



ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test report file number : E01DR-063

Applicant : OMNITRONIC IND.

Address : 2Fl. DongIl B/D, #40 Guro5-Dong, Guro-Gu, Seoul, Korea

Manufacturer : OMNITRONIC IND.

Address : 2Fl. DongIl B/D, #40 Guro5-Dong, Guro-Gu, Seoul, Korea

Type of Equipment : REMOTE KEYLESS ENTRY SYSTEM

FCC ID : P43RCF2002

Model / Type No. : RCF-2002

Serial number : N/A

Total page of Report : 15 pages (including this page)

Date of Incoming : November 29, 2001


Date of issuing : December 21, 2001

SUMMARY


The equipment complies with the regulation; FCC PART 15 SUBPART C 15.231

This test report contains only the result of a single test of the sample supplied for the examination. It is not a general valid assessment of the features of the respective products of the mass-production.

Prepared by:


G. W. Lee/ Ass. Chief Engineer
EMC Dept.
ONETECH Corp.

Reviewed by:


Y. K. Kwon/ Chief Engineer
EMC Dept.
ONETECH Corp.



CONTENTS

| | Page |
|---|-----------|
| 1. VERIFICATION OF COMPLIANCE..... | 3 |
| 2. GENERAL INFORMATION | 4 |
| 2.1 PRODUCT DESCRIPTION | 4 |
| 2.2 RELATED SUBMITTAL(S) / GRANT(S) | 4 |
| 2.3 TEST SYSTEM DETAILS | 5 |
| 2.4 TEST METHODOLOGY | 5 |
| 2.5 TEST FACILITY | 5 |
| 3. SYSTEM TEST CONFIGURATION..... | 5 |
| 3.1 JUSTIFICATION | 5 |
| 3.2 EUT EXERCISE SOFTWARE | 5 |
| 3.3 EQUIPMENT MODIFICATIONS..... | 5 |
| 3.4 CONFIGURATION OF TEST SYSTEM..... | 6 |
| 3.5 ANTENNA REQUIREMENT | 6 |
| 4. PRELIMINARY TEST | 7 |
| 4.1 AC POWER LINE CONDUCTED EMISSIONS TESTS | 7 |
| 4.2 RADIATED EMISSIONS TESTS..... | 7 |
| 5. FINAL RESULT OF MEASUREMENT | 8 |
| 5.1 FIELD STRENGTH OF THE CARRIER TEST | 8 |
| 5.2 MAXIMUM MODULATION PERCENTAGE(MMP)..... | 8 |
| 5.5 BANDWIDTH OF THE OPERATING FREQUENCY..... | 11 |
| 6. FIELD STRENGTH CALCULATION | 15 |
| 7. LIST OF TEST EQUIPMENT..... | 16 |

**1. VERIFICATION OF COMPLIANCE**

APPLICANT : OMNITRONIC IND.
ADDRESS : 2Fl. DongIl B/D, #40 Guro5-Dong, Guro-Gu, Seoul, Korea
CONTACT PERSON : John Kim / President
TELEPHONE NO : 82-2-584-8618
FCC ID : P43RCF2002
MODEL NO/NAME : RCF-2002
SERIAL NUMBER : N/A
DATE : December 21, 2001

| | |
|---|---|
| DEVICE TYPE | REMOTE KEYLESS ENTRY SYSTEM - INTENTIONAL RADIATOR |
| E.U.T. DESCRIPTION | RF REMOTE KEYLESS ENTRY SYSTEM FOR VEHICLE - TRANSCEIVER |
| THIS REPORT CONCERNS | ORIGINAL GRANT |
| MEASUREMENT PROCEDURES | ANSI C63.4/1992 |
| TYPE OF EQUIPMENT TESTED | PRE-PRODUCTION |
| KIND OF EQUIPMENT AUTHORIZATION REQUESTED | CERTIFICATION |
| EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S) | FCC PART 15 SUBPART C 15.231 |
| MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE | No |
| FINAL TEST WAS CONDUCTED ON | 3 METER OPEN AREA TEST SITE |

The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.



