JungAng EMC Co., Ltd.

109-2, Yepyung-ri, Kumsa-myun, Youju-kun, Kyungki-do, KOREA
TEL: 82 31 764 0125 FAX:82 31 764 0126

FCC EMI TEST REPORT

Date of Test : **September 18, 2001**
Test Report No : **01JAC021.FCC**
Test Site : **JungAng EMC Co., Ltd., Korea(31040/SIT 1300F2)**

Trade Name : **N/A**
Manufacturer : **Ui Telecom Co., Ltd.**
Address : **Toetuk B/D 6F #1329 Dunsan-Dong, Seo-Gu, Daejun, Korea.**

Contact Person : **Seung Ho, Yoo**
Tel No. : 82-42-482-2326
Fax No. : 82-42-482-2327

Product : **900MHZ Wireless Handsfod**

Model : **Ui-502M**

Fcc Rule Part(s) : **FCC Part 15 Subpart C**

Classification : **N/A**

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 C.63.4-2000.

I attest to the accuracy of data and all measurement 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 qualification of all persons taking them.

TaeHyun Nam
President-JungAng EMC Co., Ltd.
http://www.jaemc.co.kr

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1. DESCRIPTION OF DEVICE

1.1 General

Responsible Party	**Ui Telecom Co., Ltd.**
Contact Person	**Yoo Seung Ho** **Tel No. : 82-42-482-2326** **Fax No. : 82-42-482-2327**
Manufacturer	**Ui Telecom Co., Ltd.** **Toetuk B/D 6F #1329 Dunsan-Dong, Seo-Gi, Daejun, Korea.**

- Trade name **N/A**
- Model name **Ui-502M**
- EUT Type **900MHZ Wireless Handsfod**
- Classification **N/A**
- Tx Frequency **902.3MHz**
- Clock Speed **Main Clock : 21.7, 9.6, 4.19MHz**
- Rule Part(s) **FCC Part 15 Subpart C § 15.249**
- Test Procedure(s) **ANSI C63.4(2000)**
- Date of Tests **September. 18, 2001**
- Place of Tests **JungAng EMC Co., Ltd.**

1.2 EUT Description

The EUT is RF wireless hands free of MIC type with super small size and light weight. This is the additional function for cellular phone that make you talk over the phone in case you cannot answer the phone because of using both hands, such as driving, and walking.

☑ Note.

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☑ Note.

Please refer to the duties and responsibilities of the Responsible Party attached.

2. TEST FACILITY

The open field test site and conducted measurement facility used for this measurement, is located following address. This site was fully described in a report dated Nov. 24, 1998, that was submitted to the FCC. Our site and facility had been accepted in a letter dated Nov. 24, 1998(31040 / SIT) :

JungAng EMC Co., Ltd.

Address : 109-2, Yepyung-ri, Kumsa-myun, Youju-kun, Kyungki-do, Korea

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.

3. SUMMARY OF RESULTS

3.1 Electromagnetic Emission

RFI Voltage Measurement ..... **PASS**

RFI Field Strength Measurement ..... **PASS**

Although the measured emissions indicate that the EUT complies with the required limits, some measurement are close to these limits.

When the uncertainty of measurement is considered, there is some possibility that the EUT may not be compliant.

3.2 Modifications to the EUT : None

4. TESTED SYSTEM DETAILS

4.1 Peripherals and Others :

Description	Model Name	Serial No.	Manufacturer	FCC ID
EUT	Ui- 502M	-	UI TELECOM	-
CR OSCILLATOR	AG-203	1010228	KENWOOD	-

4.2 Type of Cables Used:

Device from	Device to	Type of Cable	Length	Type of shield
EUT	Adaptor	Power cable	1.8	Non shielded
	-	-	-	-

