



## FCC MEASUREMENT REPORT

PUESUANT TO PART 15, SUBPART B & C  
(KEYLESS ENTRY DEVICE)

TRADE NAME : HYUNDAI Electronics Industries Co., Ltd.

MODEL NO. : EF

FCC ID : CKLEFRX

APPLICANT : HYUNDAI Electronics Industries Co., Ltd.

MANUFACTURE : HYUNDAI Electronics Industries Co., Ltd.

ADDRESS : San 136-1, Ami-Ri, Bubal-Eub,  
Ichon-Si, Kyoungki-Do,  
467-701, Korea

S/N : HEIEFR001

DATE OF REPORT : JUNE 16, 1998

TEST SITE : HYUNDAI Electronics Industries Co., Ltd.

SIGNATURE

I ATTEST TO THE ACCURACY OF THIS REPORT :

SIGN

A handwritten signature in black ink, appearing to read 'Chang Hee Ji'.

PRINT NAME

: Chang Hee, Ji

TITLE

: General Manager of QA Office

## I . Introduction

This report is designed to show compliance with part 15 of the FCC rules, for a keyless entry device in accordance with the reporting requirements of rule 15.31, 15.33, 15.101 and 15.231.

## II. Description of test site

The measurement facilities are shielded enclosure and open field test site for verification or preparation of applications for certification. The open field test site have been filed with the FCC, as required by FCC rule, section 2.948.

The open field test site is situated in open field with ground screen whose site attenuation characteristics meet that required by ANSI C63.4/1992.

A mast capable of lifting the receiving antenna from a height of one to four meters is used together with a rotatable wooden platform mounted at three meters from the antenna mast. The power line RFI measurements and the radiated RFI preliminary testing and monitoring are performed in a RFI shielded room. The equipment is placed on a wooden support table of 80cm height. The LISN is electrically bonded to the shielded room wall.

The address of the site is :

254-1, Mackok-Ri, Hobup-Myun,  
Ichon-Si, Kyounggi-Do, 467-701, Korea.

### III. Description of Test Methods.

#### A. Transmitter Portion(Certification)

##### 1. Field Strength of the Carrier.

The field strength of the carrier frequency shall be tested at open field test site with normal supply voltage. In addition, the variation of the fundamental transmitted by the device is shown for variation in supply voltage to 85% and 115% of the normal supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

##### 2. Spurious Emissions.

During this test, which is conducted at the HYUNDAI test site described above, the unit is mounted on a wooden table  $1.5\text{m} \times 1.0\text{m} \times 0.8\text{m}$  which is placed on the ground floor. During the emission test, the turntable is rotated to find the configuration resulting in maximum emissions. The antenna height and polarization are also varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Detector function is in PEAK mode. The 6dB bandwidth of the measuring instrument is set to 120KHz for field strength measurements over the frequency range of 30 to 1000MHz. Above 1000MHz, the measurement bandwidth is set to 1MHz. Radiated emission are taken at three meter open field test site.

##### 3. Bandwidth of the Emission.

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 10KHz/division frequency span, 1KHz resolution bandwidth and 10dB/division logarithmic display from an HP8591EM spectrum analyzer. Bandwidth is determined at the point 20dB down from the modulated carrier.

#### 4. Frequency Tolerance.

This measurement is performed only for devices operating within the frequency band 40.66~40.70MHz. The frequency tolerance shall be tested for a temperature variation and voltage variation. For both measurements, the frequency counter with high stability time base used. The counter is coupled to the transmitter by coiling a pick up wire over the transmitter antenna. The testing for temperature variation is carried out with the aid of a TABAI model PL-2GT temperature/humidity chamber. The device is cooled to -20 degrees C and allowed to stabilize for 30minutes. Frequency is measured with normal supply voltage. The chamber is set to +50 degrees C and stabilized for 30 minutes, and the measurement is repeated. The testing for voltage variation is carried out at room temperature by varying the primary voltage from 85% to 115% of the rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

#### 5. Line Conducted Emission.

This measurement is performed only for devices which are designed to be connected to the public utility(AC) power line. Line conducted emissions are measured in a shielded enclosure. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT from the public utility power grid through a 50 micro henry LISN. Conducted emission levels were measured on each current carrying line. The EMI METER's band width was set to 9KHz and the EMI METER was operated in the quasi-peak detector. The spectrum shall be scanned from 0.45 to 30MHz.

## B. Receiver Portion.(Certification)

#### 1. Radiated Emission

The same measurement process is used to measure the emissions from the receiver. The limits are those of rule 15.109.

#### 2. Line conducted Emissions.

This measurement applies only to radio receivers intended to be connected to powerlines of public utility systems. The same measurement process is used to measure line conducted emissions from receiver. Conducted emission levels shall not exceed 250uV at any frequency between 450KHz and 30MHz.

## IV. 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

Assume a receiver reading of 20 dBuV is obtained. The Antenna Factor of 10 and a Cable Factor of 2 is added. The 32 dBuV/m value was mathematically converted to its corresponding level in uV/m.

$$FS = 20 + 10 + 2 = 32 \text{ dBuV/m}$$

$$\text{Level in uV/m} = \text{Common Antilogarithm} [(32 \text{ dBuV/m})/20] = 39.81 \text{ uV/m}$$

## APPENDIX 1.

TEST TYPE : FIELD STRENGTH OF CARRIER AND SPURIOUS EMISSIONS

EUT : KEYLESS ENTRY DEVICE(RX) (FCC ID : CKLEFRX)

TEST DATE : 1998. 06. 12.

DETECTOR : QUASI-PEAK MODE

FCC RULES : FCC PART 15.109

EMISSION FREQUENCY (MHz)	ANTENNA POLARITY (H,V)	EMISSION LEVEL (dBuV)	ANT FACTOR &CABLELOSS (dB/m)	EMISSION LEVEL (dBuV/m)	EMISSION LEVEL (uV/m)	LIMIT (uV/m)
=====	=====	=====	=====	=====	=====	=====
315.0	H	21.0	16.92	37.92	78.7	200

\* There is no emissions between 1GHz to 2GHz.