TEST REPORT

Ref. Report No.
04-1341-004

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Name and address of the applicant

Han Seung Enterprise Co., Ltd.
715-2, Gojan-dong, Namdong-ku,
Incheon, 405-821 Korea

Standard / Test regulation

FCC Part 15, Subpart C

Test result

Pass

Test item(s) ;

Low Power Tx below 1.705MHz (Dog Fence)

Model/type ref. ;

DOGTRA e-Fence System

Manufacturer ;

Han Seung Enterprise Co., Ltd.

Additional information ;

-Required Authorization : Certification
-FCC ID. : FO6RE-FENCE

Incoming date : January 30, 2004

Test date : February 27, 2004

Issue date : March 8, 2004

Tested and reported by

Jeong-Min Kim, Senior Engineer

Reviewed by

Hee-Soo Kim , Telecommunication Team Manager

KOREA TESTING LABORATORY

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□. GENERAL INFORMATION

1. Grantee's Name and Mailing Address : Han Seung Enterprise Co., Ltd.
715-2, Gojan-dong, Namdong-ku, Incheon,
405-821 Korea

2. Manufacturer's Name and Mailing Address : Han Seung Enterprise Co., Ltd.
715-2, Gojan-dong, Namdong-ku, Incheon,
405-821 Korea

3. Equipment Descriptions

3.1 Operating Frequency : 10.0 kHz
3.2 Power Supply : DC 12 V (Adapter)
3.3 Adapter used : Model: AEC-4112B, Manufacturer: ANOMA ELECTRIC CO., LTD.

4. Rules and Regulations : FCC Part 15, Subpart C

5. Measuring Procedure : ANSI C63.4-2001

6. Place of Measurement : Open Area Test Site (KTL)

7. Date of Measurement

7.1 Conducted Emission : February 27, 2004
7.2 Radiated Emission : February 27, 2004

□. GENERAL REQUIREMENTS OF THE EUT

1. Labeling Requirement (Section 15.19)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interface, and (2) this device must accept any interference received, including interference that may cause undesired operation.

1.1 Location of Label : Rear side of EUT
1.2 How Applied : Printed on Adhesive Label

2. Information to User (Section 15.21)

The following or similar statements were provided in the manual for user instruction.
Please refer page 31 of the attached manual for details.

CAUTION : Any changes or modifications in construction of this device which are not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

3. Special Accessories (Section 15.27)

3.1 Were the special Accessories provided? [ ] yes, [x] no

3.2 If yes, details for the special accessories are as follows :

3.3 If yes, were the appropriate instructions provided on the first page of the text concerned with the installation of the device?
[ ] yes, [ ] no

3.4 Are these accessories provided of the type which can be readily obtained from multiple retail outlets ?
[ ] yes, [ ] no

And therefore does the manual specify what additional components or accessories are required to used in order to comply with the Rules?
[ ] yes, [ ] no

□. CONDUCTED EMISSION MEASUREMENT (Section 15.207)

1. Test Procedure

Conducted emission measurements on the EUT were performed by "AC Power Line Conducted Emissions Testing" procedure as per ANSI C63.4. The EUT was set up on a wooden table 0.8 meters height, 1.0 by 1.5 meters in size, placed in the shielded enclosed with a side of wall of which constituted a vertical conducting surface of 2.2 m x 3.1 m in size to maintain 40 cm from the rear of EUT.

LISN(Line Impedance Stabilization Network, EMCO, 3825/2, 50 ohm / 50 μH) was installed and electrically boned to the conducting ground plane.

