

# Electromagnetic Emission

## FCC MEASUREMENT REPORT

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### VERIFICATION OF COMPLIANCE

### FCC Part 15 Certification Measurement

**PRODUCT** : 900MHz Cordless Telephone  
**MODEL/TYPE NO** : WHF-7020S  
**FCC ID** : O6JWHF-7020S  
**APPLICANT** : OPENERS Co.,Ltd.  
3<sup>rd</sup> FL. Sungji Bldg., 499, Wolpyung1-Dong,  
Seo-Gu, Taejon, 302-281, Korea  
Attn. : Byung Ho, Yoon  
**FCC CLASSIFICATION** : Low Power Communication Device Transceiver(DXT)  
Intentional Radiator  
**FCC RULE PART(S)** : FCC Part 15 Subpart C Part 15.249  
**FCC PROCEDURE** : Certification  
**TRADE NAME** : OPENERS  
**TEST REPORT No.** : E01.0608.FCC.241.N  
**DATES OF TEST** : May 26, 2001  
**DATES OF ISSUE** : June 08, 2001  
**TEST LAB.** : ETL Inc ( FCC Registration Number : 95422)  
371-51, Gasan-Dong, Geumcheon-Gu, Seoul, Korea  
Tel : (031) 885-0072 Fax : (031) 885-0074

This 900MHz Cordless Telephone has been tested in accordance with the measurement procedures specified in ANSI C63.4-1992 at the ETL/EMC Test Laboratory and has been shown to be complied with the applicable technical standards specified in FCC Rule Part15 Subpart C section15.249as indicated in the measurement report.

I attest to the accuracy of data. All measurement 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. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.



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Title : Chief Engineer & Lab.Manager

**E-RAE Testing Laboratory Inc.**  
371-51, Gasan-Dong, Geumcheon-Gu,  
Seoul, 153-023, Korea

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## FCC MEASUREMENT REPORT

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**Scope** – Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)

### General Information

**Applicant Name** : OPENERS Co.,Ltd.

**Address** : 3<sup>rd</sup> FL. Sungji Bldg., 499,  
Wolpyung1-Dong, Seo-Gu,  
Taejon, 302-281, Korea

**Attention** : Byung Ho, Yoon

- **EUT Type** : Cordless Telephone
- **Model Number** : WHF-7020S
- **FCC Identifier** : O6JWHF-7020S
- **S/N** : Prototype
- **Freq. Range** : 902.30 MHz – 904.75 MHz(Base station)  
925.30 MHz – 927.25 MHz(Handy Unit)
- **FCC Rule Part(s)** : Part 15 Subpart C Section 15.249
- **Test Procedure** : ANSI C63.4-1992
- **FCC Classification** : Low Power Communication Device Transceiver(DXT) :  
Intentional Radiator
- **Dates of Tests** : May 25, 2001
- **Place of Tests** : ETL Inc  
EMC Testing Lab (FCC Registration Number : 95422)  
584, Sangwhal-Ri, Kanam-Myun, Yoju-Kun,  
Kyounggi-Do, Korea  
Tel : (031) 885-0072 Fax : (031) 885-0074
- **Test Report No.** : E01.0608.FCC.241.N

## 1. INTRODUCTION

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The measurement test for radiated and conducted emission test were conducted at the open area test site of E-RAE Testing Laboratory Inc. facility located at 584, Sangwhal-ri, Ganam-myun, Youju-kun, Kyoungki-do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-1992 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 and 10 meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-1992 and registered to the Federal Communications Commission(Registration Number : 95422 ).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-1992) was used in determining radiated and conducted emissions from the Openers Co.,Ltd. Cordless Telephone Model : WHF-7020S.

## 2. PRODUCT INFORMATION

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### 2.1 Equipment Description

The Equipment Under Test(EUT) is the Openers Co., Ltd. Cordless Telephone Model: WHF-7020S(FCC ID : O6JWHF-7020S). This cordless telephone is powered by rechargeable batteries(handy unit) and AC power supply adapter(base station). This cordless telephone has internet phone function through VoIP Gateway and e-mail checking function.

### 2.2 General Specification

|                                                    |                                                                            |
|----------------------------------------------------|----------------------------------------------------------------------------|
| - Chassis Type                                     | Plastic                                                                    |
| - List of Each OSC. Or X-Tal. Freq.( $\geq 1$ MHz) | X1:3.579MHz                                                                |
| - MCU                                              | HT93LC46                                                                   |
| - RF Frequency Out                                 | 902.8 MHz – 904.75 MHz(Base station)<br>925.3 MHz – 927.75 MHz(Handy Unit) |
| - Channel Number                                   | 40 ch                                                                      |
| - Communication                                    | Full duplex                                                                |
| - Modulation Type                                  | Analog FM                                                                  |
| - Antenna Type                                     | Omni-directional antenna permanently attached to the unit                  |
| - Max. Transmission Output                         | 10 dBm                                                                     |
| - Supurious transmission                           | -55dBm                                                                     |
| - I/O Cable(s)                                     | Two Unshielded RJ-11C (Line/Phone), Interface cable to PC                  |
| - Power Requirement                                | Handset unit : NI-MH 3.6V 400mAh<br>Base unit : AC Adapter 120VAC 0.07A    |
| - Dimension(HxWxD)                                 | 70 x 59.3 x 28 mm ( for handy unit)                                        |

