TEST REPORT

Date : 2003-02-13

No. : BRF-0212001

APPLICANT :

Hyun Joung System Co., Ltd.
No. 302, 2nd ACE Techno Tower, 197-7, Guro-dong, Guro-gu,
Seoul, Korea

DATE OF SMAPLES RECEIVED :

Dec. 06, 2002

TEST DURATION :

Dec. 16, 2002 ~ Feb. 7, 2003

DESCRIPTION OF SAMPLE (S) :

A sample of product said to be :

Product :	Wireless Security System
Manufacturer :	Hyun Joung System Co., Ltd.
Model Number :	SAVERCALL-1000
Type of Modulation :	FSK
Frequency Range :	433.425MHz – 434.415MHz
High Frequency	4.096MHz(CPU/CODEC Clock)
Tx/Rx Antenna Type :	Whip
No. of Units :	1 Tx/Rx
Rating :	Tx/Rx : Main : AC/DC Adaptor 9V 500mA
Origin :	Korea

INVESTIGATIONS REQUESTED :

Measurement to the relevant clauses of F.C.C. Rules and Regulations Part15 Subpart B – Unintentional Radiator and Subpart C – Intentional Radiator.

TEST PROCEDURE :

ANSI C63.4-2000

RESULT / REMARK :

Please see attached sheet(s).

CONCLUSION :

From the measurement data obtained, the tested sample was considered to have COMPLIED with the clause 15.231 for the Transmitter Section of Federal Communications Commission Rules, Clause 15.231 (a), (b) & (c) and clause 15.109 for the Receiver Section of Part 15 and ANSI C63.4-2000 Section 12.1.1.1

The receiver portion of the main unit is subject to verification per Part 15.101(b), the receiver portion of this transceiver is not part of this application for certification and the receiver was tested and found compliant with Part 15.

TEST EQUIPMENT AUDIT :

2003. 2. 13	2003. 2. 13
Testing by M.J. Byun	Approval by C.A.Kwon

TEST SUMMARY

(1)	Measurement of Emission of RF energy on the carrier frequency…….	Satisfactory
	Measurement of the out-of band emissions including harmonics……..	Satisfactory
(2)	Measurement of Emission Within Band Edges……..	Satisfactory
(3)	Measurement of Radiated Emissions……..	Satisfactory
(4)	Measurement of Line-Conducted Voltage onto AC Power Line……..	Satisfactory
(5)	FCC rule clause 15.231 (a), (b) and (c) subpart C– Intentional-radiator……..	Satisfactory

TEST DATA

Please refer to the attached result sheets.

INTENTIONAL RADIATOR (Main)

(1) Measurement of Radiated Interference

TEST REFERENCE : FCC Rule Part 15 Section 15.231 (433.92MHz)

TEST CONDITION : Normal

TEST DATE : 2002. 12. 16 ~ 12. 18

Emission of RF energy on the carrier frequency –433.92MHz							
Emission Frequency	Reading (Peak Value)	Polarization	Antenna Factor & Cable Loss	Amp Gain	Average Factor	Field Strength (at 3m)	FCC Limit
MHz	dB(□)	H-V	dB	dB	dB	dB(□/m)	dB(□/m)
433.92	71.2	H	21.7	-27.3	-4.4	61.2	80.825

Calculation of the field strength limits by linear interpolation (F=433.92)

Field strength limit of the fundamental frequency:

Limit = (F-260)*(12500-3750)/(470-260) + 3750 = 10996.6□/m = 80.825 dB□/m

Field strength limit of spurious emissions:

Limit = (F-260)* (1250-375)/(470-260) + 375 = 1099.6□/m = 60.825 dB□/m

Field strength of spurious emissions							
Emission Frequency	Reading (Peak Value)	Polarization	Antenna Factor & Cable Loss	Amp Gain	Average Factor	Field Strength (at 3m)	FCC Limit
MHz	dB(□)	H-V	dB	dB	dB	dB(□/m)	dB(□/m)
867.82	20	V	30.6	-26.7	-4.4	19.5	60.825
***1301.76**	< 10		31.7	-26.7	-4.4	< 10.6	54
1735.68	< 10		35.3	-26.6	-4.4	< 14.3	60.825
2169.6	< 10		36.6	-26.4	-4.4	< 15.8	60.825
2603.52	< 10		36.9	-26.4	-4.4	< 16.1	60.825
3037.44	< 10		37.6	-26.3	-4.4	< 16.0	60.825
3471.36	< 10		38.7	-26.3	-4.4	< 18.0	60.825
***3905.28**	< 10		39.3	-26.2	-4.4	< 18.7	54
***4339.2**	< 10		40.5	-26.2	-4.4	< 19.9	54

Remark: *-Denotes restricted band of operation.

