. This Unit was found to be within the limits.



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TEST RESULTS

Radiated Emissions(Part 15.209 & 15.249)

Company : TELENETPIA CO., LTD.

Model No. : Batongee(TN-301)(FDD ID : QJLBATONGEETN301) / Handy Part

Date of Test : 20 August 2002

Measure Bandwidth : 120kHz

Freq. (MHz)	Level (dB μ V)	AF* (dB)	CL** (dB)	POL (H/V)	Limit (dB)	F/S (μ V/m)	Margin*** (dB)
1389.27	10.40	25.33	3.47	H	64.00	91.22	24.80
1783.60	5.40	24.84	3.97	H	64.00	51.33	29.79
1852.32	10.40	24.88	4.09	H	74.00	93.03	34.63
2314.35	4.60	26.60	4.84	H	64.00	63.37	27.96
2778.48	16.80	27.54	5.50	H	74.00	310.38	24.21
3240.12	4.90	28.30	6.20	H	64.00	93.28	24.60
3704.64	5.20	28.91	6.70	H	74.00	109.80	33.19
4630.80	4.20	30.90	7.80	H	74.00	139.77	31.09

Table 1. Radiated Measurements at 3meters.

* AF = Antenna Factor.

** CL = Cable Loss.

*** Margin=Each Frequency Limit Level(dBuV) - (Level+AF+CL)

**** Each Frequency Limit Level=Average Limit + 20dB

Remark : This is measured by Peak Detector.

Note : All Frequency from 1G to 10GHz was scanned and the worst cases are reported in the above table. This Unit was found to be within the limits.



Tested by **See - Ho, Lee**

TEST RESULTS

Radiated Emissions(Part 15.209 & 15.249)

Company : TELENETPIA CO., LTD.

Model No. : Batongee(TN-301)(FDD ID : QJLBATONGEETN301) / Base Part

Date of Test : 20 August 2002

Measure Bandwidth : 120kHz

Freq. (MHz)	Level (dB μ V)	AF* (dB)	CL** (dB)	POL (H/V)	Limit (dB)	F/S (μ V/m)	Margin*** (dB)
451.07	17.00	16.84	5.81	V	44.00	95.98	4.36
457.66	7.90	16.93	5.86	V	44.00	34.23	13.31
902.15	45.80	23.70	9.42	H	94.00	8827.55	15.08
903.84	46.10	23.74	9.42	H	94.00	9188.83	14.74
1804.27	3.50	22.48	4.09	H	54.00	31.89	23.93
1873.67	2.90	22.48	4.09	H	44.00	29.76	14.53
2706.42	3.40	27.57	5.50	H	54.00	66.62	17.53
3157.51	6.50	28.16	6.10	H	44.00	109.14	3.24
3608.55	3.70	28.80	6.60	H	54.00	90.16	14.90

Table 1. Radiated Measurements at 3meters.

* AF = Antenna Factor.

** CL = Cable Loss.

*** Margin=Each Frequency Limit Level(dBuV) - (Level+AF+CL)

Remark : This is measured by Qusi-Peak Detector from 30-1000MHz and the frequencies above 1GHz is by Average Detector.

Note : All Frequency from 30MHz to 10GHz was scanned and the worst cases are reported in the above table. This Unit was found to be within the limits.



Tested by See - Ho, Lee

TEST RESULTS

Radiated Emissions(Part 15.209 & 15.249)

Company : TELENETPIA CO., LTD.

Model No. : Batongee(TN-301)(FDD ID : QJLBATONGEETN301) / Base Part

Date of Test : 20 August 2002

Measure Bandwidth : 120kHz

Freq. (MHz)	Level (dB μ V)	AF* (dB)	CL** (dB)	POL (H/V)	Limit (dB)	F/S (μ V/m)	Margin*** (dB)
1804.27	5.30	22.48	4.09	H	74.00	39.23	42.13
1873.67	4.60	22.48	4.09	H	64.00	36.19	32.83
2706.42	5.20	27.57	5.50	H	74.00	81.96	35.73
3157.51	16.30	28.16	6.10	H	64.00	337.29	13.44
3608.55	4.80	28.80	6.60	H	74.00	102.33	33.80

Table 1. Radiated Measurements at 3meters.

* AF = Antenna Factor.


** CL = Cable Loss.

*** Margin=Each Frequency Limit Level(dBuV) - (Level+AF+CL)

**** Each Frequency Limit Level=Average Limit + 20dB

Remark : This is measured by Peak Detector.

Note : All Frequency from 1GHz to 10GHz was scanned and the worst cases are reported in the above table. This Unit was found to be within the limits.