### 3. DESCRIPTION OF TESTS

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#### 3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-1992. The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50 $\Omega$ /50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1m x 1.5m x 0.8m wooden table which is placed 40cm away from the vertical wall and 1.5m away from the side wall of the chamber room. Two EMCO 3825/2 LISN are bonded to the shielded room. The EUT is powered from the EMCO LISN and the support equipment is powered from the another EMCO LISN. Power to the LISNs is filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner  $\phi$  1.2cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the EMCO LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling (serpentine fashion) to a 1m 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 R3261A Spectrum Analyzer to determine the frequency producing the max. emission from the EUT. The frequency producing the max. level was reexamined using the detector function set to the CISPR Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.45 to 30MHz. The bandwidth of the Spectrum Analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was maximized by switching power lines, varying the mode of operation or resolution, clock or data exchange speed, if applicable, whichever determined the worst-case emission. Each emission reported was calibrated using self-calibrating mode. Photographs of the worst-case emission can be seen in photographs of conducted emission test setup.

### 3. DESCRIPTION OF TESTS

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#### 3.2 Radiated Emission Measurement

Preliminary measurements were made at indoors 3 meter semi EMC Anechoic Chamber using broadband antennas, broadband amplifier, and spectrum analyzer to determine the emission frequencies producing the maximum EME.

Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000MHz using biconilog antenna and above 1000MHz, linearly polarized double ridge horn antennas were used. The measurements were performed with three frequencies which were selected as bottom, middle and top frequency in the operating frequency band. Emission level from the EUT with various configurations were examined on the spectrum analyzer connected with the RF amplifier and plotted graphically.

Final measurements were made outdoors open site at 3-meter test range using biconilog antenna. The output from the antenna was connected, via a preselector or a preamplifier, to the input of the EMI Measuring Receiver and Spectrum analyzer(for above 1GHz). The detector function was set to the quasi-peak or peak mode as appropriate. The measurement bandwidth on the Field strength receiver was set to at least 120kHz (1MHz for measurement above 1GHz), with all post-detector filtering no less than 10 times the measurement bandwidth. 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 preliminary measurement was examined and investigated as the same set up and configuration which produced the maximum emission. The EUT, support equipment and interconnecting cables were 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 1m x 1.5 meter table. The turntable containing the system was rotated and the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission.

Each emission was maximized by varying the mode of operating frequencies of the EUT. The system was tested in all the three orthogonal planes and changing the polarity of the antenna. The worst case emissions are recorded in the data tables. If necessary, the radiated emission measurement could be performed at a closer distance to ensure higher accuracy and the results were extrapolated to the specified distance using an inverse linear distance extrapolation factor(20dB/decade) as per section 15.31(f).

Photographs of the worst-case emission test setup can be seen in Appendix B.

## 4. TEST CONDITION

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### 4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipments were installed to meet FCC requirement and operated in a manner which tends to maximize its emission level in a typical application.

The following test mode for EUT operating were investigated

- Internet Phone function : worst case condition
- Normal cordless phone function

### 4.2 Support Equipment Used

Following peripheral devices and interface cables were connected during the measurement:

#### EUT- 900MHz Cordless Telephone

|                   |                                                 |
|-------------------|-------------------------------------------------|
| FCC ID            | : O6JWHF-7020S                                  |
| Model Name        | : WHF-7020S                                     |
| Serial No.        | : Prototype                                     |
| Manufacturer      | : Openers Cp.,Ltd.                              |
| Power Supply Type | : AC 120V Adapter (Model : AP120902)            |
| Interface Cable   | : Non shielded type Manufacturer supplied cable |
| Tel Line Cord     | : Non-shielded type 2m                          |

#### Support Unit 1 – Personal Computer

|                   |                                                 |
|-------------------|-------------------------------------------------|
| FCC ID            | : N/A                                           |
| Model Name        | : PRESARIO 2230                                 |
| Serial No.        | : 8742BP9M2143                                  |
| Manufacturer      | : COMPAQ/영국                                     |
| Power Supply Type | : Internal SMPS AC 120V                         |
| Power Cord        | : Non shielded type 1.2m                        |
| Interface cable   | : Non shielded , non detachable interface cable |

#### Support Unit 2- Monitor

|                   |                                          |
|-------------------|------------------------------------------|
| FCC ID            | : CKLHL-7682B                            |
| Model Name        | : HL-7682B                               |
| Serial No.        | : N/A                                    |
| Manufacturer      | : Hyundai Electronics Industry Co., Ltd. |
| Power Supply Type | : SMPS AC120V                            |
| Power Cord        | : Non-shielded, Detachable: 1.2m         |
| Data Cable        | : Shielded 15pin D-sub, 1.5m             |

#### Support Unit 3- Printer

|                   |                       |
|-------------------|-----------------------|
| FCC ID            | : B94C2164X           |
| Model Name        | : C4562B              |
| Serial No.        | : TH9411434G          |
| Manufacturer      | : H.P                 |
| Power Supply Type | : DC 24V From Adaptor |
| Power Cord        | : Non-Shield, 1.5m    |
| Data Cable        | : Shielded, 1.5m      |