Measurement were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 were not adjusted for averaging and the limit of FCC Rules Part15 Section 15.209 were applied.

========== SUMMARY==========

Data is within limits

Broad-band Antennas were used and both polarizations of emissions were measured.
Polarizations at highest reading indicated as;
H—Horizontal V--Vertical

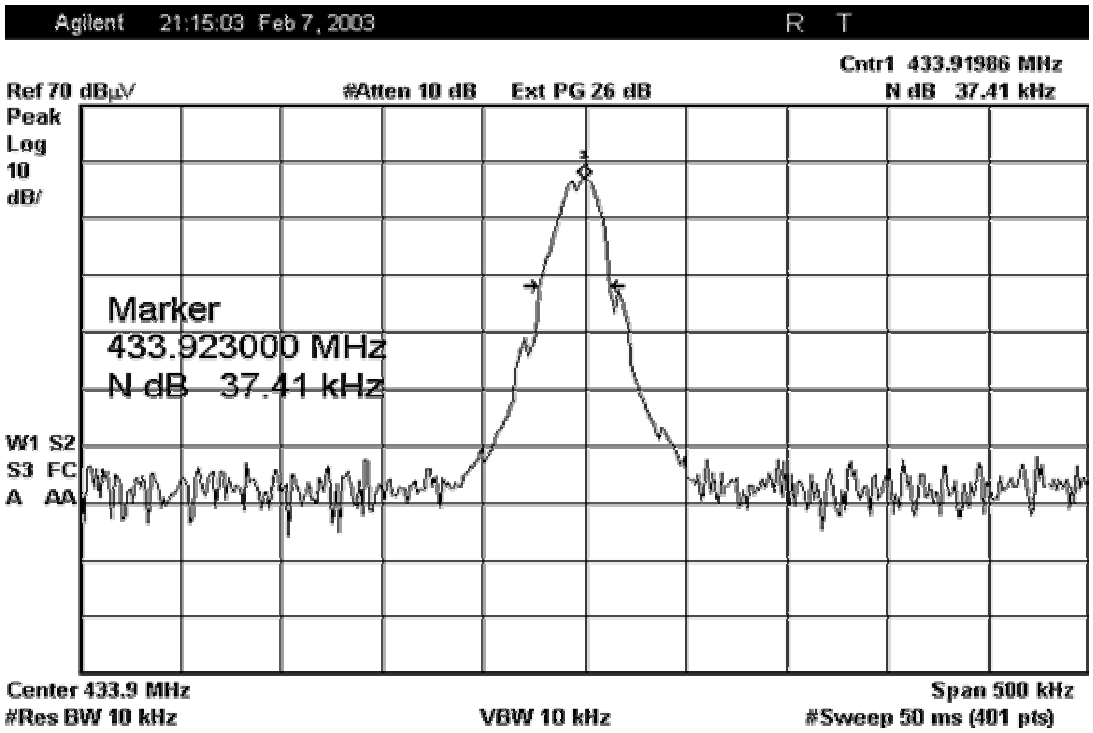
INTENTIONAL RADIATOR(Main)

(2) Measurement of Emissions Within Band Edges.

TEST REFERENCE : FCC Rules Part 15 Section 15.231 (433.92MHz)

TEST CONDITION : Normal

TEST DATE : 2003. 2. 7 ~ 2. 7



RESULTS AND NOTES

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. The bandwidth is determined at the points 20dB down from the modulated carrier.

@433.92MHz

433.92 MHz x 0.0025 =1084.8 KHz

1084.8 KHz / 2 =542.4 KHz

The bandwidth at 20dB down is 37.41kHz which is within the allowable limit of 542.4KHz at 433.92MHz.

