



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

**Test report file number** : E022R-001

**Applicant** : SHINCHANG ELECTRICS CO., LTD.

**Address** : 734-2, Wonshi-Dong, Ansan-Si, Gyungki-Do, 425-090, Korea

**Manufacturer** : SHINCHANG ELECTRICS CO., LTD.

**Address** : 734-2, Wonshi-Dong, Ansan-Si, Gyungki-Do, 425-090, Korea

**Type of Equipment** : REMOTE KEYLESS ENTRY SYSTEM

**FCC ID** : NYOSKS-005Tx

**Model / Type No.** : SKS-005Tx

**Serial number** : N/A

**Total page of Report** : 17 pages (including this page)

**Date of Incoming** : January 25, 2002

**Date of issuing** : February 5, 2002

## **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.

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## CONTENTS

|                                             | Page      |
|---------------------------------------------|-----------|
| <b>1. VERIFICATION OF COMPLIANCE</b>        | <b>3</b>  |
| <b>2. GENERAL INFORMATION</b>               | <b>4</b>  |
| 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         |
| <b>3. SYSTEM TEST CONFIGURATION</b>         | <b>5</b>  |
| 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         |
| <b>4. PRELIMINARY TEST</b>                  | <b>6</b>  |
| 4.1 AC POWER LINE CONDUCTED EMISSIONS TESTS | 6         |
| 4.2 RADIATED EMISSIONS TESTS                | 6         |
| <b>5. FINAL RESULT OF MEASUREMENT</b>       | <b>7</b>  |
| 5.1 FIELD STRENGTH OF THE CARRIER TEST      | 7         |
| 5.2 MAXIMUM MODULATION PERCENTAGE (MMP)     | 7         |
| 5.4 BANDWIDTH OF THE OPERATING FREQUENCY    | 9         |
| <b>6. FIELD STRENGTH CALCULATION</b>        | <b>16</b> |
| <b>7. LIST OF TEST EQUIPMENT</b>            | <b>17</b> |



## 1. VERIFICATION OF COMPLIANCE

APPLICANT : SHINCHANG ELECTRICS CO., LTD.  
ADDRESS : 734-2, Wonshi-Dong, Ansan-Si, Gyungki-Do, 425-090, Korea  
CONTACT PERSON : Joon-Young, Jung / R&D Center. Research Engineer  
TELEPHONE NO : 82-31-4904-526  
FCC ID : NYOSKS-005Tx  
MODEL NO/NAME : SKS-005Tx  
SERIAL NUMBER : N/A  
DATE : February 5, 2002

|                                                         |                                                             |
|---------------------------------------------------------|-------------------------------------------------------------|
| DEVICE TYPE                                             | REMOTE KEYLESS ENTRY SYSTEM<br>- INTENTIONAL RADIATOR       |
| E.U.T. DESCRIPTION                                      | RF REMOTE KEYLESS ENTRY SYSTEM FOR VEHICLE<br>- TRANSMITTER |
| THIS REPORT CONCERNS                                    | ORIGINAL GRANT                                              |
| MEASUREMENT PROCEDURES                                  | ANSI C63.4/1992                                             |
| TYPE OF EQUIPMENT TESTED                                | PRE-PRODUCTION                                              |
| KIND OF EQUIPMENT<br>AUTHORIZATION REQUESTED            | CERTIFICATION                                               |
| EQUIPMENT WILL BE OPERATED<br>UNDER FCC RULES PART(S)   | FCC PART 15 SUBPART C 15.231                                |
| MODIFICATIONS ON THE EQUIPMENT<br>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 SHINCHANG ELECTRICS CO., LTD., Model SKS-005Tx (referred to as the EUT in this report) is a transmitter that it controls locking and unlocking the door of a vehicle by wireless remote controller. The associated receiver is manufactured by Shinchang Co., Ltd, Model No: SKS-005Rx, FCC ID: NYOSKS-005RX. The product specification described herein was obtained from product data sheet or user's manual.