## 4. TEST CONDITION

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### Support Unit 4-Keyboards

FCC ID : N/A(DoC)  
Model Name : RT2156TWGR  
Serial No. : BOAB80B39FB16H  
Manufacturer : COMPAQ/Taiwan  
Power Supply Type : N/A  
Power Cord : N/A  
Data Cable : Shielded, 1.5m

### Support Unit 5-Mouse

FCC ID :  
Model Name : GNEZE4  
Serial No. : 970122726  
Manufacturer : COMPAQ/Taiwan  
Power Supply Type : N/A  
Power Cord : N/A  
Data Cable : Shielded, 1.2m

### Support Unit 6- Joystick

FCC ID :  
Model Name : DHA-2000  
Serial No. : N/A  
Manufacturer : Dahoo Electronics Co., Ltd.  
Power Supply Type :  
Power Cord : Non-shielded, Detachable: 1.2m  
Data Cable : Shielded 15pin D-sub, 1.5m

## 5. TEST RESULTS

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### 5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

| FCC Rule Parts   | Measurement Required                           | Result               |
|------------------|------------------------------------------------|----------------------|
| 15.249(a)        | Radiated Emissions of RF Carrier and Harmonics | Passed by – 2.18 dB  |
| 15.249(c)/15.209 | Out-of-band Radiated Emissions(Spurious)       | Passed by – 17.72 dB |
| 15.209(a)        | AC Line Conducted Emission Measurement         | Passed by – 23.05 dB |

The data collected shows that the **OPENERS Co.,Ltd. 900 MHz Cordless Telephone WHF-7020S** complies with technical requirements of the Part 15.247 of the FCC Rules.

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

## 5. TEST RESULTS

### 5.2 Radiated Emissions of RF Carrier and Harmonics

|                       |                                                |
|-----------------------|------------------------------------------------|
| EUT                   | Cordless Telephone WHF-7020S (SN:Prototype)    |
| Limit apply to        | FCC Part15 Subpart C Section 15.249(a)         |
| Test Date             | May 25, 2001                                   |
| Operating Condition   | Carrier channel : 902.8 MHz (Base station Low) |
| Environment Condition | Humidity Level : 37 %RH, Temperature : 22°C    |
| Result                | Passed                                         |

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.

Detector mode : Peak mode

Measurement Distance : 3 meters

| Frequency [MHz] | Reading [dBμV] | Polarization (*H/**V) | AFCL [dB] | AMP. [dB] | Emission Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] |
|-----------------|----------------|-----------------------|-----------|-----------|-------------------------|----------------|-------------|
| 902.8           | 87.7           | V                     | 31.34     | 28.5      | 90.54                   | 94.0           | -3.46       |
| 1805.6          | 38.5           | V                     | 31.50     | 31.0      | 36.48                   | 54.0           | -17.52      |
| 2708.4          | 27.8           | V                     | 34.10     | 31.0      | 30.90                   | 54.0           | -23.10      |
| 3611.2          | 28.6           | V                     | 37.90     | 31.0      | 35.50                   | 54.0           | -18.50      |
| 4514.0          | 24.1           | V                     | 38.52     | 31.0      | 31.62                   | 54.0           | -22.38      |
| 5416.8          | 20.6           | V                     | 40.10     | 31.0      | 29.70                   | 54.0           | -24.30      |

#### NOTES :

1. \* H : Horizontal polarization , \*\* V : Vertical polarization
2. Emission Level = Reading + AFCL(antenna factor + Cable loss) – AMP.Gain
3. Margin value = Emission Level - Limit
4. Measurement were performed at two frequencies as bottom and top of the operating frequency range.
5. The EUT was tested in all the three orthogonal planes and the worst case emissions was vertical axes.
6. The EUT(handset unit) was tested in all the three orthogonal planes and the worst case emissions was vertical axes. The EUT(base station) antenna was placed vertical and horizontal position for the measurement.

*Y. H. Park*

Tested by : Y. H. Park / Test Engineer

## 5. TEST RESULTS

### 5.2 Radiated Emissions of RF Carrier and Harmonics

|                       |                                                  |
|-----------------------|--------------------------------------------------|
| EUT                   | Cordless Telephone WHF-7020S (SN:Prototype)      |
| Limit apply to        | FCC Part15 Subpart C Section 15.249(a)           |
| Test Date             | May 25, 2001                                     |
| Operating Condition   | Carrier channel : 904.75 MHz (Base station High) |
| Environment Condition | Humidity Level : 37 %RH, Temperature : 22°C      |
| Result                | Passed                                           |

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.