 Tested by See - Ho, Lee

PLOTS OF EMISSIONS

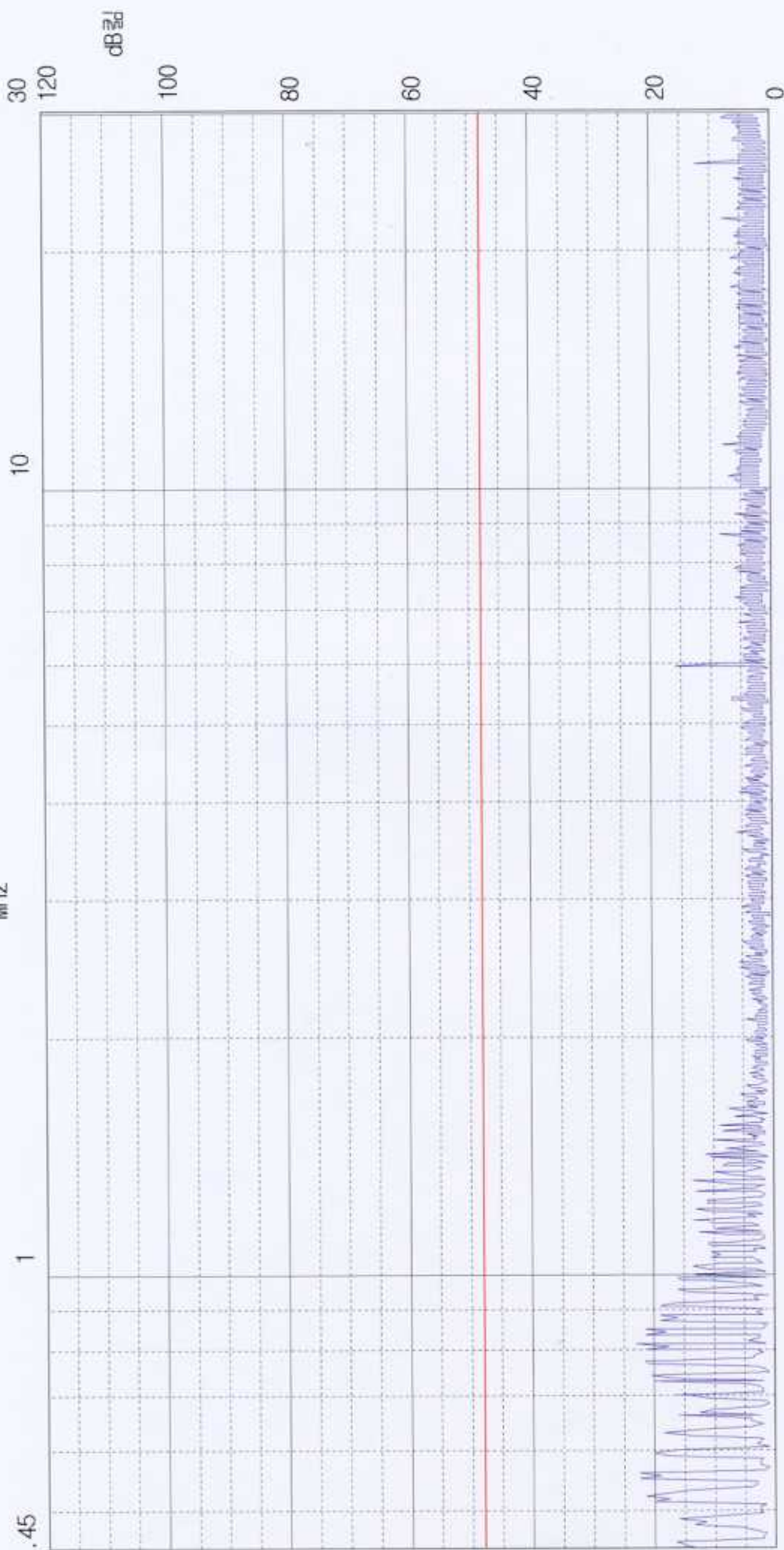
P M M 8 0 1 0 for Windows

Name:

Date: 02-08-22

Time: 14:50

MHz



Limit : Fcc_15_b Detector: Peak Lisn L2-16 Line: 1

MODEL : Batongee(TN-301)