2. GENERAL INFORMATION

2.1 Product Description

The OMNITRONIC IND., Model PG5000 (referred to as the EUT in this report) is a transceiver that it controls locking and unlocking the door and the trunk opening of a vehicle by wireless remote controller. The associated receiver is manufactured by Omnitronic Ind., Model No: PG5000, FCC ID: OARM447675. The product specification described herein was obtained from product data sheet or user's manual.

| | |
|---|---|
| CHASSIS TYPE | Plastic |
| TX/RX FREQUENCY | 447.675MHz |
| TRANSMISSION TIME PER 1 CYCLE | 50 ms |
| INTERMIT TIME PER 1 CYCLE | 40 ms |
| INTERMITTENTLY CONTINUOUS TIME | Max. 1 s |
| MODULATION SCHEME | FM |
| LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz) | 447.675 MHz X 2, 10.7MHz, 4MHz |
| ANTENNA TYPE | Built-in on the PCB in the EUT |
| RATED SUPPLY VOLTAGE | DC 1.5V (Lithium cell) |
| NUMBER OF LAYERS | RF Board: 4 Layers, Control Board: 2 Layers |
| FUNCTION OF BUTTON | Doors Lock/Unlock, Trunk Open |

* Remark: This equipment automatically deactivates the transmitter within not more than 1 second of being released.

Model Differences:

-. No other model differences have been mentioned

2.2 Related Submittal(s) / Grant(s)

-. None



2.3 Test System Details

The EUT was tested with the following all equipment used in the tested systems are: N/A

2.4 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4/1992. Radiated testing was performed at a distance of 3 meters from EUT to the antenna.

2.5 Test Facility

The open area test site and conducted measurement facilities are located on at 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-Kun, Kyunggi-Do 464-080 Korea. Description details of test facilities were submitted to the Commission on January 12, 1999. (Registration Number: 92819)

3. SYSTEM TEST CONFIGURATION

3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

| DEVICE TYPE | MANUFACTURER | MODEL/PART NUMBER | FCC ID |
|---------------|-----------------|-------------------|--------|
| RF BOARD | OMNITRONIC IND. | N/A | N/A |
| CONTROL BOARD | OMNITRONIC IND. | N/A | N/A |

3.2 EUT exercise Software

To get a maximum radiated emission from the EUT at Transmitter mode, the button on the EUT was continuously pressed to transmit the signal. To activate continuous transmission, place a small plastic block between rubber band and the push button on the EUT.

Also, for getting maximum emission from the EUT at Receiver mode, the signal generator set to transmit at 447.675MHz and the EUT receives the signal.

3.3 Equipment Modifications

None



3.4 Configuration of Test System

Line Conducted Test: It needs not to test this requirement, because the EUT supplies from a DC battery.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.4/1992 8.3.1.1 and 13.1.4.1 to determine the worse operating conditions. Final radiated emission tests were conducted at 3meter open area test site.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

Occupied Bandwidth Measurement:

This measurement is performed with the antenna located close enough to give a full-scale deflection of the modulated carrier on the spectrum analyzer. The plot is taken at 20kHz/division frequency span, 10kHz resolution bandwidth and 10dB/division logarithmic display from an 8568B spectrum analyzer.

Antenna Power Conduction Test:

This equipment was only with a permanently attached antenna, so the radiated emission measurement was performed with the antenna attached.

3.5 Antenna Requirement

According to the 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.

Antenna Construction:

The transmitter antenna of the EUT is built-in on the PCB in the EUT, no consideration of replacement by the user.



4. PRELIMINARY TEST

4.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

| Operation Mode | The Worse operating condition (Please check one only) |
|--|---|
| N/A | N/A |
| It is not need to test this requirement, because the power of the EUT is supplied from a DC battery. | |

4.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

| Operation Mode | The Worse operating condition (Please check one only) |
|----------------|---|
| RX Mode | |
| TX Mode | X |



5. FINAL RESULT OF MEASUREMENT

5.1 Field Strength of the Carrier Test

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

Humidity Level : 48 % Temperature : 13°C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231(b)
 Type of Test : Intentional Radiator
 Result : PASSED BY -24.52 dB