4.3 System layout on EUT and peripherals

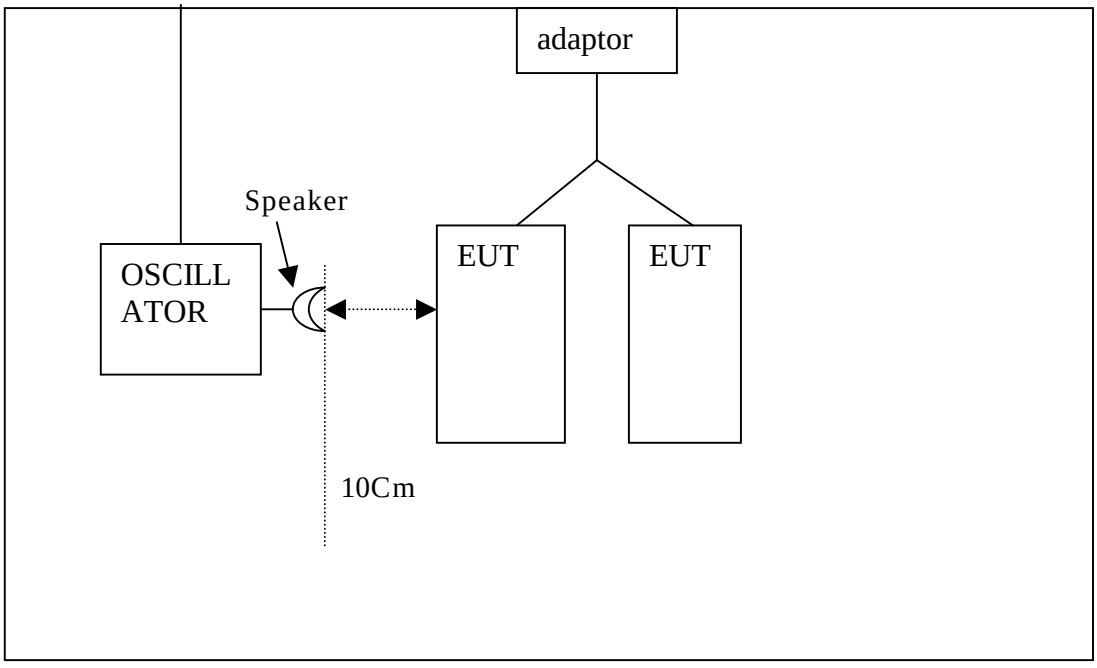


Figure 4-1 System layout

5. TEST RESULT

5.1 RFI Voltage Measurement

5.1.1 Measurement Instrumentation Used

(model / serial no. / manufacturer / last calibration / next calibration)

Signal Analyzer ..... (PMM9000 / 3100J70602 / PMM / 10 Oct. 2000 / Oct. 2001)

L.I.S.N ..... (L3-25 / 1110K70403 / PMM / 15 Aug. 2001 / Aug. 2002)

Coaxial cable ..... (RG213U / --- / MARLOW / - / -)

Shield Room ..... (JASH01 / JAC01 / DAIL EMC / --- / ---)

5.1.2 Measurement Procedure

The power line conducted interference measurement were performed according to ANSI C63.4-2000 in a Shielded room placed on a table, 0.8 m high over a metal floor.
It was located more than required distance away from the shielded enclosure wall.
Deviations from the standard was none. The EUT was plugged into the LISN and the frequency range of interest scanned. **We measured device in charging mode**.
We reported at maximum emission levels.

5.1.3 Operation Modes

EUT was tested charging mode.

5.1.4 Measurement Uncertainty

Measurement uncertainty of RFI Voltage Measurement test was estimated at ±1.8 dB(k=2)

5.1.5 Test Data

RFI Voltage Measurement Results (0.45 MHz to 30 MHz)

Operating mode : **charging Mode.**
Test procedure : ANSI C63.4-2000

Date of measurement : Sep. 18, 2001
Temperature : 25 degree C
Humidity : 65 %

Model : **Ui-502M**

Frequency (MHz)	Level (dBuV)	Line	Total Factor (dB)	Result (dBuV)	Result (uV)	Limit (uV)	Margin (dB)
4.000	18.60	N	1.02	19.62	9.57	250.00	28.38
7.310	15.30	H	1.13	16.43	6.63		31.57
8.000	15.30	N	1.15	16.45	6.65		31.55
9.750	18.10	N	1.17	19.27	9.19		28.73
9.900	21.60	N	1.17	22.77	13.76		25.23
11.890	19.20	H	1.23	20.43	10.51		27.57
16.000	13.60	N	1.28	14.88	5.55		33.12

Table 1. Line Conducted Emission Tabulated Data

Note :