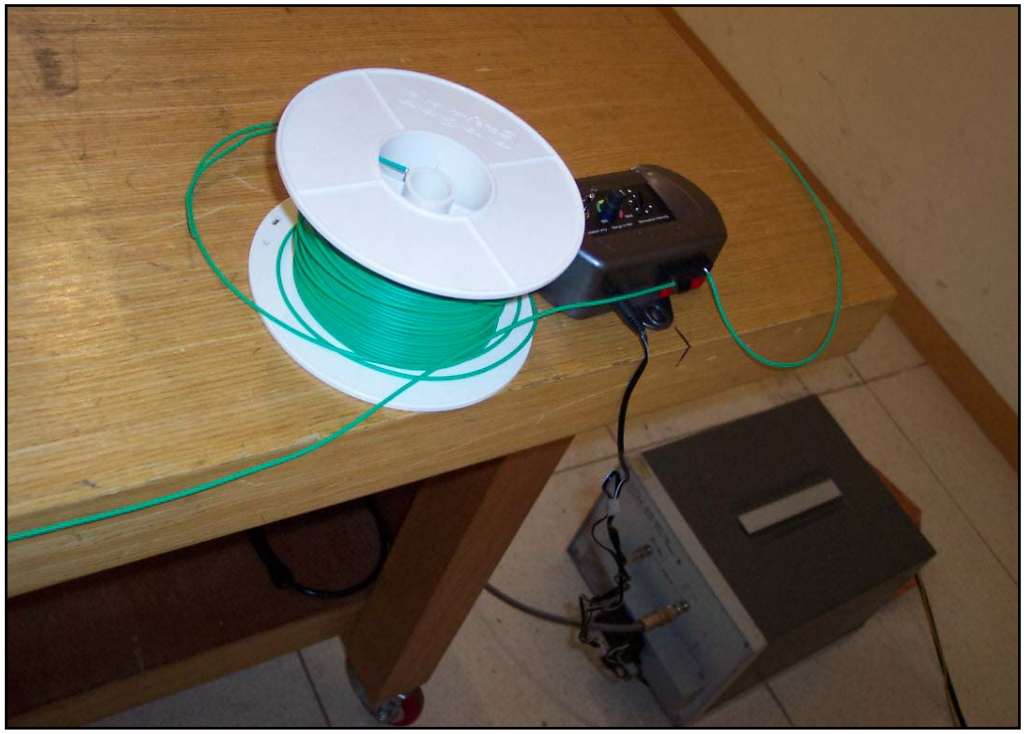
One of two 50 ohm output terminals of the LISN was connected to the EMI Test Receiver(R&S, ESI, 20 Hz to 7 GHz) and the other was terminated in 50 ohms. Measurements were again performed after interchanging such a connection oppositely.

The frequency range from 150 kHz to 30 MHz was examined and the peak values that are within 6 dB of the limit would be compared to quasi-peak values using the Quasi-Peak Detector Function.

The voltage developed across the 50 ohms port in LISN was measured and graphed by the EMI Test Receiver. The 6 dB bandwidth of the EMI Test Receiver was set to 9 kHz.

The position of connecting cables of the EUT was changed to find the worst case configuration during measurements. The maximum emission level from the EUT occurred in such configuration as shown in the following photograph.

2. Photograph for the test configuration



3. Sample Calculation

The emission level measured in decibels above one microvolt (dB□) was converted into microvolt (□) as shown in following sample calculation.

For example :

Measured Value at	4.645 MHz	47.2 dB □ @ Q-peak mode
+ Cable Loss*		0.0 dB
= Conducted Emission		47.2 dB □

* In case of RG214/ RF cable 15 Ft, the loss is about 0.17 dB at the frequency of 30 MHz which is negligible.