EUT : REMOTE KEYLESS ENTRY SYSTEM Date: December 4, 2001
 Operating Condition : TX mode
 Distance : 3 Meter

| Radiated Emissions | | | Ant | Correction Factors | | | Total | FCC Limit | |
|------------------------|----------------|----------------|------|--------------------|---------------|-------------------------|------------------|-------------------|----------------|
| Carrier Freq. (MHz) | Amp. (dBuV) | Detect Mode | Pol. | Ant. (dBuV/m) | Cable (dB) | Average Level Factor | Amp. (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
| 447.675 | 55.2 | Peak | H | 16.44 | 2.54 | -10.5 | 74.18 | 81.3 | -17.62 |
| 447.675 | 54.2 | AVE | H | 16.44 | 2.54 | -10.5 | 73.18 | 81.3 | -18.62 |

*Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

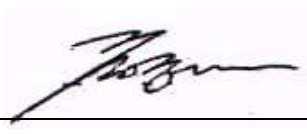
5.2 Maximum Modulation Percentage(MMP)

In order to determine possible Maximum Modulation Percentage from the EUT, we measured the duty cycle according to the clause I4.(10) in ANSI C63.4/1992.

The pulse train from the EUT was consisting of long and short pulse. The measured values are as follows.

| Long Pulse (LP) | Short Pulse (SP) | Total sum of LP | Total sum of SP | Pulse Width |
|------------------------------------|------------------|--|-----------------|-------------|
| 0.90ms | 0.30ms | 9 | 15 | 42.4 |
| Duty Cycle | | $(9 \times 0.9 + 15 \times 0.30) / 42.4 = 0.297$ | | |
| Maximum Modulation Percentage(MMP) | | Duty Cycle X 100 % = 29.7 % | | |
| Average Level Factor | | -10.5 dB | | |

Remark: Please refer to Plotted Data #1.


 Tested by: Young-Min, Choi / Project Engineer



5.3 Spurious Emission Test

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

Humidity Level : 48 % Temperature : 13°C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231(b)
 Type of Test : Intentional Radiator
 Result : PASSED BY -8.46dB at 446.10 MHz

EUT : REMOTE KEYLESS ENTRY SYSTEM Date: December 4, 2001
 Operating Condition : TX mode
 Distance : 3 Meter

| Radiated Emissions | | | Ant | Correction Factors | | Total(dBuV/m) | FCC Limit(dBuV/m) | |
|--|----------------|----------------|------|--------------------|---------------|---------------|-------------------|------------|
| Freq. (MHz) | Amp. (dBuV) | Detect Mode | Pol. | Ant. (dBuV/m) | Cable (dB) | Peak | Limit | Margin(dB) |
| 298.60 | 7.9 | Peak | H | 14.50 | 2.53 | 24.93 | 46.00 | -21.07 |
| 397.80 | 18.3 | Peak | H | 15.38 | 2.43 | 36.11 | 46.00 | -9.89 |
| 444.58 | 17.6 | Peak | H | 16.37 | 2.53 | 36.50 | 46.00 | -9.50 |
| 446.10 | 18.6 | Peak | H | 16.4 | 2.54 | 37.54 | 46.00 | -8.46 |
| 448.44 | 18.0 | Peak | H | 16.46 | 2.55 | 37.01 | 46.00 | -8.99 |
| 497.80 | 16.4 | Peak | H | 17.60 | 2.67 | 36.67 | 46.00 | -9.33 |
| It was not observed any emissions from the EUT up to 5GHz. | | | | | | | | |

*Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

Tested by: Young-Min, Choi / Project Engineer



5.4 Radiated Emission Test for Receiver Mode

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

Humidity Level : 48 % Temperature : 13°C
 Limits apply to : FCC CFR 47, PART 15, SUBPART B
 Type of Test : Un-Intentional Radiator
 Result : PASSED BY -15.25dB at 286.2 MHz