1. All modes of operation were investigated and the worst-case emissions are reported.
   See attached Plots.

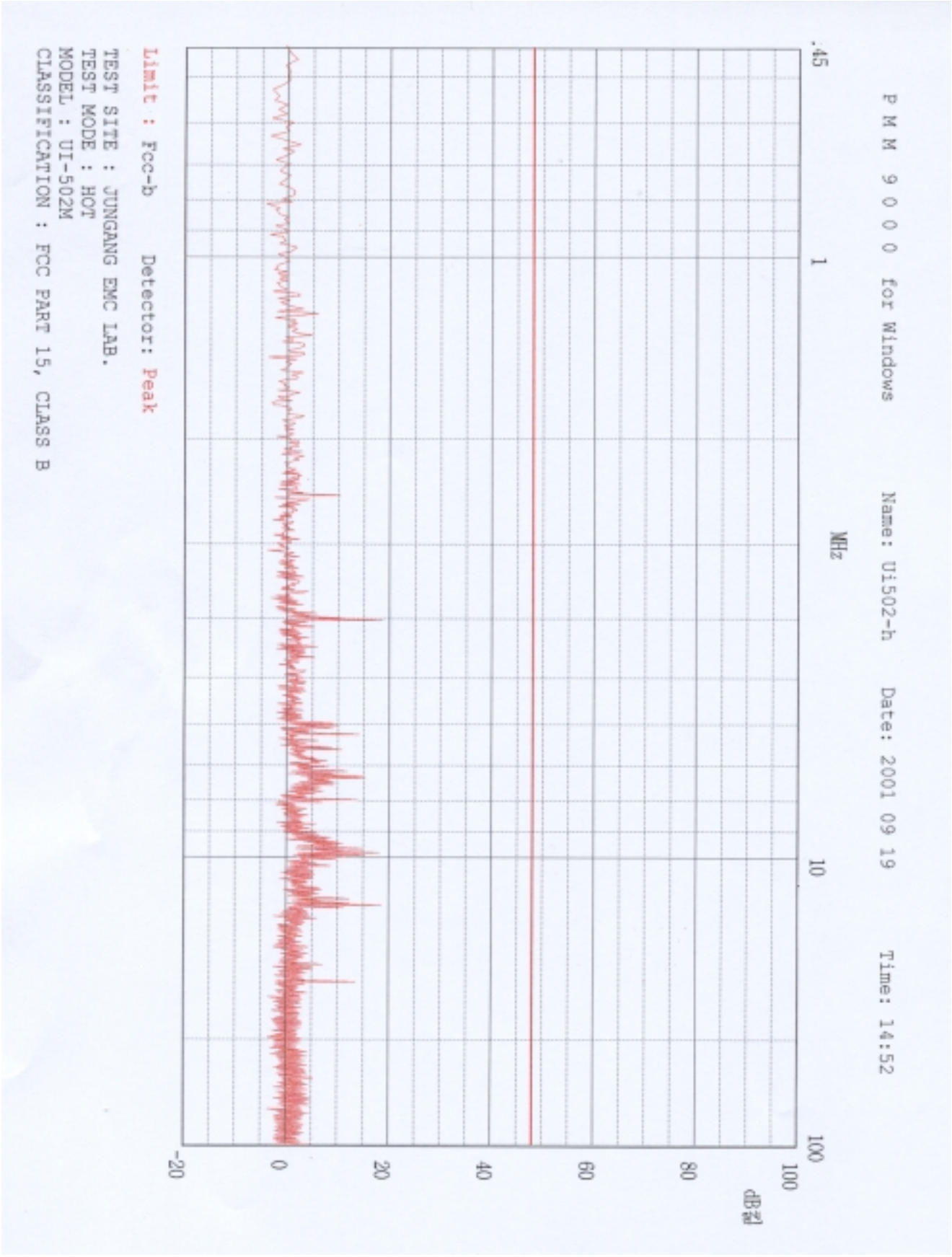
2. The limit for **FCC part 15 subpart C § 15.207** is 250 μV (48.0 dBμV) from 450 KHz to 30 MHz.