Detector mode : Peak mode

Measurement Distance : 3 meters

| Frequency [MHz] | Reading [dBμV] | Polarization (*H/**V) | AFCL [dB] | AMP. [dB] | Emission Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] |
|-----------------|----------------|-----------------------|-----------|-----------|-------------------------|----------------|-------------|
| 904.75          | 86.8           | V                     | 31.34     | 28.5      | 89.64                   | 94.0           | -4.36       |
| 1809.5          | 37.5           | V                     | 31.50     | 31.0      | 38.00                   | 54.0           | -16.00      |
| 2714.3          | 28.4           | V                     | 34.10     | 31.0      | 31.50                   | 54.0           | -22.50      |
| 3619.0          | 25.7           | V                     | 37.90     | 31.0      | 32.60                   | 54.0           | -21.40      |
| 4523.8          | 24.1           | V                     | 38.52     | 31.0      | 31.62                   | 54.0           | -22.38      |
| 5428.5          | 20.6           | V                     | 40.10     | 31.0      | 29.60                   | 54.0           | -24.40      |

#### NOTES :

1. \* H : Horizontal polarization , \*\* V : Vertical polarization
2. Emission Level = Reading + AAFCL(antenna factor + Cable loss) – AMP.Gain
3. Margin value = Emission Level - Limit
4. Measurement were performed at two frequencies as bottom and top of the operating frequency range.
5. The EUT was tested in all the three orthogonal planes and the worst case emissions was vertical axes.
6. The EUT(handset unit) was tested in all the three orthogonal planes and the worst case emissions was vertical axes. The EUT(base station) antenna was placed vertical and horizontal position for the measurement.

*Y. H. Park*

Tested by : Y. H. Park / Test Engineer

## 5. TEST RESULTS

### 5.2 Radiated Emissions of RF Carrier and Harmonics

|                       |                                              |
|-----------------------|----------------------------------------------|
| EUT                   | Cordless Telephone WHF-7020S (SN:Prototype)  |
| Limit apply to        | FCC Part15 Subpart C Section 15.249(a)       |
| Test Date             | May 25, 2001                                 |
| Operating Condition   | Carrier channel : 925.3 MHz (Handy Unit Low) |
| Environment Condition | Humidity Level : 37 %RH, Temperature : 22°C  |
| Result                | Passed                                       |

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.

Detector mode : Peak mode

Measurement Distance : 3 meters

| Frequency [MHz] | Reading [dBμV] | Polarization (*H/**V) | AFCL [dB] | AMP. [dB] | Emission Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] |
|-----------------|----------------|-----------------------|-----------|-----------|-------------------------|----------------|-------------|
| 925.3           | 88.5           | V                     | 31.82     | 28.5      | 91.82                   | 94.0           | -2.18       |
| 1805.6          | 39.0           | V                     | 31.50     | 31.0      | 39.50                   | 54.0           | -14.50      |
| 2775.9          | 32.3           | V                     | 34.10     | 31.0      | 35.40                   | 54.0           | -18.60      |
| 3701.2          | 24.7           | V                     | 37.90     | 31.0      | 31.60                   | 54.0           | -22.40      |
| 4626.5          | 21.2           | V                     | 38.52     | 31.0      | 28.72                   | 54.0           | -25.28      |
| 5551.8          | 19.9           | V                     | 40.10     | 31.0      | 29.00                   | 54.0           | -25.00      |

#### NOTES :

1. \* H : Horizontal polarization , \*\* V : Vertical polarization
2. Emission Level = Reading + AAFCL(antenna factor + Cable loss) – AMP.Gain
3. Margin value = Emission Level – Limit
4. Measurement were performed at two frequencies as bottom and top of the operating frequency range.
5. The EUT was tested in all the three orthogonal planes and the worst case emissions was vertical axes.
6. The EUT(handset unit) was tested in all the three orthogonal planes and the worst case emissions was vertical axes. The EUT(base station) antenna was placed vertical and horizontal position for the measurement.

*Y. H. Park*

Tested by : Y. H. Park / Test Engineer

## 5. TEST RESULTS

### 5.2 Radiated Emissions of RF Carrier and Harmonics

|                       |                                                |
|-----------------------|------------------------------------------------|
| EUT                   | Cordless Telephone WHF-7020S (SN:Prototype)    |
| Limit apply to        | FCC Part15 Subpart C Section 15.249(a)         |
| Test Date             | May 25, 2001                                   |
| Operating Condition   | Carrier channel : 927.25 MHz (Handy Unit High) |
| Environment Condition | Humidity Level : 37 %RH, Temperature : 22°C    |
| Result                | Passed                                         |

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.

Detector mode : Peak mode

Measurement Distance : 3 meters

| Frequency [MHz] | Reading [dBμV] | Polarization (*H/**V) | AFCL [dB] | AMP. [dB] | Emission Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] |
|-----------------|----------------|-----------------------|-----------|-----------|-------------------------|----------------|-------------|
| 927.3           | 88.3           | V                     | 31.82     | 28.5      | 91.62                   | 94.0           | -2.38       |
| 1854.5          | 38.6           | V                     | 31.50     | 31.0      | 39.10                   | 54.0           | -14.90      |
| 2781.8          | 30.2           | V                     | 34.10     | 31.0      | 33.30                   | 54.0           | -20.70      |
| 3709.0          | 22.4           | V                     | 37.90     | 31.0      | 29.30                   | 54.0           | -24.70      |
| 4636.3          | 20.8           | V                     | 38.52     | 31.0      | 28.32                   | 54.0           | -25.68      |
| 5563.5          | 19.8           | V                     | 40.10     | 31.0      | 28.90                   | 54.0           | -25.10      |

#### NOTES :

1. \* H : Horizontal polarization , \*\* V : Vertical polarization
2. Emission Level = Reading + AAFCL(antenna factor + Cable loss) – AMP.Gain
3. Margin value = Emission Level - Limit
4. Measurement were performed at two frequencies as bottom and top of the operating frequency range.
5. The EUT was tested in all the three orthogonal planes and the worst case emissions was vertical axes.
6. The EUT(handset unit) was tested in all the three orthogonal planes and the worst case emissions was vertical axes. The EUT(base station) antenna was placed vertical and horizontal position for the measurement.