EUT : REMOTE KEYLESS ENTRY SYSTEM Date: December 4, 2001
 Operating Condition : RX mode
 Distance : 3 Meter

| Radiated Emissions | | | Ant | Correction Factors | | Total(dBuV/m) | FCC Limit(dBuV/m) | |
|--------------------|----------------|----------------|------|--------------------|---------------|---------------|-------------------|------------|
| Freq. (MHz) | Amp. (dBuV) | Detect Mode | Pol. | Ant. (dBuV/m) | Cable (dB) | Peak | Limit | Margin(dB) |
| 245.4 | 13.9 | Peak | H | 11.61 | 1.81 | 27.32 | 46.00 | -18.68 |
| 286.2 | 15.1 | Peak | H | 13.71 | 1.94 | 30.75 | 46.00 | -15.25 |
| 336.1 | 11.2 | Peak | H | 14.39 | 2.21 | 27.80 | 46.00 | -18.20 |
| 436.7 | 7.8 | Peak | H | 16.19 | 2.51 | 26.50 | 46.00 | -19.50 |
| 449.2 | 8.1 | Peak | H | 16.47 | 2.55 | 27.12 | 46.00 | -18.88 |
| 552.2 | 7.5 | Peak | H | 18.18 | 2.78 | 28.46 | 46.00 | -17.54 |

*Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

Tested by: Young-Min, Choi / Project Engineer



5.5 Bandwidth of the operating frequency

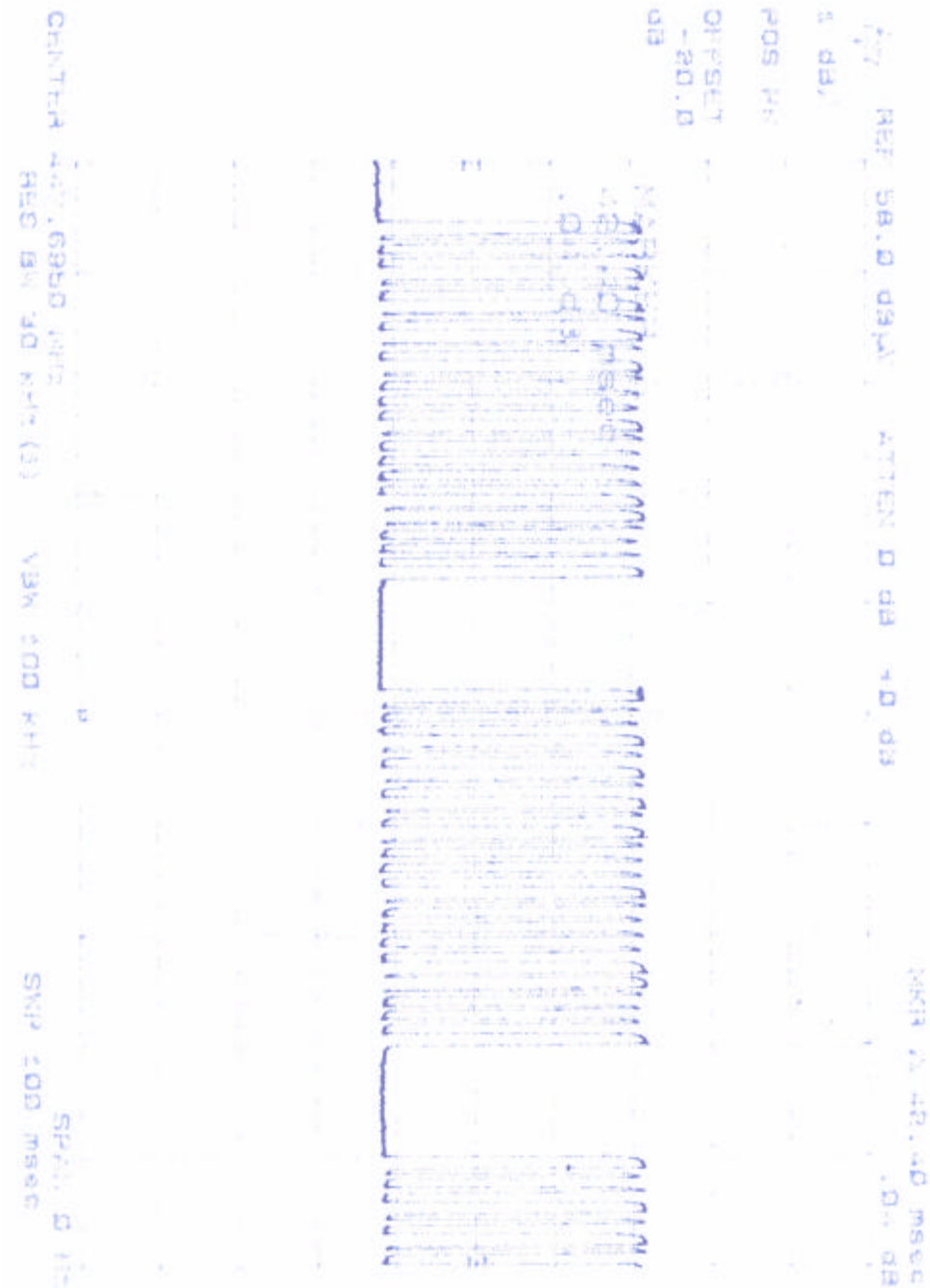
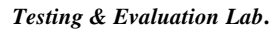
Humidity Level : 49 % Temperature : 21°C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231 (c)
Type of Test : Intentional Radiator
Result : PASSED