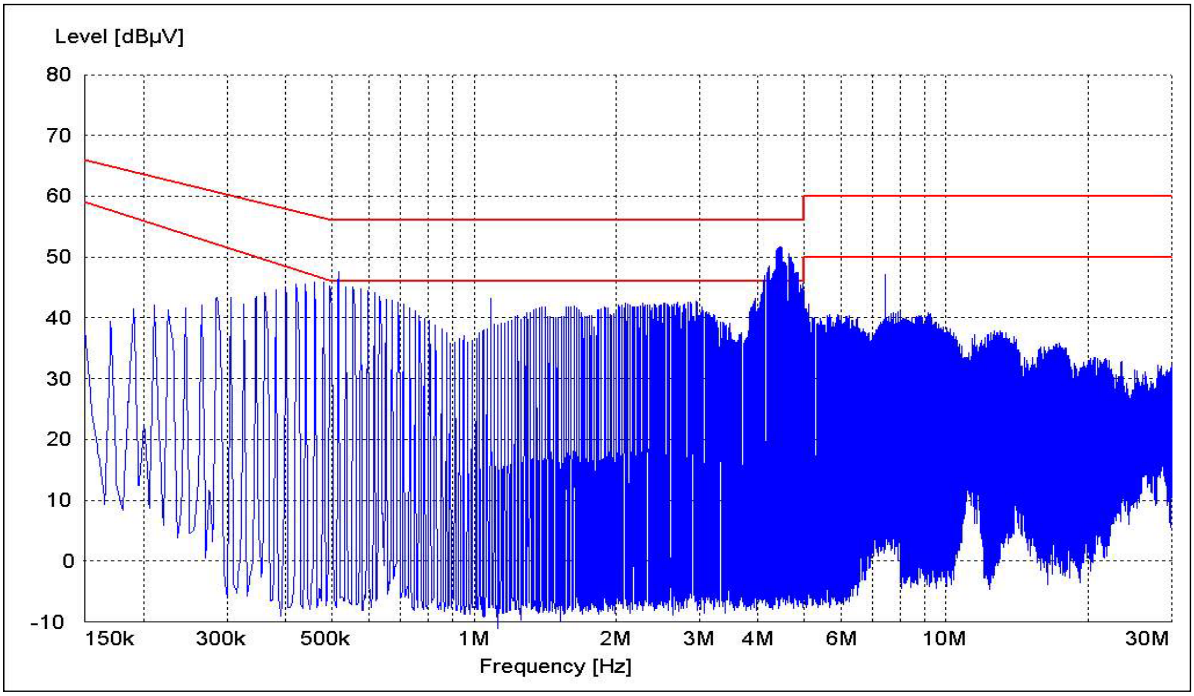
4. Measurement Data

- Resolution Bandwidth : x CISPR Quasi-Peak (6 dB Bandwidth : 9 kHz)
  x Average (6 dB Bandwidth : 9 kHz)

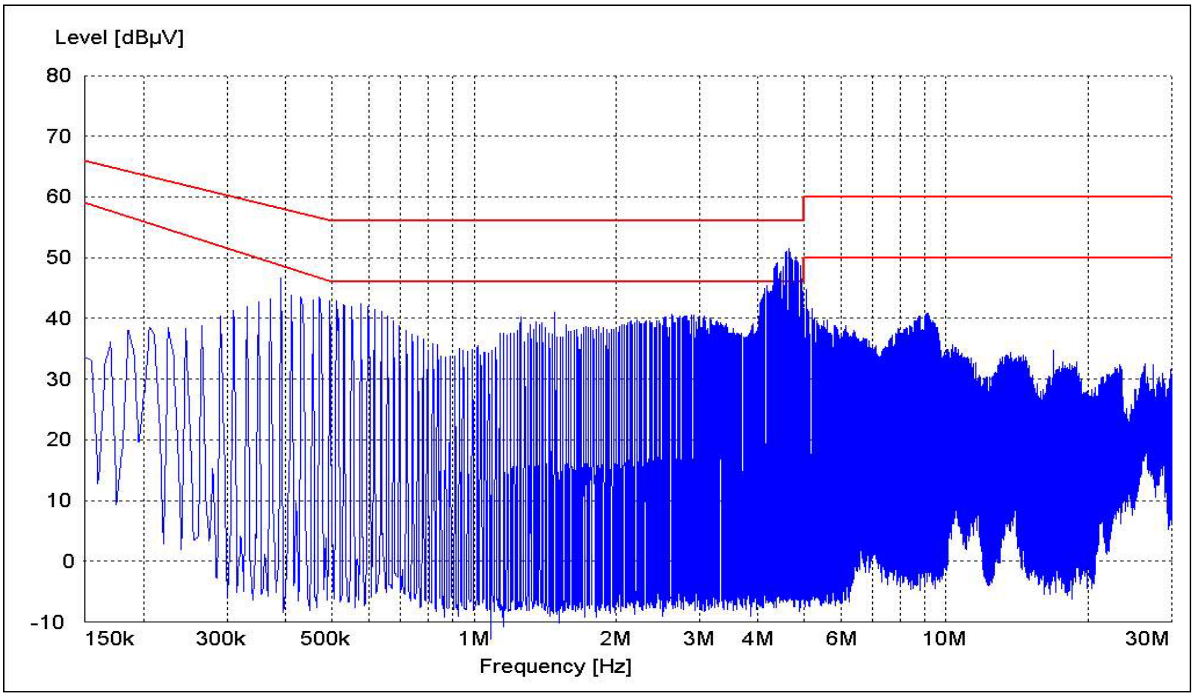
Power Lead Tested	Frequency (MHz)	Measured Value		Limit		Margin	
		Q-Peak (dB□)	Average (dB□)	Q-Peak (dB□)	Average (dB□)	Q-Peak (dB)	Average (dB)
Live to Ground	4.225	44.6	22.1	56.0	46.0	-11.4	-23.9
	4.455	46.7	20.8	56.0	46.0	- 9.3	-25.2
	4.645	47.2	20.5	56.0	46.0	- 8.8	-25.5
	-	-	-	-	-	-	-
Neutral to Ground	4.395	45.1	20.1	56.0	46.0	-10.9	-25.9
	4.645	46.0	19.2	56.0	46.0	-10.0	-26.8
	4.800	46.1	18.7	56.0	46.0	- 9.9	-27.3
	-	-	-	-	-	-	-