LINE : HOT

OPERATOR : S.H.LEE

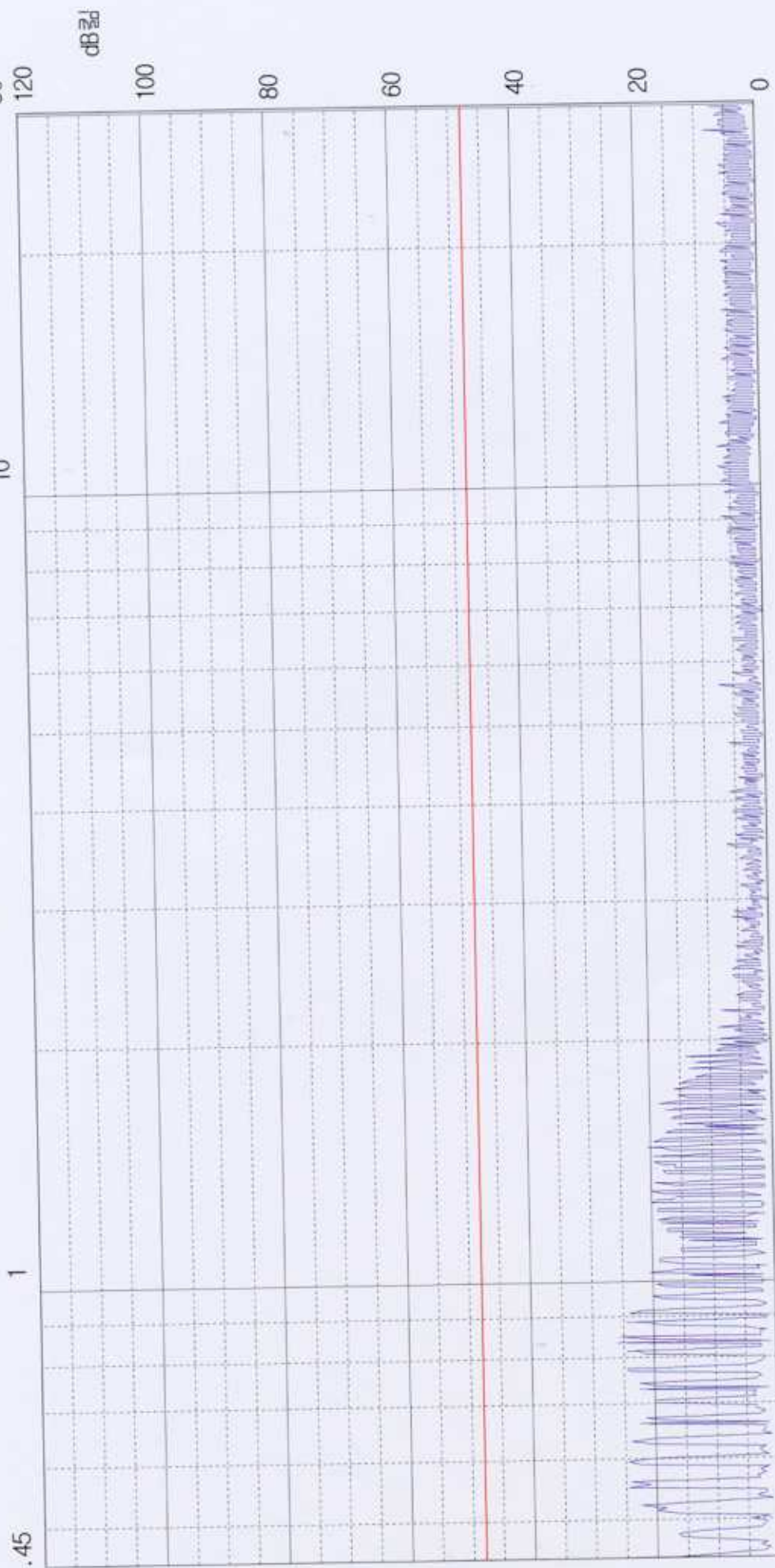
P M M 8 0 1 0 for Windows

Name:

Date: 02-08-16

Time: 14:24

MHz



Limit : Fcc_15_b

Detector: Peak

Lisn L2-16 Line: 1

MODEL : Batongee(TN-301)

LINE : NEUTRAL

OPERATOR : S.H. LEE

hp 14:00:48 AUG 16, 2002

BASE

Ref 53.5 dBμV

Atten 0 dB

Mkr 902.0000 MHz
-27.96 dBμV(1 Hz)

Smpl
Log
5
dB/

Marker
902.0000 MHz
-27.96 dBμV(1 Hz)