*Y. H. Park*

Tested by : Y. H. Park / Test Engineer

## 5. TEST RESULTS

### 5.3 Out-of-band Radiated Emissions(Spurious)

|                       |                                                 |
|-----------------------|-------------------------------------------------|
| EUT                   | Cordless Telephone WHF-7020S (SN:Prototype)     |
| Limit apply to        | FCC Part15 Subpart C Section 15.209 & 15.249(c) |
| Test Date             | May 25, 2001                                    |
| Operating Frequencies | 902 – 927 MHz                                   |
| Environment Condition | Humidity Level : 37 %RH, Temperature : 22°C     |
| Result                | Passed by – 17.72dB                             |

### Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.

Detector mode : CISPR Quasi-Peak mode ( 6dB Bandwidth : 120 kHz )

Measurement Distance : 3 meters

| Frequency [MHz] | Reading [dBμV] | Polarization (*H/**V) | Ant. Factor [dB] | Cable Loss [dB] | Emission Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] |
|-----------------|----------------|-----------------------|------------------|-----------------|-------------------------|----------------|-------------|
| 35.40           | 7.90           | V                     | 13.32            | 1.06            | 22.28                   | 40.0           | -17.72      |
| 72.20           | 5.60           | V                     | 9.83             | 1.57            | 17.00                   | 40.0           | -23.00      |
| 112.90          | 5.20           | V                     | 10.37            | 1.96            | 17.53                   | 40.0           | -22.47      |
| 135.34          | 7.92           | H                     | 12.12            | 2.18            | 22.22                   | 43.5           | -21.30      |
| 163.80          | 6.00           | V                     | 12.80            | 2.39            | 21.19                   | 43.5           | -22.31      |
| 208.57          | 11.90          | H                     | 9.51             | 2.68            | 24.09                   | 43.5           | -19.41      |
| 241.83          | 5.92           | H                     | 10.69            | 2.96            | 19.57                   | 43.5           | -23.97      |
| 247.77          | 11.65          | H                     | 10.69            | 2.96            | 25.30                   | 43.5           | -18.20      |
| 255.86          | 9.20           | H                     | 11.38            | 3.08            | 23.66                   | 43.5           | -19.84      |
| 316.29          | 10.35          | H                     | 12.77            | 3.38            | 26.50                   | 46.0           | -19.50      |
| 391.00          | 8.82           | H                     | 14.32            | 3.82            | 26.96                   | 46.0           | -19.04      |
| 446.57          | 10.17          | H                     | 15.48            | 4.05            | 29.70                   | 46.0           | -16.30      |

#### NOTES :

1. \* H : Horizontal polarization , \*\* V : Vertical polarization
2. Emission Level = Reading + Antenna factor + Cable loss
3. Margin value = Emission Level - Limit
4. All operating modes and channels were investigated and the worst-case emissions were reported.
5. All other emissions not reported were more than 25dB below the permitted limit.
6. The EUT(handset unit) was tested in all the three orthogonal planes and the worst case emissions was vertical axes. The EUT(base station) antenna was placed vertical and horizontal position for the measurement.

*Y. H. Park*

Tested by : Y. H. Park / Test Engineer

## 5. TEST RESULTS

### 5.4 AC Line Conducted Emission Measurement

|                       |                                             |
|-----------------------|---------------------------------------------|
| EUT                   | Cordless Telephone WHF-7020S (SN:Prototype) |
| Limit apply to        | FCC Part15 Subpart C Section 15.207(a)      |
| Test Date             | May 25, 2001                                |
| Operating Condition   | Internet Phone Function                     |
| Environment Condition | Humidity Level : 37 %RH, Temperature : 22°C |
| Result                | Passed by – 23.05dB                         |

### Conducted Emission Test Data

The following table shows the highest levels of conducted emissions on both polarization of live and neutral line.

Detector mode : CISPR Quasi-Peak mode ( 6dB Bandwidth : 9 KHz )

| Frequency<br>[MHz] | Reading<br>[dBμV] |         | Phase<br>(*H/**N) | Limit<br>[dBμV] |         | Margin<br>[dB] |         |
|--------------------|-------------------|---------|-------------------|-----------------|---------|----------------|---------|
|                    | Quasi-peak        | Average |                   | Quasi-peak      | Average | Q.Peak         | Average |
| 0.152              | 44.32             | -       | H                 | 65.8            | 55.8    | 21.48          |         |
| 0.311              | 37.82             | -       | H                 | 59.9            | 49.9    | 22.08          | -       |
| 0.470              | 35.15             | -       | N                 | 56.00           | 46.00   | 20.85          | -       |
| 0.592              | 33.12             | -       | H                 |                 |         | 22.80          | -       |
| 0.633              | 32.32             | -       | N                 |                 |         | 23.68          | -       |
| 2.300              | 26.15             | -       | H                 |                 |         | 29.85          | -       |
| 3.490              | 35.80             | -       | N                 |                 |         | 20.20          | -       |
| 7.130              | 25.92             | -       | N                 | 60.00           | 50.00   | 34.00          | -       |
| 10.74              | 32.10             | -       | N                 |                 |         | 27.90          | -       |
| 14.30              | 34.97             | -       | H                 |                 |         | 25.03          | -       |
| 21.96              | 23.05             | -       | H                 |                 |         | 36.95          | -       |