3. Line H = Hot Line N = Neutral

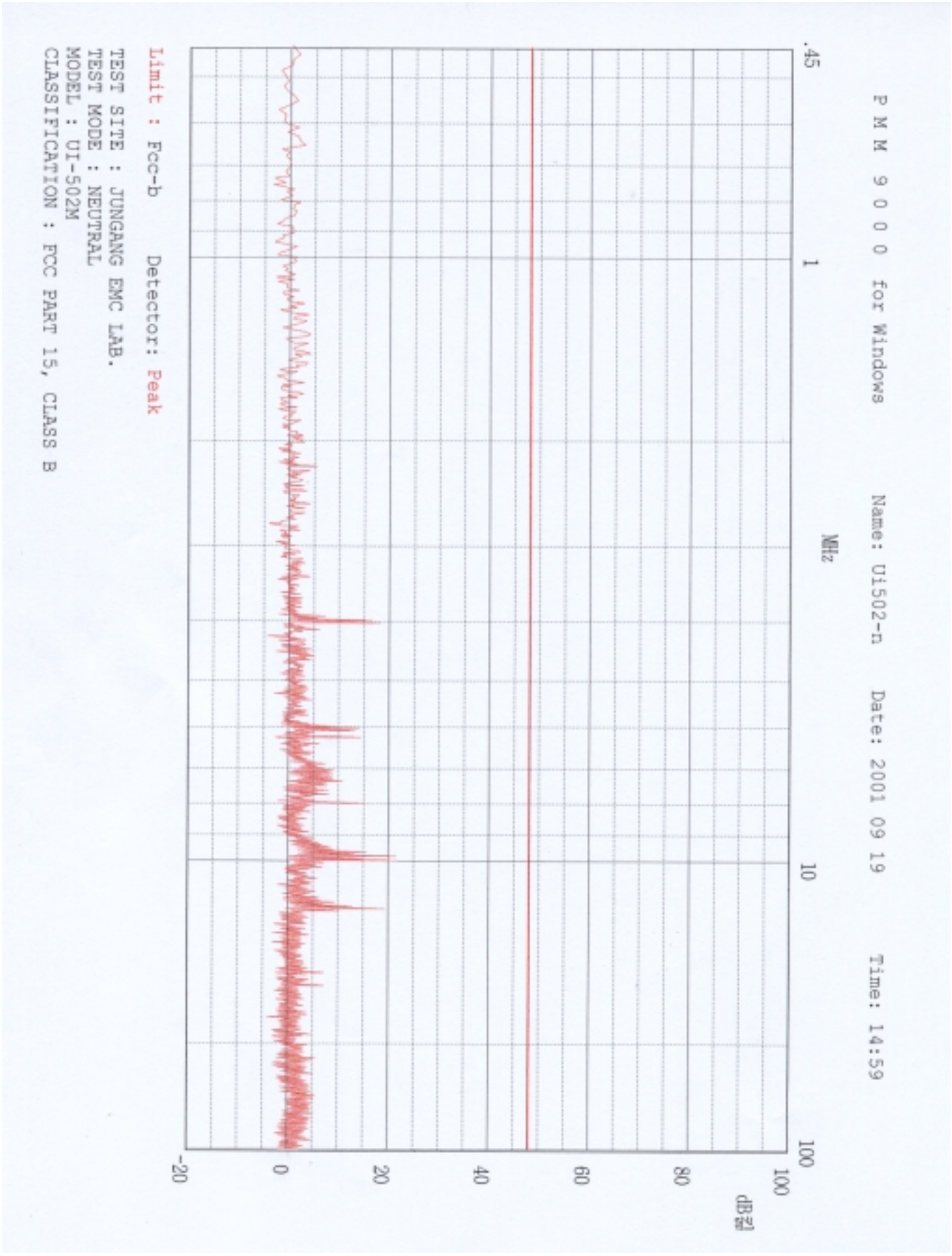
** Measurement using CISPR quasi-peak mode

Tested by **Hyung-Seok Lee**

PLOTS OF EMISSIONS



PLOTS OF EMISSIONS



5.2 RFI Field Strength Measurement

5.2.1 Measurement Instrumentation Used

(30MHz ~ 1000MHz)

Signal Analyzer ..... (PMM9000 / 3100J70602 / PMM / 10 Oct. 2000 / Oct. 2001)

Spectrum Analyzer..... (R3261 / 61720002 / Advantest / 25 Aug. 2001 / Aug. 2002)

Biconical antenna ..... (BC01 / 0020J70501 / PMM / 10 Oct. 2000 / Oct. 2001)

Log periodic antenna ..... (LP01 / 0020J70501 / PMM / 10 Oct. 2000 / Oct. 2001)

Coaxial cable ..... (RG213U / --- / MARLOW / -- / --)

(Over 1000MHz)

Pre-amplifier (8449B / 3008A00682)HP / 02 Jun. 2001 / Jun. 2002)

Spectrum Analyzer (8563E / 3450A02895)HP / 25 Jun. 2001 / Jun. 2002)

Horn Antenna (BBHA9120D / 0501 / SCHWARZBECK / 23 Mar. 2001 / Mar. 2002)

Coaxial cable (Sucoflex 104 / --- / SUCOFLEX / -- / --)

5.2.2 Measurement Procedure

Final test was performed according to ANSI C63.4-2000 at the open field site .
Deviations from the standard were none.