|                                                 |                                  |
|-------------------------------------------------|----------------------------------|
| CHASSIS TYPE                                    | Plastic                          |
| TX FREQUENCY                                    | 315.00 MHz                       |
| MODULATION                                      | AM                               |
| LIST OF EACH OSC. OR<br>CRY. FREQ.(FREQ.>=1MHz) | 315.00 MHz                       |
| ANTENNA TYPE                                    | Built-in on the PCB in the EUT   |
| CODE                                            | Rolling Code (Hopping Algorithm) |
| TRANSMISSION TIME                               | Not longer than 1 sec            |
| RATED SUPPLY VOLTAGE                            | DC 3V (Lithium cell)             |
| OPERATING VOLTAGE RANGE                         | DC 2.5 ~ 3.2V                    |
| NUMBER OF LAYERS                                | 2 LAYERS                         |
| FUNCTION OF BUTTON                              | Doors Lock and Doors Unlock      |

\* 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:

| Model     | Manufacturer                  | FCC ID       | Description | Connected to |
|-----------|-------------------------------|--------------|-------------|--------------|
| SKS-005Rx | SHINCHANG ELECTRICS CO., LTD. | NYOSKS-005Rx | RECEIVER    | 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 18, 2002. (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 |
|-------------|--------------------------------|-------------------|--------|
| MAIN BOARD  | SHINCHANG ELECTRICS CO., LTD.. | 325600-2500       | N/A    |

## 3.2 EUT exercise Software

To get a maximum radiated emission from the EUT, 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.

## 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 5dB/division logarithmic display from an 8568B spectrum analyzer.

### 3.5 Antenna Requirement

For intentional device, according to §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) |
|----------------|-------------------------------------------------------|
| 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 : 49 % 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 -27.92 dB

EUT : REMOTE KEYLESS ENTRY SYSTEM Date: February 1, 2002  
 Operating Condition : TX mode  
 Distance : 3 Meter

| Radiated Emissions     |                |                | Ant  | Correction Factors |               |                         | Total           | FCC Limit         |                |
|------------------------|----------------|----------------|------|--------------------|---------------|-------------------------|-----------------|-------------------|----------------|
| Carrier Freq.<br>(MHz) | Amp.<br>(dBuV) | Detect<br>Mode | Pol. | Ant.<br>(dBuV/m)   | Cable<br>(dB) | Average Level<br>Factor | Amp<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) |
| 315.00                 | 43.60          | Peak           | H    | 14.37              | 2.09          | -12.36                  | 60.06           | 75.62             | -27.92         |
| 315.00                 | 39.2           | Peak           | V    | 14.37              | 2.09          | -12.36                  | 55.66           | 75.62             | -32.32         |

\*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 (LP1)                   | Long Pulse (LP2) | Short Pulse (SP) | Total sum<br>of LP1                                                | Total sum<br>of LP2 | Total sum of<br>SP | Pulse<br>Width |
|------------------------------------|------------------|------------------|--------------------------------------------------------------------|---------------------|--------------------|----------------|
| 4.36ms                             | 0.76ms           | 0.34ms           | 1                                                                  | 17                  | 20                 | 111.8          |
| Duty Cycle                         |                  |                  | $(1 \times 4.36 + 17 \times 0.76 + 20 \times 0.34) / 100 = 0.2408$ |                     |                    |                |
| Maximum Modulation Percentage(MMP) |                  |                  | Duty Cycle X 100 % = 24.08 %                                       |                     |                    |                |
| Average Level Factor               |                  |                  | -12.36 dB                                                          |                     |                    |                |

Remark: Please refer to Plotted Data #1 for test data.

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 : 49 % 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 -14.68dB at 945.00 MHz

EUT : REMOTE KEYLESS ENTRY SYSTEM Date: February 1, 2002  
 Operating Condition : TX mode  
 Distance : 3 Meter

| Radiated Emissions                                        |                |                | Ant  | Correction Factors |               | Total(dBuV/m) | FCC Limit(dBuV/m) |             |
|-----------------------------------------------------------|----------------|----------------|------|--------------------|---------------|---------------|-------------------|-------------|
| Freq.<br>(MHz)                                            | Amp.<br>(dBuV) | Detect<br>Mode | Pol. | Ant.<br>(dBuV/m)   | Cable<br>(dB) | Peak          | Limit             | Margin( dB) |
| 630.00                                                    | 16.20          | Peak           | V    | 19.31              | 3.02          | 38.53         | 55.62             | -17.09      |
| 945.00                                                    | 13.90          | Peak           | H    | 22.95              | 4.09          | 40.94         | 55.62             | -14.68      |
| 1260.00                                                   | 8.60           | Peak           | H    | 25.20              | 5.26          | 39.06         | 55.62             | -16.56      |
| 1575.00                                                   | 5.30           | Peak           | H    | 27.80              | 5.94          | 39.04         | 55.62             | -16.58      |
| Other spurious frequencies were not found up to 3000 MHz. |                |                |      |                    |               |               |                   |             |