Note : Refer to measured graphs on next page.

* Margin(dB) : Emission Level (dB) - Limit (dB)



[Live to Ground Side]



[Neutral to Ground Side]

□. RADIATED EMISSION MEASUREMENT (Section 15.209)

1. Test Procedure

1.1 Preliminary Testing for Reference

Preliminary testing was performed in a KTL open area test site to determine the emission characteristics of the EUT. The EUT was placed on the wooden table which has dimensions of 0.8 meters in height, 1 meter in length and 1.5 meters in width. Receiving antenna (Active Loop antenna : 9 kHz to 30 MHz) was placed at the distance of 10 meter from the EUT.

An attempt was made to maximize the emission level with the various configurations of the EUT. Emission levels from the EUT with various configurations were examined on a spectrum analyzer connected with a RF amplifier and graphed by a plotter.

1.2 Final Radiated Emission Test at an Absorber-Lined Room

The final measurement of radiated field strength was carried out in a KTL open area test site that was listed up at FCC according to the "Radiated Emissions Testing" procedure specified by ANSI C63.4.

Based on the test results in preliminary test, measurement was made in same test set up and configuration which produced maximum emission level. Since the antenna of EUT is too long to fit on the table, we installed two pieces of wood to fit the antenna of EUT. The length of antenna of EUT to be tested was 5 meters. Receiving antenna was installed at 10-meter distance from the EUT, and was connected to an EMI receiver or spectrum analyzer with a RF amplifier.

Turntable was rotated through 360 degrees and the center of receiving loop antenna was 1 meter above the ground plane with horizontal and vertical polarization to read maximum emission level.

If necessary, the radiated emission measurements could be performed at a closer distance than specified distance to ensure higher accuracy and their results were extrapolated to the specified distance using an inverse linear distance extrapolation factor (40dB/decade) as per Section 15.31(f).

The maximum emission level from the EUT occurred in such configuration as shown in the following photograph.

2. Photograph of the test configuration

3. Sample Calculation

The emission level measured in decibels above one microvolt (dB □) was calculated as shown in following sample calculation.

For example :

	Measured Value at 0.010 MHz	63.8 dB □
+	Antenna Factor	19.0 dB/m
+	Cable Loss	0.0 dB
-	Preamplifier	0.0 dB
-	Distance Correction Factor *	59.1 dB
=	Radiated Emission	23.7 dB □/m

* Extrapolated from the measured distance to the specified distance by an inverse linear distance extrapolation.

4. Measurement Data

- Resolution Bandwidth : Peak (6 dB Bandwidth : 200 Hz for ranges below 30 MHz)
  Average (6 dB Bandwidth : 200 Hz for ranges below 30 MHz)
- Measurement Distance : 10 Meter

Frequency (MHz)	* D.M.	* A.P.	Measured Value (dB□)	* A.F. + C.L. (dB/m)	* A.G. (dB)	* D.C.F. (dB)	Emission Level (dB□/m)	Limit (dB□/m)	** Margin (dB)
0.010	P	H	63.8	19.0	-	-59.1	23.7	47.6	- 23.9
0.020	P	H	56.7	14.1	-	-59.1	11.7	41.6	- 29.9
0.022	P	H	53.7	13.8	-	-59.1	8.4	40.7	- 32.3
0.030	P	H	58.4	12.9	-	-59.1	12.2	38.1	- 25.9
0.040	P	H	53.7	11.8	-	-59.1	6.4	35.6	- 29.2
0.050	P	H	53.2	10.7	-	-59.1	4.8	33.6	- 28.8
0.060	P	H	57.1	10.4	-	-59.1	8.4	32.0	- 23.6
0.070	P	H	53.3	10.2	-	-59.1	4.4	30.7	- 26.3
0.080	P	H	45.4	10.1	-	-59.1	-3.6	29.5	- 33.1
-	-	-	-	-	-	-	-	-	-

Note
The frequency range of this test was from 9kHz to 30 MHz. The observed EMI Test Receiver's noise floor level was 35.0 dB□ for the test frequency range. And all other emissions not reported on data were more than 30 dB below the permitted level.