#### NOTES :

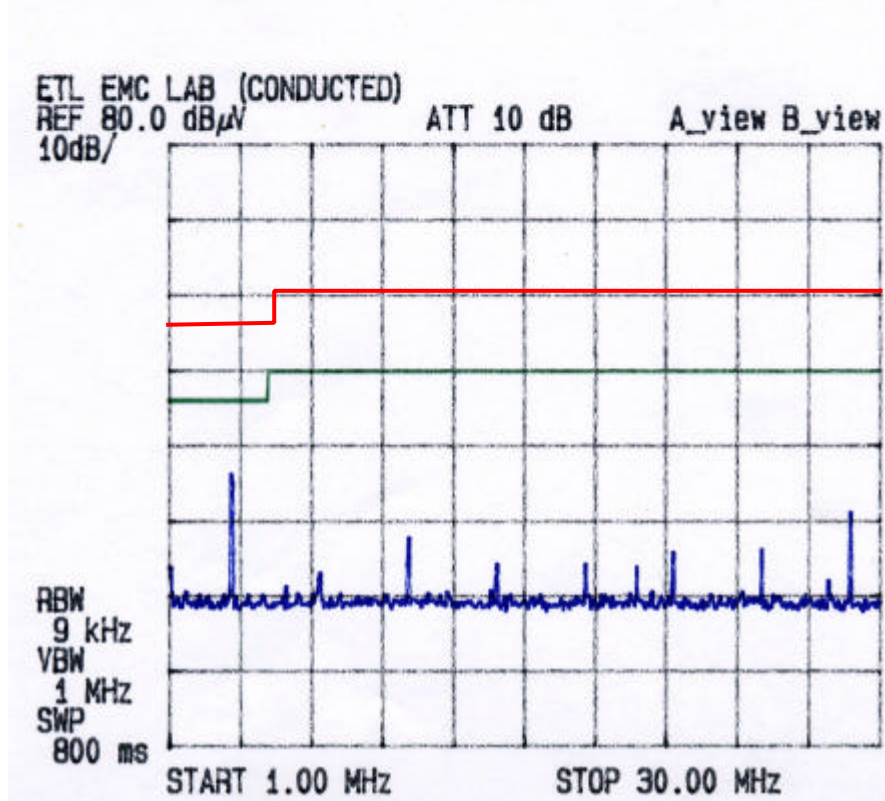
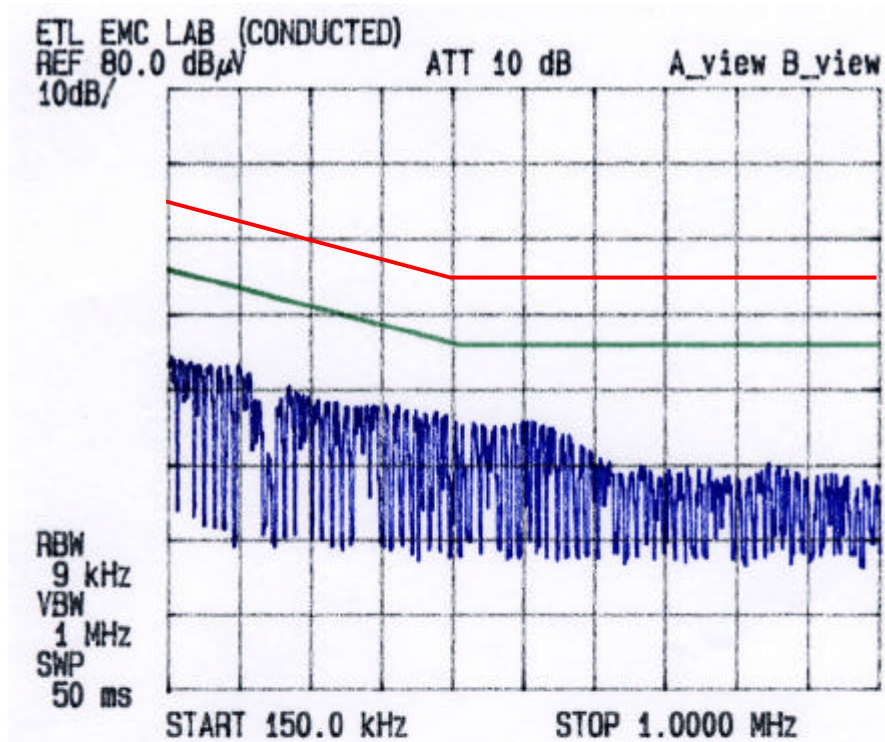
1. Please see the measured plot in next page.
2. \* H : HOT Line , \*\*N : Neutral Line
3. Margin value = Limit – Reading
4. The EUT was supplied with the nominal AC voltage through the AC power supply adapter.
5. All operating modes and channels were investigated and the worst-case emissions were reported.
6. The measurement was performed for the frequency range 150KHz ~ 30MHz according to the CISPR 22 Class B