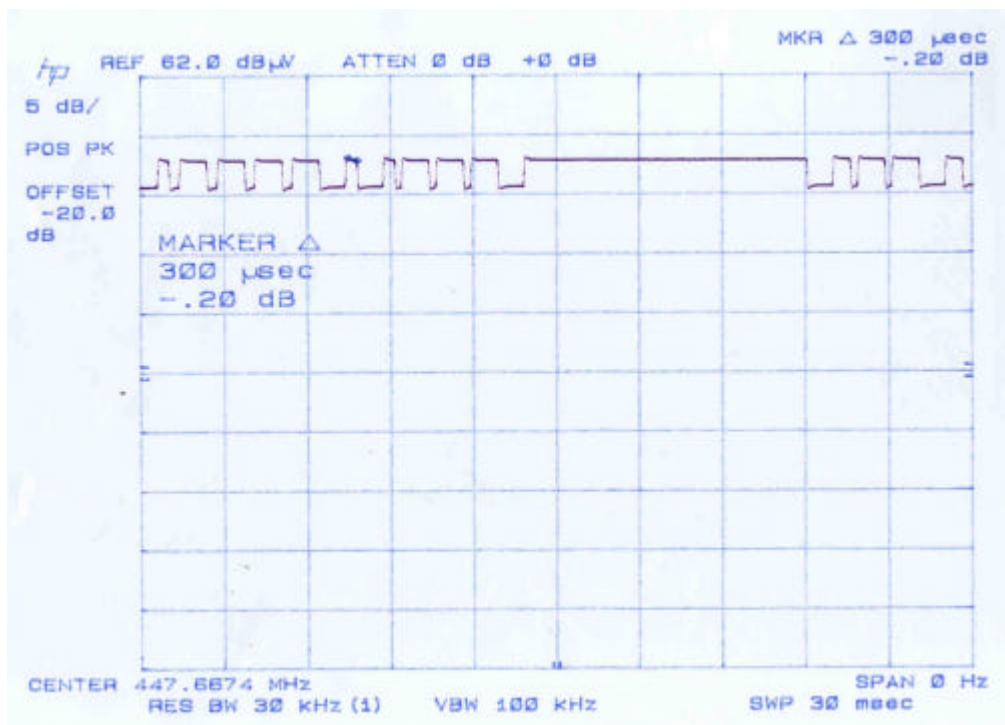
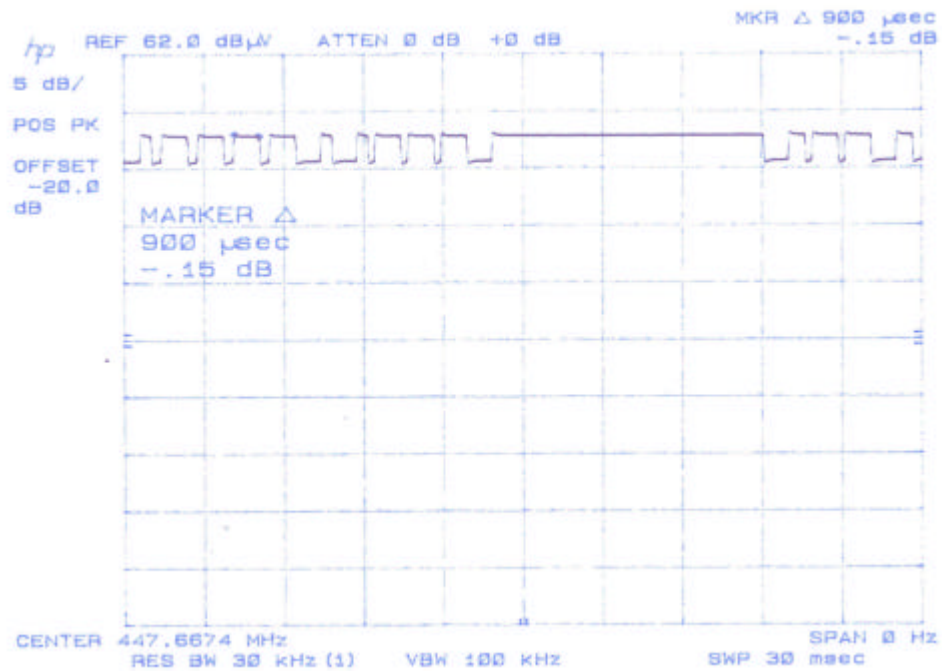
EUT : REMOTE KEYLESS ENTRY SYSTEM Date: December 4, 2001
Operating Condition : TX mode
Minimum Resolution
Bandwidth : 10 kHz