* D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
A.P. : Antenna Polarization (H : Horizontal, V : Vertical)
A.F. : Antenna Factor
C.L. : Cable Loss
A.G. : Amplifier Gain
D.C.F. : Distance Correction Factor (in here, 40 log(10/300) = -59.1dB)
< : Less than

** Margin (dB) = Emission Level (dB) - Limit (dB)

Note ;

(1) Fundamental emissions from the intentional radiators were not located within any of frequency bands described in section 15.205(a) listed below ;

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.1775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	
13.36-13.41			

The field strength of emissions appearing within above frequency bands did not exceed the limits shown in section 15.209. At frequency equal to or less than 1000MHz, compliance with the limits section 15.209 was demonstrated using measurement employing a CISPR quasi-peak detector. Above 1000MHz, demonstrated based on the average value of the measured emissions.

(2) If the intentional radiator was operated under the radiated emission limits of the general requirements of section 15.209, it's fundamental emissions were not located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-860MHz.

(3) The level of any unwanted emissions from an intentional radiator did not exceed the level of the fundamental emission.

(4) Radiated and spurious emissions were checked from 30MHz to 3GHz. And all other emissions not reported on data were more than 20 dB below the permitted level.

□. TEST EQUIPMENT USED FOR MEASUREMENTS

Equipment	Model No.	Manufacturer	Serial No.	Effective Cal. Duration
[ ] EMI Receiver (20 MHz-1 GHz)	ESVS30	R & S	830516/002	06/13/03-06/13/04
[x] EMI Receiver (20 Hz-7 GHz)	ESI	R & S	835571/004	09/05/03-09/05/04
[x] Spectrum Analyzer (9 kHz-26.5 GHz)	8563A	H. P.	3222A02069	03/27/03-03/27/04
[x] Spectrum Analyzer (100 Hz-22 GHz)	8566B	H. P.	3014A07057	05/26/03-05/26/04
[x] Quasi-Peak Adapter (10 kHz-1 GHz)	85650A	H. P.	3107A01511	05/26/03-05/26/04
[x] RF-Preselector (20 Hz-2 GHz)	85685A	H. P.	3010A01181	05/26/03-05/26/04
[ ] Test Receiver (9 kHz-30 MHz)	ESH3	R & S	860905/001	06/13/03-06/13/04
[ ] Synthesized Sweeper (10 MHz-20 GHz)	83620A	H. P.	3250A01653	06/13/03-06/13/04
[ ] Pre-Amplifier (0.1-3000 MHz, 30 dB)	8347A	H. P.	2834A00543	05/26/03-05/26/04
[ ] Pre-Amplifier (1-26.5 GHz, 35 dB)	8449B	H. P.	3008A00302	05/26/03-05/26/04
[x] LISN(50 Ω , 50 μH) (10 kHz-100 MHz)	3825/2	EMCO	9010-1710	05/26/03-05/26/04
[ ] Tuned Dipole Ant. (30 MHz-300 MHz)	VHA 9103	Schwarzbeck	-	*
[ ] Tuned Dipole Ant. (300 MHz-1 GHz)	UHA 9105	Schwarzbeck	-	*
[ ] Biconical Ant. (30 MHz-300 MHz)	BBA 9106	Schwarzbeck	-	*
[ ] Biconi-Log Ant. (26 MHz-2000 MHz)	3142B	EMCO	00023784	*
[ ] Log Periodic Ant. (200 MHz-1 GHz)	3146	EMCO	-	*
[ ] Horn Ant. (1 GHz-18 GHz)	3115	EMCO	-	*
[x] Active Loop Ant. (9 kHz-30 MHz)	6502	EMCO	2532	*
[x] Shielded Room (5.0 m x 4.5 m)	-	SIN-MYUNG	-	-

* Each set of antennas has been calibrated to ensure correlation with ANSI C63.5 standard. The calibration of antennas is traceable to Korea Standard Research Institute(KSRI).