*Y. H. Park*

Tested by : Y. H. Park / Test Engineer

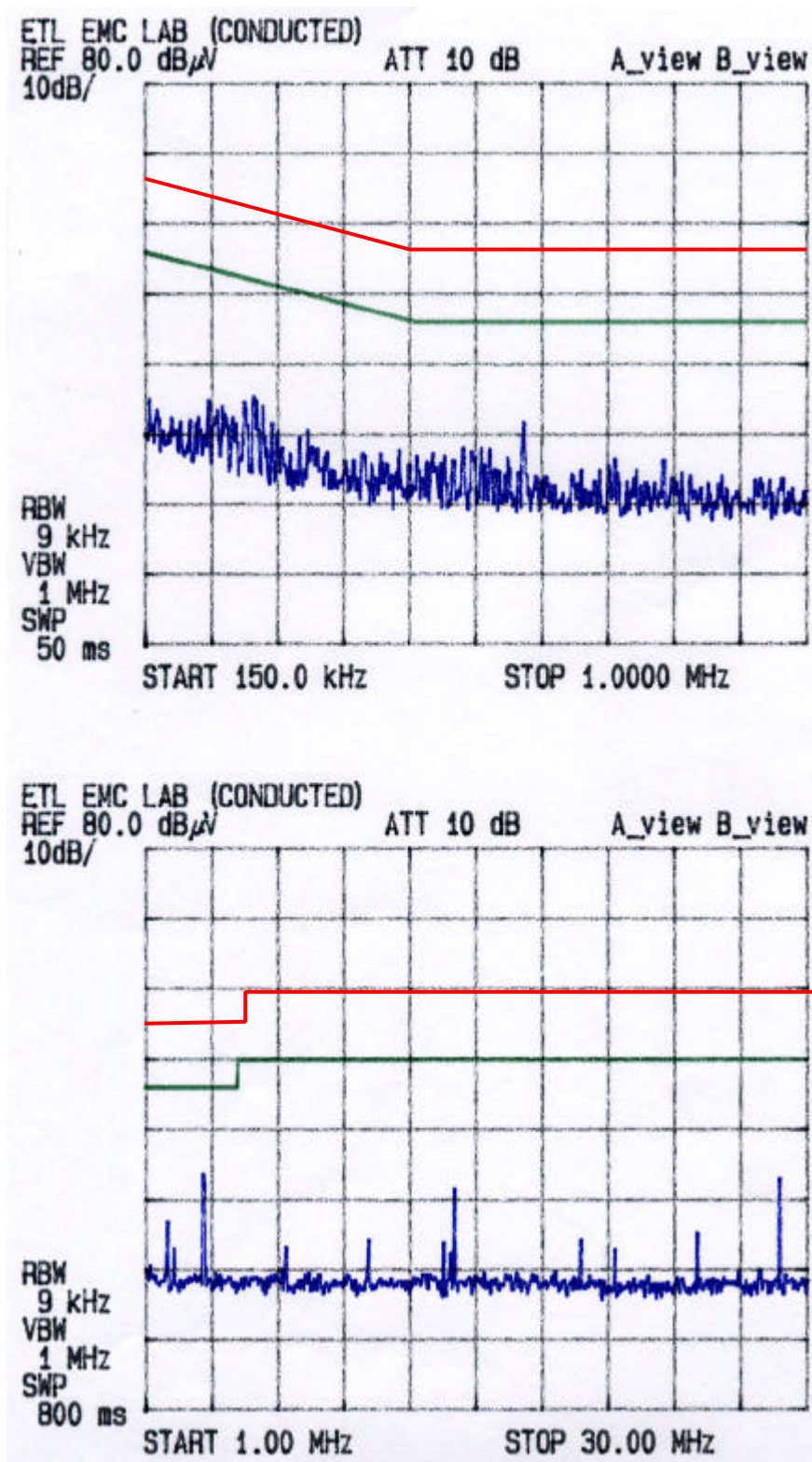
## 5. TEST RESULTS

Line Polarity : Hot



## 5. TEST RESULTS

Line Polarity : Neutral



## 6. ANTENNA REQUIREMENT

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### 6.1 Antenna Requirement

According to the section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to be complied.

### 6.2 Antenna Construction

The antenna used for the EUT is so designed that antenna other than that furnished by the manufacturer shall not be used with this device. The antenna supplied is a unique coupling to this 900MHz Cordless Telephone.