| Carrier Freq. (MHz) | Bandwidth of the emission. (kHz) | Limit (kHz) | Remark |
|------------------------|-------------------------------------|----------------|---|
| 447.675 | 27.6 | 111.92 | <u>The point 20dB down from the modulated carrier</u> |

Remark: Please refer to Plotted Data #2.

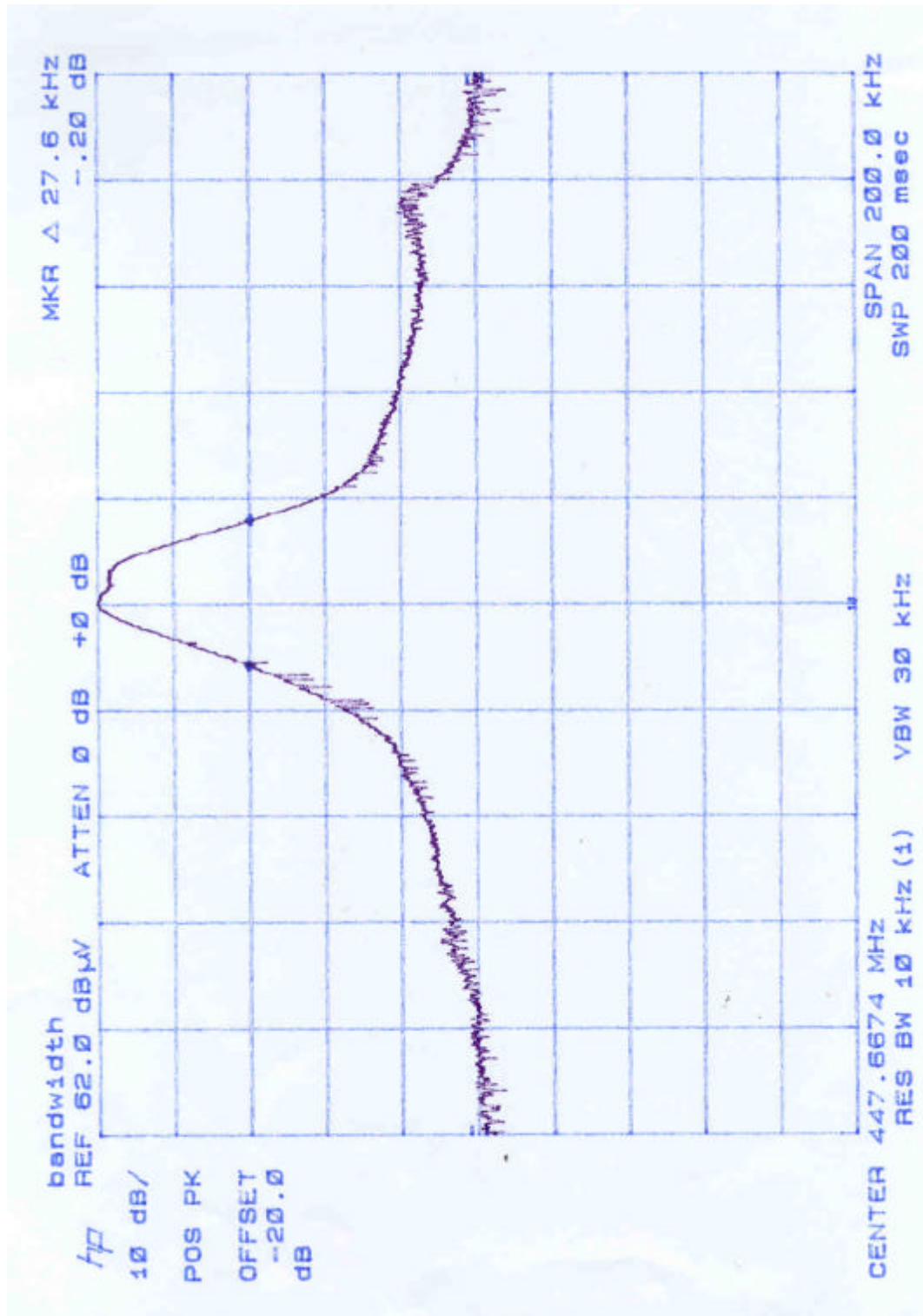
Tested by: Young-Min, Choi / Project Engineer