\*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 Bandwidth of the operating frequency

Humidity Level : 49 % Temperature : 13°C  
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231 (c)  
Type of Test : Intentional Radiator  
Result : PASSED

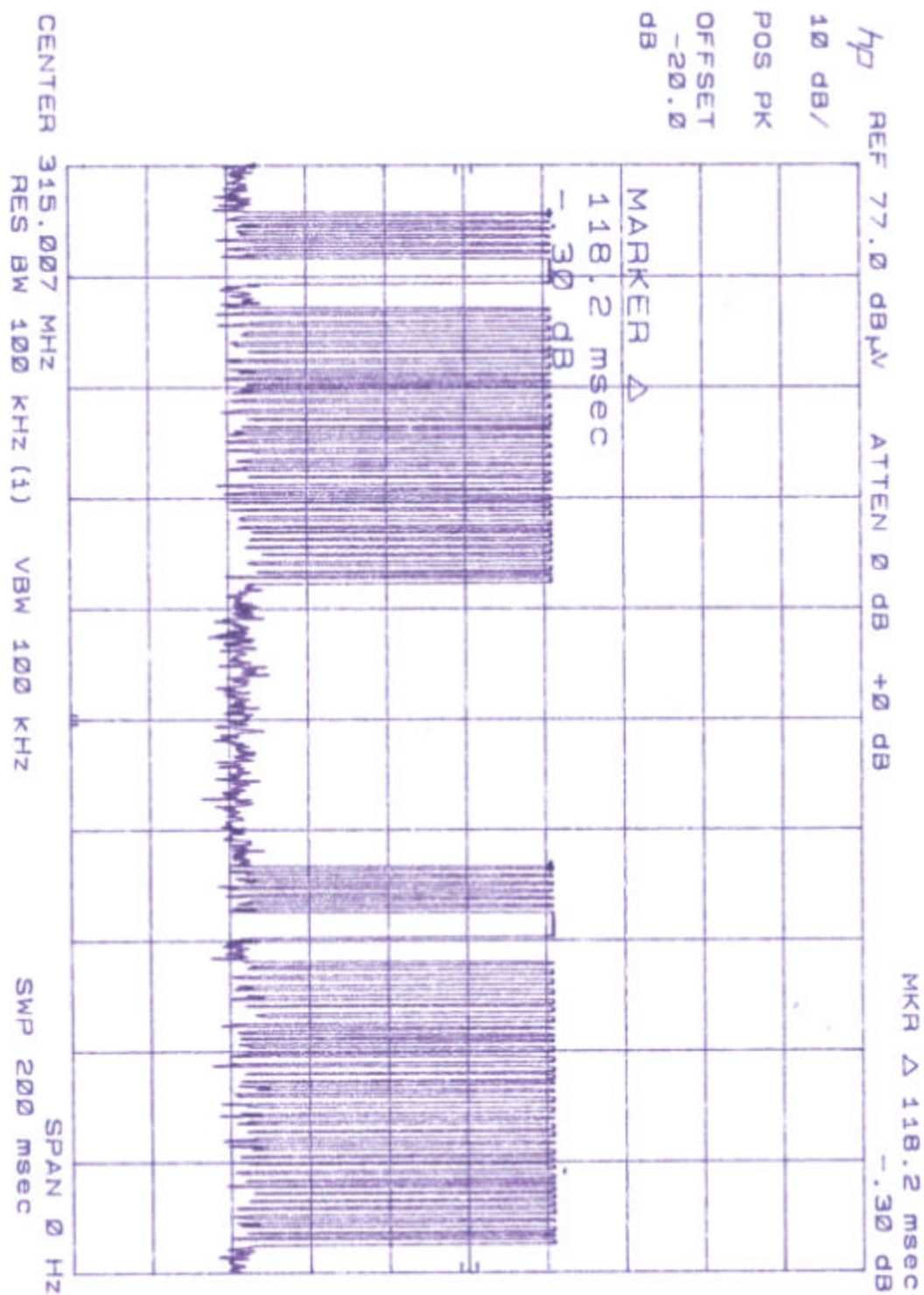
EUT : REMOTE KEYLESS ENTRY SYSTEM Date: February 1, 2002  
Operating Condition : TX mode  
Minimum Resolution  
Bandwidth : 10 kHz