SA VB
SC FC
AA

Center 902.1500 MHz
#Res BW 30 kHz

#VBW 10 kHz

Span 500.0 kHz
#Sweep 75.0 msec

Marker

Marker Normal

Marker Δ

Select Marker
1 2 3 4

Marker 3
On Off

Marker Noise
On Off

Mkr Readout>

Marker All Off

1 of 2 ↓

10:30:08 AUG 31, 2002

HANDY

Ref 57.5 dBμV

Atten 0 dB

Mkr 927.9510 MHz

13.75 dBμV

Peak

Log

5

dB/

VA SB

SC FC

AA

Th

-32.5

dBμV

Center 927.7950 MHz

*Res BW 30 kHz

*VBW 10 kHz

Span 500.0 kHz

*Sweep 75.0 msec

Display

Display Line

On

Off

Threshold

On

Off

Title>

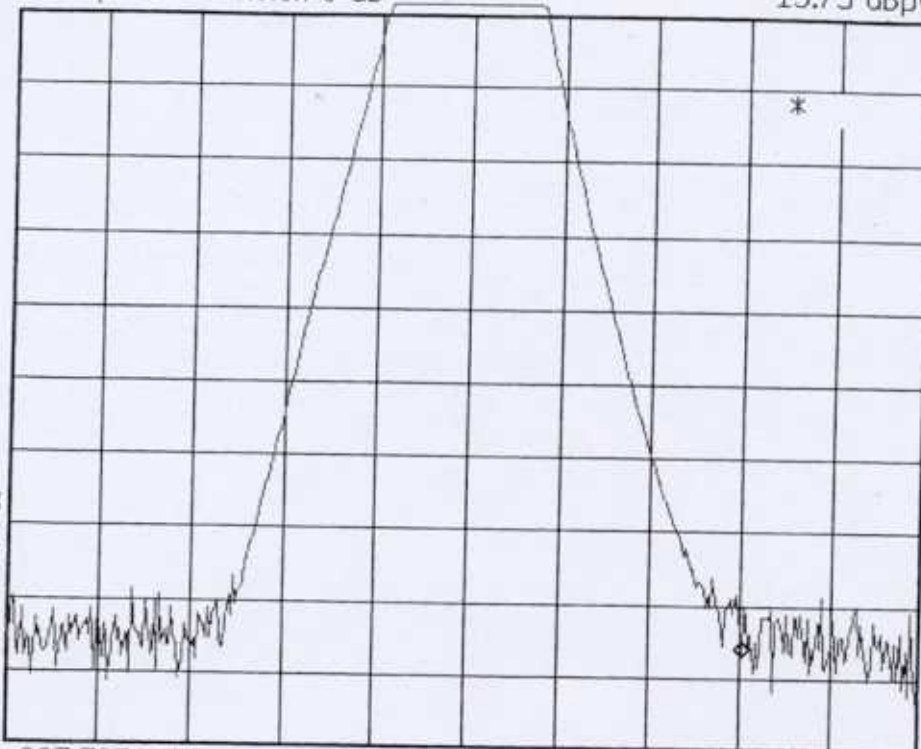
Preferences>

Contrast

Inverse Video

On

Off



SAMPLE CALCULATIONS

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

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

EX. 1.

@20.3 MHz

Class B limit = $250 \mu V = 48.0 \text{ dB } \mu V$

Reading = $40.8 \text{ dB } \mu V$ (calibrated level)

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

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

7.2 dB below limit

EX. 2.

@57.7 MHz

Class B limit = $100 \mu V/m = 40.0 \text{ dB } \mu V/m$

Reading = $19.1 \text{ dB } \mu V$ (calibrated level)

Antenna factor + Cable Loss = 10.12 dB

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

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

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

Equipment	Manufactory	Model	Cal. Date
Signal Analyzer	PMM	8010	Sep. 2001
LISN	PMM	3825/2	Apr. 2002
LISN	PMM	3825/2	Apr. 2002
Pulse Limiter	PMM	PL-01	Jul. 2002
Shielded Room	Daeil	N/A	-

Radiated Emission

Equipment	Manufactory	Model	Cal. Date
Test Receiver	R/S	ESPC	Nov. 2001
RF Amplifier	Hewlett Packard	8447F/OPT H64	April. 2002
BILOG Antenna	Schaffner	CBL-6111B	Nov. 2001
Horn Antenna	Schwarzbeck	BBHA 9120D	Sep.2001
Antenna Master	Electro-Mechanics	EMCO-1050	Nov. 2001
Turn Table	Dail EMC	DIE-1500	Feb. 2002
Spectrum Analyzer	H.P.	HP8563E	Mar. 2002
PreAmplifier	H.P.	HP8447F	May. 2002

CONCLUSION

The test results collected show that the EUT

Company : TELENETPIA CO., LTD.

Model : Batongee(TN-301)

Complies with part 15.207 & part 15.249 of the FCC Rules. The conducted and radiated emissions from this unit are observed within the limits. Emissions from the intentional radiator are wholly within the frequency range of 902~928MHz,

APPENDIX A – SAMPLE LABEL

Labelling Requirements

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

<p>Wireless Earphone Model : Batongee(TN-301) FCC ID:QJLBATONGEETN301 TELENETPIA CO., LTD.</p>
<p>THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1)THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE AND (2)THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.</p>