The EUT was placed in a 0.8 m high table along with the peripherals. The turn table was separated from the antenna with the distance of 3 meter. Cables were placed in a position to produce maximum emissions as determined by experimentation, and operation mode was selected for maximum.

The frequencies and amplitudes of maximum emission were measured at varying azimuths, antenna heights and antenna polarities. **We measured device in normal operation mode**.
We reported at maximum emission levels.

5.2.3 Operation Modes

EUT was tested according to the specifications given by the manufacturer, and exercised in the most unfavorable manner.
We tested have a 1000Hz tone at 100-dB SPL APPLIED 10Cm from the microphone.

5.2.4 Measurement Uncertainty

Measurement uncertainty of RFI Field Strength Measurement test was estimated at ±3.5 dB(k=2)

5.2.5 Test Data

RFI Field Strength Measurement Results(30 MHz to 1000 MHz)

Testing mode : **Spurious emission test.**
Test procedure : ANSI C63.4-2000

Date of measurement : Sep. 18 2001
Temperature : 26 degree C
Humidity : 65 %

Model : **Ui –502M**

Frequency (MHz)	Level (dBuV)	Antenna Pplarity (H/V)	Factor (dB)	Loss (dB)	Level (dBuV/m)	Level (uV/m)	Limit (uV/m)	Margin (dB)
452.60	13.25	H	16.96	4.63	34.84	55.21	200	11.16
474.80	7.25	H	17.46	4.77	29.48	29.79		16.52

Table 2. Radiated Measurements at 3meters.

Note :

1. All modes of operation were investigated and the worst-case emissions are reported.
2. The limit for FCC part 15 subpart C § 15.209 is 100 μV/m (40.0 dBμV/m) from 30 MHz to 88 MHz, 150 μV/m (43.5 dBμV/m) from 88 MHz to 216 MHz, 200 μV/m(46.0 dBμV/m) from 216 MHz to 960 MHz and 500 μV/m (53.98 dBμV/m) from above 960 MHz.

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

Tested by **Hyung-Seok Lee**

5.2.6 Test Data

RFI Field Strength Measurement Results(30 MHz to 10 GHz)

Testing mode : **Carrier & harmonic test.**
Test procedure : ANSI C63.4-2000

Date of measurement : Sep. 18, 2001
Temperature : 26 degree C
Humidity : 65 %

Model : **Ui-502M**

Frequency (MHz)	Level (dBuV)	Antenna Pplarity (H/V)	Factor (dB)	Loss (dB)	Level (dBuV/m)	Level (uV/m)	Limit (uV/m)	Margin (dB)
902.30	57.20	H	24.77	6.80	88.77	27447.32	50000	5.21
1804.79	12.12	H	25.10	8.15	45.37	185.57	500	8.63

Table 2. Radiated Measurements at 3meters.

Note :

1. **This device is body-worn product. So we tested rotated through three orthogonal axes and the worst-case emissions are reported.**
2. **The limit for fcc part 15 subpart C § 15.249 is the following**

a. 15.249(a)

Fundamental frequency (MHz)	Field strength of fundamental (Millivolts/Meter)	Field strength of harmonics (Microvolts/Meter)
902 - 928	50	500

b. 15.249(c)