## 7. SAMPLE CALCULATION

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### Sample Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

$$\text{dB}(\mu\text{V}/\text{m}) = 20 \log_{10} (\mu\text{V} / \text{m}) : \text{Equation 1}$$

$$\text{dB}\mu\text{V} = \text{dBm} + 107 : \text{Equation 2}$$

Example 1 : @ 0.218 MHz

|               |   |                         |
|---------------|---|-------------------------|
| Class B Limit | = | 441.063 uV = 52.89 dBuV |
| Reading       | = | 48.45dBuV               |
| Convert to uV | = | 264.55uV                |
| Margin        | = | 48.45 – 52.89 = -4.44   |
|               | = | -4.44dB below Limit     |

Example 2 : @664.64 MHz

|                             |   |                        |
|-----------------------------|---|------------------------|
| Class B Limit               | = | 70.79 uV = 37.0 dBuV/m |
| Reading                     | = | 7.38dBuV               |
| Antenna Factor + Cable Loss | = | 25.14 dB               |
| Total                       | = | 32.52 dBuV/m           |
| Margin                      | = | 32.52 – 37.0 = -4.48   |
|                             | = | -4.48dB below Limit    |

## 8. TEST EQUIPMENT LIST

### List of Test Equipments Used for Measurements

| Test Equipment                 | Model     | Mfg.               | Serial No.             | Cal. Due Date |
|--------------------------------|-----------|--------------------|------------------------|---------------|
| Spectrum Analyzer              | R3261A    | Advantest          | 21720033               | 01-10-08      |
| Spectrum Analyzer              | R3265A    | Advantest          | 45060321               | 02-02-28      |
| Spectrum Analyzer              | L1500A    | H.P                | US37360920             | 01-10-20      |
| Receiver                       | ESVS 10   | R & S              | 835165/001             | 02-04-06      |
| Signal Generator               | SMT-03    | Rohde & Schwarz    | 831676/029             | 01-09-26      |
| Signal Generator               | SMT-03    | Rohde & Schwarz    | 831676/030             | 01-09-27      |
| Signal Generator               | 2025      | IFR                | 202301/933             | 01-11-01      |
| Power Meter                    | 4232A     | Boonton            | 42001                  | 02-04-11      |
| Power Meter                    | NRVS      | Rohde & Schwarz    | 834053/060             | 02-04-17      |
| Power Meter                    | URV35     | Rohde & Schwarz    | 831688/004             | 02-04-25      |
| Power Sensor                   | 51011     | Boonton            | 31619/32620            | 02-04-11      |
| Audio Analyzer                 | 8903B     | HP                 | 3120A07501             | 01-10-25      |
| Audio Analyzer                 | UPL       | Rohde & Schwarz    | 836421/028             | 01-09-07      |
| Modulation Analyzer            | 8901B     | HP                 | 2525A03952             | 01-10-25      |
| Power Sensor                   | 11722A    | HP                 | 2501A02085             | 01-10-25      |
| Synthesized Function Generator | 33120A    | Agilent            | US36042014             | 02-01-07      |
| Broadband Power Amplifier      | AR75A250  | Amplifier Research | 27568                  | 02-02-23      |
| Broadband Power Amplifier      | GRF5066   | Ophir              | 1011                   | 02-01-25      |
| Preamplifier                   | HP8447D   | HP                 | 2944A07626             | 02-03-05      |
| Preamplifier                   | HP 8347A  | HP                 | 2834A00544             | 01-05-23      |
| TriLog Antenna                 | VULB9160  | Schwarz Beck       | 3082                   | 02-05-08      |
| LogBicon                       | VULB9165  | Schwarz Beck       | 2023                   | 02-05-08      |
| Dipole Antenna                 | VHAP      | Schwarz Beck       | 964                    | 02-05-03      |
| Dipole Antenna                 | VHAP      | Schwarz Beck       | 965                    | 02-05-03      |
| Dipole Antenna                 | UHAP      | Schwarz Beck       | 949                    | 02-05-03      |
| Dipole Antenna                 | UHAP      | Schwarz Beck       | 950                    | 02-05-03      |
| Dipole Antenna                 | 3121C     | EMCO               | 9807-2104              | 01-09-20      |
| Double Ridged Horn             | 3115      | EMCO               | 9809-2334              | 01-09-20      |
| Double Ridged Horn             | 3115      | EMCO               | 9809-2335              | 01-09-20      |
| Attenuator                     | 33-20-34  | Weinschel          | BH3583/2997            | 01-08-26      |
| Attenuator                     | 33-30-34  | Weinschel          | BG9477/9487            | 01-09-15      |
| Dual directional coupler       | C5571     | Werlatone          | 7860                   | 02-01-26      |
| Dual directional coupler       | C3653     | Werlatone          | 7825                   | 02-01-26      |
| LISN                           | 3825/2    | EMCO               | 9208-1995<br>9006-1669 | 01-12-27      |
| RF Detector                    | 8471D     | HP                 | 3012A                  | 01-10-12      |
| Digital Oscilloscope           | TDS540B   | Tektronix          | B020115                | 02-04-20      |
| Digital Oscilloscope           | 2430A     | Tektronix          | B015319                | 02-03-15      |
| Turn-Table                     | DETT-03   | Daeil EMC          | -                      |               |
| Antenna Master                 | DEAM-03   | Daeil EMC          | -                      |               |
| Plotter                        | 7440A     | H.P                | 2725A 75722            |               |
| EMC Anechoic Chamber           | DTEC01    | DAETONG            | -                      |               |
| Temp/Humidity Chamber          | DSTH 702  | DAESUNG            | -                      | 02-01-03      |
| Impedance Matching Pad         | 6001.01.A | SUNNER             | 3252                   | 01-09-22      |
| Thermo Hygrograph              | 3-3122    | ISUZU              | 3312201                | 01-12-20      |
| BaroMeter                      | Regulus   | Aneroid            | -                      | 02-03-08      |