Plotted Data #2.





6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses

+ Meter reading (dBuV)

+ Cable Loss (dB)

+ Antenna Factor (Loss) (dB/meter)

= Corrected Reading (dBuV/meter)

- Specification Limit (dBuV/meter)

= dB Relative to Spec (+/- dB)



7. LIST OF TEST EQUIPMENT

| No. | EQUIPMENTS | MFR. | MODEL | SER. NO. | LAST CAL | DUE CAL | USE |
|-----|----------------------|------|-----------|-------------------------------------|----------|---------|-----|
| 1. | Test receiver | R/S | ESVS 10 | 827864/005 | SEP/00 | 12MONTH | ■ |
| 2. | Test receiver | R/S | ESHS10 | 834467/007 | APRIL/00 | 12MONTH | |
| 3. | Spectrum analyzer | HP | 8568B | 3026A0226 | SEP/00 | 12MONTH | ■ |
| 4. | RF preselector | HP | 85685A | 3107A01264 | SEP/00 | 12MONTH | ■ |
| 5. | Quasi-Peak Adapter | HP | 85650A | 3107A01542 | SEP/00 | 12MONTH | ■ |
| 6. | Dipole Antenna | EMCO | 3121C | 9107-745 | JUN/00 | 12MONTH | |
| 7. | Biconical antenna | EMCO | 3104C | 9109-4441 9109-4443 9109-4444 | MAR/00 | 12MONTH | ■ |
| 8. | Log Periodic antenna | EMCO | 3146 | 9109-3213 9109-3214 9109-3217 | MAR/00 | 12MONTH | ■ |
| 10. | Horn Antenna | EMCO | 3115 | 9509-4563 | MAR/00 | 12MONTH | ■ |
| 11. | LISN | EMCO | 3825/2 | 9109-1867 9109-1869 | FEB/00 | 12MONTH | |
| 12. | RF Amplifier | HP | 8447F | 3113A04554 | JUN/00 | N/A | |
| 13. | Spectrum Analyzer | HP | 8561E | 3350A00546 | SEP/00 | 12MONTH | ■ |
| 14. | Spectrum Analyzer | HP | 8591A | 3131A02312 | APR/00 | 12MONTH | |
| 15. | Computer System | HP | 98581C | 98543A | N/A | N/A | ■ |
| | Hard disk drive | | 9153C | CMC762Z9153 | N/A | N/A | ■ |
| 16. | Plotter | HP | 7475A | 30052 22986 | N/A | N/A | ■ |
| 17. | Position Controller | EMCO | 1090 | 9107-1038 | N/A | N/A | ■ |
| 18. | Turn Table | EMCO | 1080-1.21 | 9109-1576 | N/A | N/A | ■ |
| 19. | Antenna Master | EMCO | 1070-1 | 9109-1624 | N/A | N/A | ■ |