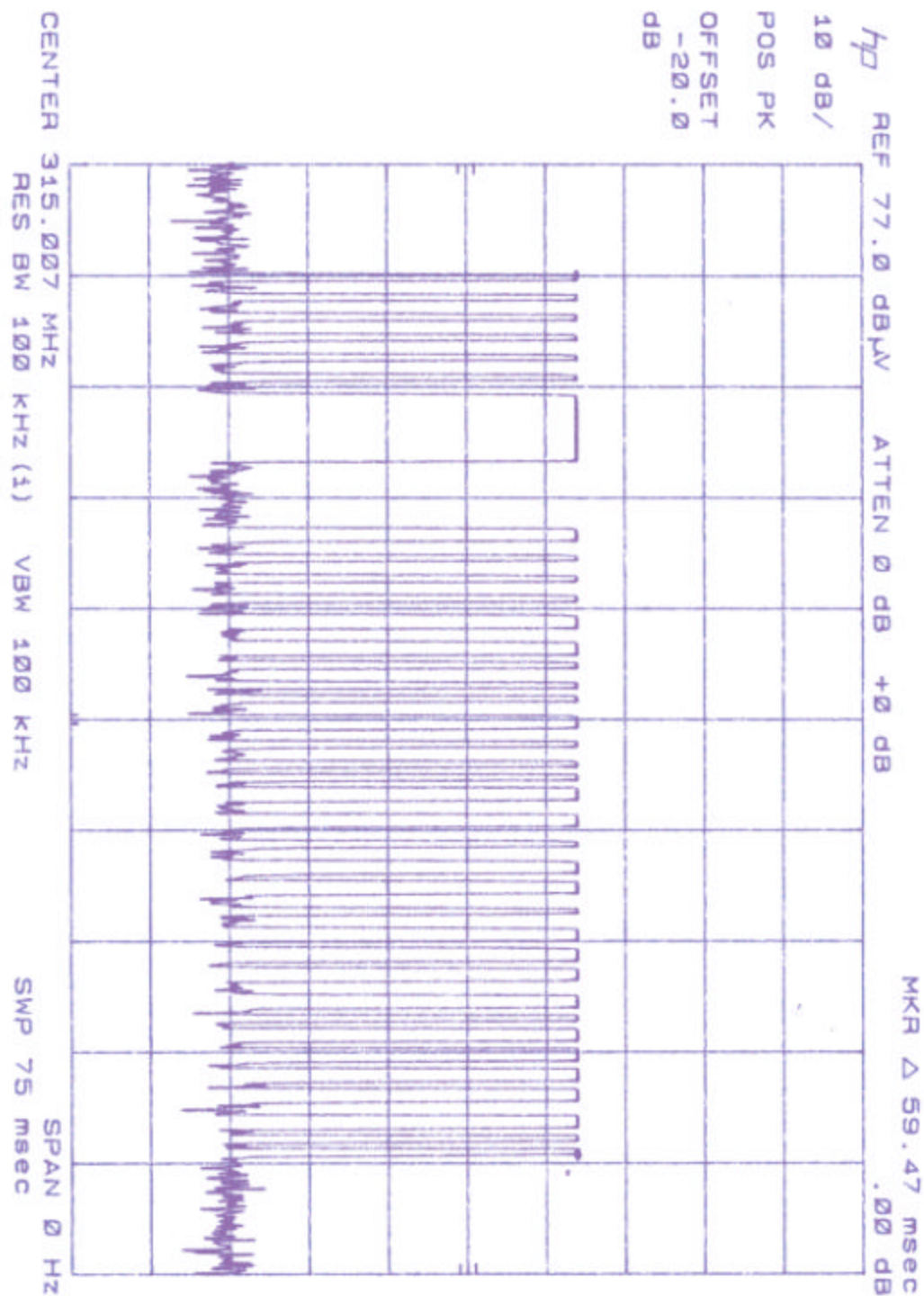
| Carrier Freq.<br>(MHz) | Bandwidth of the emission.<br>(kHz) | Limit<br>(kHz) | Remark                                                    |
|------------------------|-------------------------------------|----------------|-----------------------------------------------------------|
| 315.00                 | 33.6                                | 787.5          | <u>The point 20dB down from<br/>the modulated carrier</u> |