========== SUMMARY==========

ALL data is within limits

UNINTENTIONAL RADIATOR(Main)

(3) Measurement of Radiated Interference

TEST REFERENCE : FCC Rules Part 15 Subpart B section 15.109 (a)

TEST CONDITION : Normal

TEST DATE : 2002. 12. 16 ~ 12. 18

Field strength of spurious emissions							
Emission Frequency	Reading (Peak Value)	Polarization	Antenna Factor & Cable Loss	Amp Gain	Average Factor	Field Strength (at 3m)	FCC Limit
MHz	dB(□)	H-V	dB	dB	dB	dB(□/m)	dB(□/m)
433.92	< 10	H	21.7	-27.3	-4.4	< 0.0	46
867.82	<10		30.6	-26.7	-4.4	< 9.5	46
1301.76	< 10		31.7	-26.7	-4.4	< 10.6	54
1735.68	< 10		35.3	-26.6	-4.4	< 14.3	54
2169.6	< 10		36.6	-26.4	-4.4	< 15.8	54
2603.52	< 10		36.9	-26.4	-4.4	< 16.1	54
3037.44	< 10		37.6	-26.3	-4.4	< 16.0	54
3471.36	< 10		38.7	-26.3	-4.4	< 18.0	54
3905.28	< 10		39.3	-26.2	-4.4	< 18.7	54
4339.2	< 10		40.5	-26.2	-4.4	< 19.9	54

========== SUMMARY==========

Data is within limits

Broad-band Antennas were used and both polarizations of emissions were measured.
Polarizations at highest reading indicated as;
H—Horizontal V--Vertical

NOTES FOR THE RADIATION MEASUREMENT

(1) Test site location

SK TECH CO., LTD.

820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea

(2) Distance between the EUT and measuring antenna : 3meters

(3) Transmission Requirement according to § 15.231(a)(1),(2),(3),(4) and Calculation of Duty cycle correction factor (Average factor)

Results: **Satisfactory**

The results of the transmission duration and duty cycle are shown in next page. The transmission duration was 59.92 ms and the duty cycle correction factor was computed to be –4.4 dB.

The intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, such as voice or video, and data transmissions are not permitted.

According to §15.231(a)(1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. (2), A transmitter activated automatically shall cease transmission within 5 seconds after activation. (3),Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission of not more than one second duration per hour for each transmitter. (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

The transmitter is activated in the following cases:

. when the user presses SOS button of remote controller or remote controller necklace

. when the fire sensor, the door sensor or the motion detector is detected

. when the transmitter of the main controls the remote siren(optional accessory not included in this category)

A data is transmitted once when the event occurrs .

After transmitting, the transmitter is de-activated within 5 seconds.

The data length of all transmitters are same.

There are no automatic transmissions at pre-determined intervals.

The test of the transmission duration was performed in the normal operation at the operating frequency. And the duty cycle correction factor was used to convert peak-detected readings to average readings. This factor was calculated from the time domain trace. With the transmitter setup to transmit for maximum pulse density, the time domain trace was displayed on the spectrum analyzer. This trace was obtained by tuning

center frequency to the transmitter frequency and then setting zero-span. The sweep time was then adjusted in order to display one full pulse train. The duty cycle correction factor was determined using the worst-case duty cycle. The transmission duration was measured, as the markers were set at beginning and end of a word period. The EUT transmits a control code continuously without OFF time during the duration of the data transmission, because the EUT uses the method of the Binary FSK modulation. The duty cycle correction factor was then calculated as following:

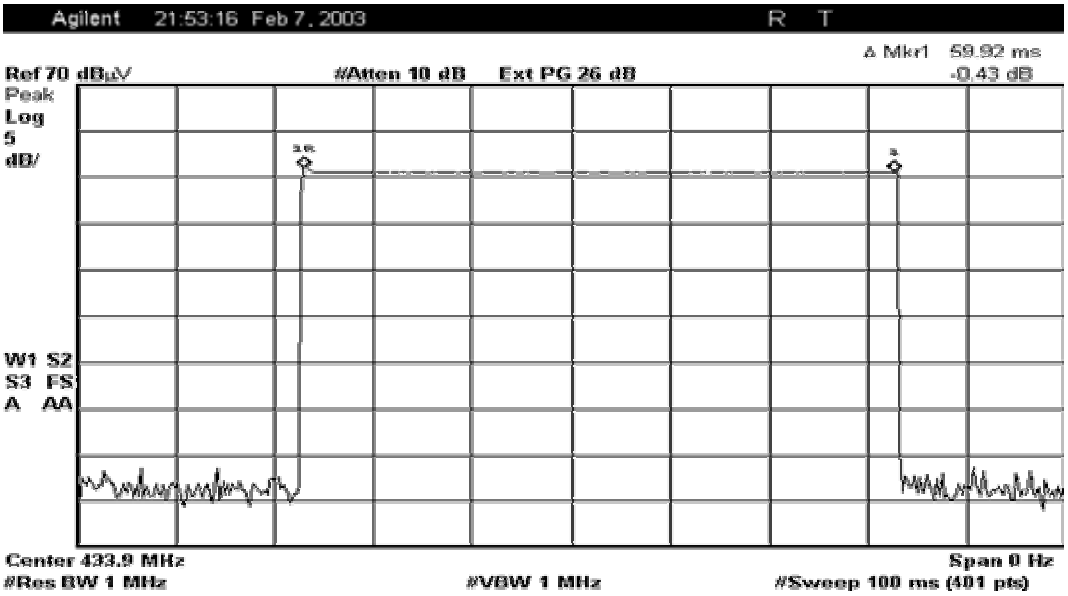
Calculation of Duty cycle correction factor (Average factor)

Transmission duration = 59.92 ms

Transmitter Duty Cycle = 59.92 %

Correction Factor = 20 log(0.5992) = – 4.4 dB

Figure of the measured Transmission Duration



(4) Measuring instrumentations :

Test Equipment	Manufacturer	Model No.	Serial No.	Next Calibration
EMI Receiver	R&S	ESI	835571/004	05. 2003
Signal Generator	R&S	SMY01		
Spectrum Analyzer	Agilent	7405A	US40240203	06. 2003
Amplifier	H.P	8347A	2834A00543	05. 2003
Log Periodic Antenna	Schwarzbeck	UHALP9107	1819	02. 2003
Biconical Antenna	Schwarzbeck	BBA9106	91031626	02 2003
Horn Antenna	Schwarzbeck	SAS-200/571	304	04 2003
Antenna Mast		5907	N/A	N/A
Antenna&Turntable controller		5906	N/A	N/A

(5) Arrangement of EUT:

During the test, the sample was operated at rated supply voltage and arranged for maximum emissions.

(6) Measuring Procedures :

Preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters. The EUT was programmed to operate in continuous transmit by using modified firmware which was programmed into the sample's processor, and then was placed on the top of the 0.8 meter high, 1 x 1.5 meter non-metallic table. According to ANSI C63.4-2000 Paragraph 13.1.4.1, To find the maximum emission levels, ,the EUT was rotated through three orthogonal axes so that all of its sides were exposed to the receiving antenna, the height of a measuring antenna was changed and the turntable was rotated 360˚. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 30 to 300 MHz using the biconical antenna and from 300 to 1000 MHz using the log-periodic antenna. Above 1GHz, linearly polarized double ridge horn antenna was used.

To obtain the final test data, the EUT was arranged on a turntable situated on a 4x4 meter at the Open Area Test Site. The EUT was tested at a 3-meter test distance. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set to peak detector function and specified bandwidth with "max hold" mode. The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT.

In accordance with the relevant clauses of the FCC Rules Part15 section 15.231.

In accordance with the relevant clauses of FCC Part Section 15.109(a) and ANSI C63.4:2000 Section 12.1.1.1.

For super regenerative receivers, an independent signal generator had been used to radiated an unmodulated were (cw) signal to the receiver at its operating frequency in order to "cohere" or resolve the individulated were (ce) signal to the receiver at its operating frequency in order to "cohere" or resolve the individual components of the characteristic broadband emission from such a receiver. The level of such signal may need to be adjusted in order to accomplish this.

(7) Measuring Uncertainty :

Radiated disturbance

Uc (Combined standard uncertainty) = ± 1.9 dB

Expanded uncertainty U = KUc

K = 2

□ U = ±3.8dB