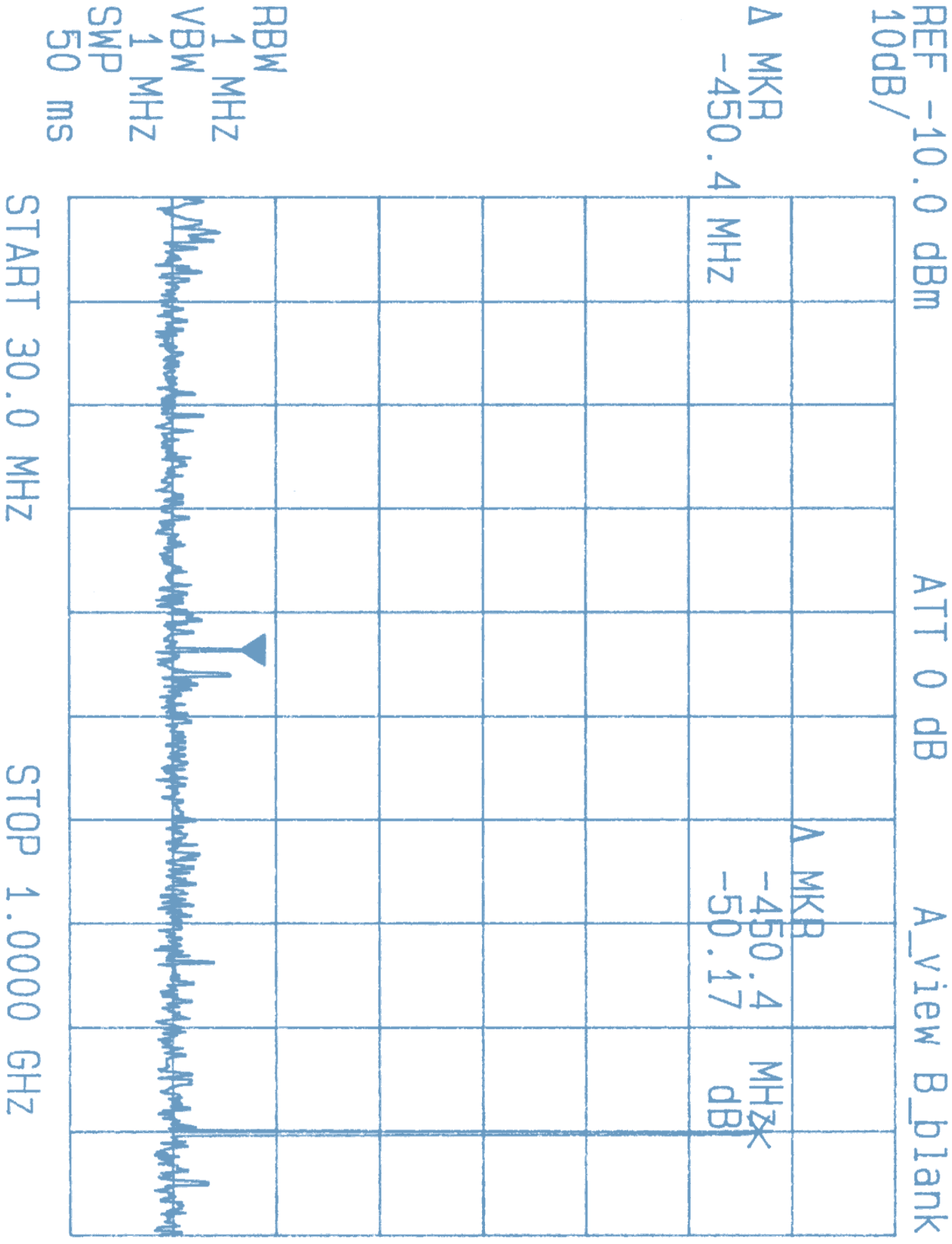
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