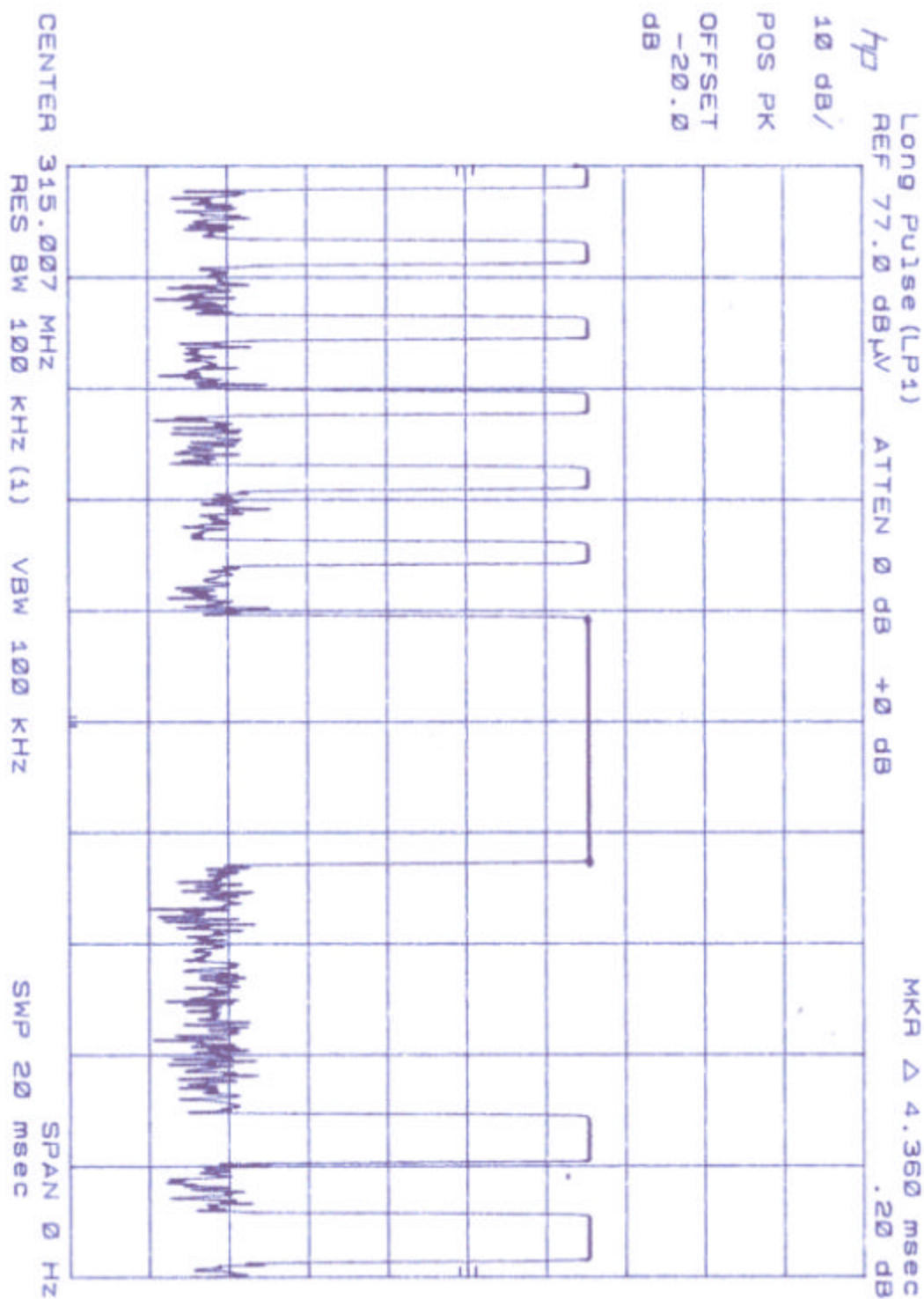
Remark: Please refer to Plotted Data #2 for test data.

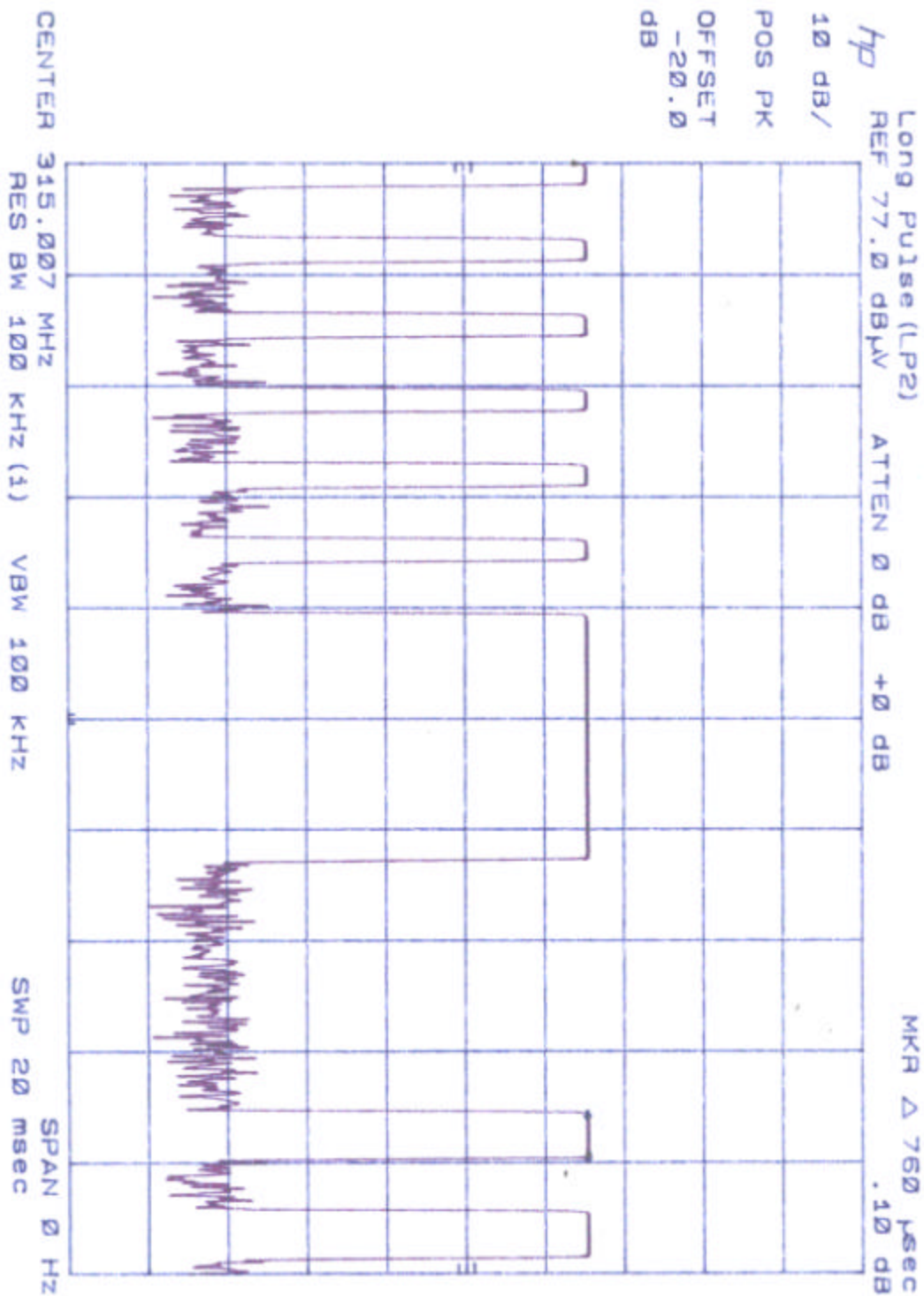
Tested by: Young-Min, Choi / Project Engineer