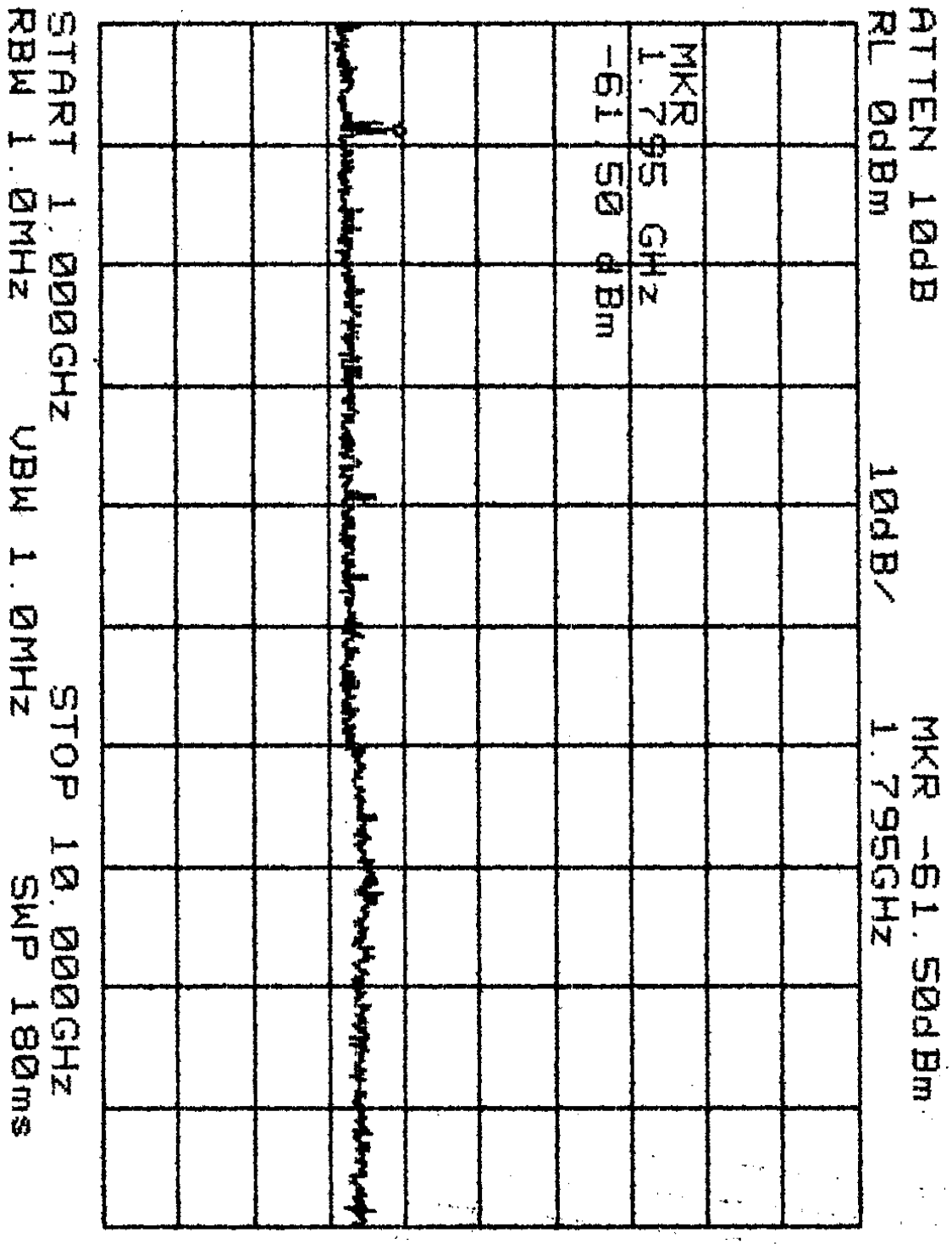
See attached Plots.

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

Tested by **Hyung-Seok Lee**

PLOTS OF EMISSIONS




ATTEN 10dB
RL 0dBm
10dB/
MKR -61.50dBm
1.795GHz
MKR
1.795 GHz
-61.50 dBm
START 1.000GHz
RBW 1.0MHz
VBW 1.0MHz
STOP 10.000GHz
SWP 180ms

5.3 Minimum Margin

Conducted emission

Ui-502M	**Charging mode**	9.90 MHz,	25.23 dB

Radiated emission

Ui-502M	**TX mode**	902.3 MHz,	5.21 dB

5.4 SAMPLE CALCULATIONS

$$dB\mu V = 20 \log 10 (\mu V / m)$$

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

EX. 1.

@ 9.90 MHz Class B limit = 250 μV = 48 dBμV

Reading = 21.60 dBμV (calibrated level)
Lisn factor + Cable Loss = 1.17 dB
Total = 22.77 dBμV
$10^{(22.77/20)}$ = 13.76 μV

Margin = 48 – 22.77 = 25.23dB
25.23 dB ; below limit

EX. 2.

@ 902.3 MHz limit = 50000 μV / m = 93.98 dBμV / m

Reading = 57.20 dBμV(calibrated level)
Antenna factor + Cable Loss = 31.57 dB
Total = 88.77 dBμV / m
$10^{(88.77/20)}$ = 27447.32 μV / m

Margin = 93.98– 88.77 = 5.21 dB
5.21 dB ; below limit

6. MEASUREMENT PHOTOS

6.1 Setup with the Maximized RFI Voltage Emission Level

6.2 Setup with the Maximized RFI Field Strength Emission Level