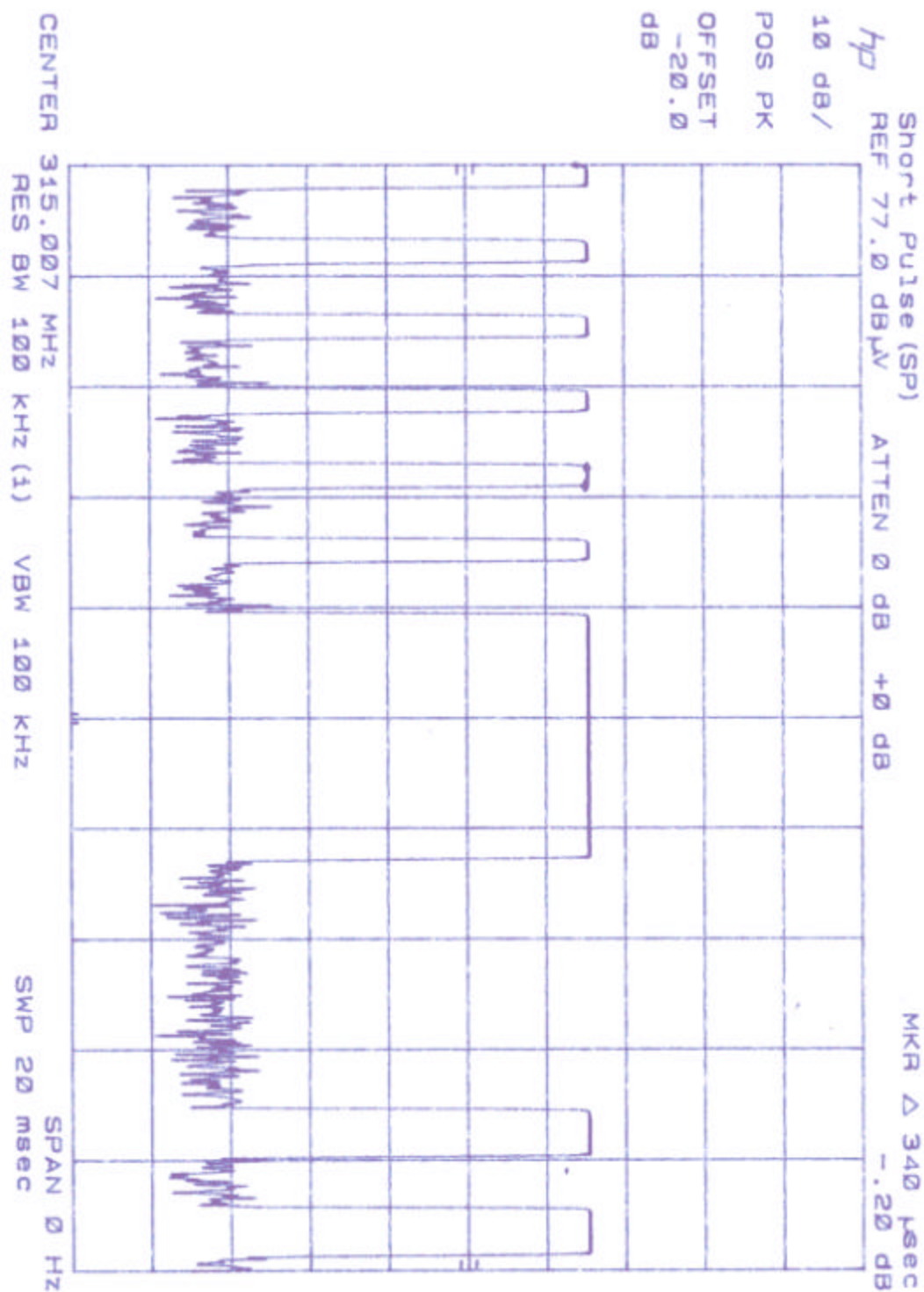
### Plotted Data #1.





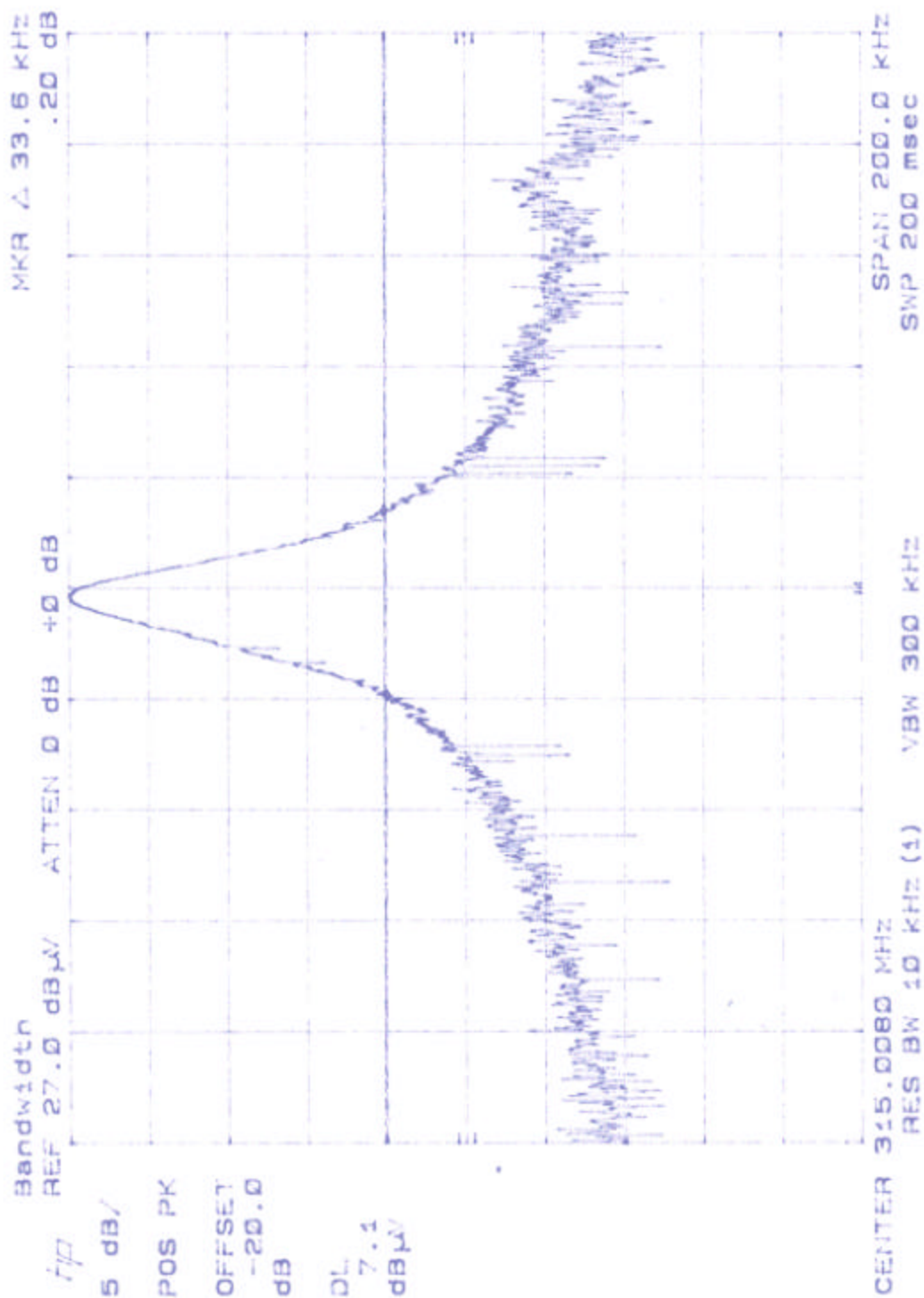








## PlottedData #2.





## 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/01   | 12MONTH | ■   |
| 2.  | Test receiver        | R/S  | ESHS10    | 834467/007                          | APRIL/01 | 12MONTH |     |
| 3.  | Spectrum analyzer    | HP   | 8568B     | 3026A0226                           | SEP/01   | 12MONTH | ■   |
| 4.  | RF preselector       | HP   | 85685A    | 3107A01264                          | SEP/01   | 12MONTH | ■   |
| 5.  | Quasi-Peak Adapter   | HP   | 85650A    | 3107A01542                          | SEP/01   | 12MONTH | ■   |
| 6.  | Dipole Antenna       | EMCO | 3121C     | 9107-745                            | JUN/01   | 12MONTH |     |
| 7.  | Biconical antenna    | EMCO | 3104C     | 9109-4441<br>9109-4443<br>9109-4444 | MAR/01   | 12MONTH | ■   |
| 8.  | Log Periodic antenna | EMCO | 3146      | 9109-3213<br>9109-3214<br>9109-3217 | MAR/01   | 12MONTH | ■   |
| 10. | Horn Antenna         | EMCO | 3115      | 9509-4563                           | MAR/01   | 12MONTH | ■   |
| 11. | LISN                 | EMCO | 3825/2    | 9109-1867<br>9109-1869              | FEB/01   | 12MONTH |     |
| 12. | RF Amplifier         | HP   | 8447F     | 3113A04554                          | JUN/01   | N/A     |     |
| 13. | Spectrum Analyzer    | HP   | 8561E     | 3350A00546                          | SEP/01   | 12MONTH | ■   |
| 14. | Spectrum Analyzer    | HP   | 8591A     | 3131A02312                          | APR/01   | 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     | ■   |