EMISSION TEST REPORT

Test Report No. : 19H0013-02

Applicant:	**SHINKO ELECTRIC CO., LTD.**
Type of Equipment:	**SELOHT**
Model No.:	**COM, CMC**
Test standard:	**FCC Part 15 Subpart C**
Test Result:	**Complies**

The results in this report apply only to the sample tested.

Date of test: August 7, 1999

Tested by: _____

Hironobu Shimoji

Approved by: _____ Issued date: September 10, 1999

Kazutoyo Nakanishi

Group Leader of EMC section

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Testing Laboratory
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1 GENERAL INFORMATION

APPLICANT	: SHINKO ELECTRIC CO., LTD.
ADDRESS	: 100, Takegahana-cho, Ise-city, Mie 516-0005 Japan Tel: +81-596-36-3974 Fax: +81-596-36-3180
REGULATION(S)	: FCC Part 15 Subpart C
MODEL NUMBER	: COM, CMC
SERIAL NUMBER	: -
KIND OF EQUIPMENT	: SELOHT
TESTED DATE	: August 7, 1999
RECEIPT DATE OF SAMPLE	: August 7, 1999
REPORT FILE NUMBER	: 19H0013-02
TEST SITE	: A-PEX Yokowa NO.1 Open Test Site

1.1 Tested Methodology

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

1.2 Test Facility

The open area site measurement facility used to collect the radiated data is located on 108, Yokowa-cho, Ise-shi, Mie-ken, 516-1106 Japan.
This site has been fully described in a report dated Aug. 1, 1997 submitted to FCC office, and listed dated Sep. 16, 1997 (31040/SIT 1300F2).

2 Product Description

SHINKO ELECTRIC CO., LTD., Model: COM, CMC (refer to the EUT in this report) is a part of communication system for transportation system on the track. This communication is between ground side vehicle controller and the vehicle on the track. Communication items are vehicle destination, other control commands to the vehicle, vehicle status to the ground, etc. In order to supply the power to the vehicle, this system adopt the non-contact power supply system.
That is, parallel wires are set in the track and 8.66 kHz AC current are lead to this wire from the ground side power supply unit. Vehicles take power with pick up transformer, which is set to the vehicle, from the parallel line.
Communication system utilize this power supply line and superimpose signals on this line.

CMC : CMC (Communication Modem Controller) is equipped in the power supply unit on the ground.
Its function is modulation and demodulation of the signals of the ground side vehicle controller. This vehicle controller is a PC based controller. (FCC granted)
CMC is mainly composed as follows,
Printed circuit board (Circuit board name : BV-BC, BV-BM2), Transformer for transmit, Transformer for receive

COM : COM (Communication Modem) is a communication parts which is equipped in the vehicle on the track.
Its function is modulation and demodulation of the signals of the vehicle side controller. This vehicle controller is also a PC based controller. Clock frequency is of the PC is 66 MHz.
COM is mainly composed as follows,
Printed circuit board (Circuit board name : BV-COM), Transformer for transmit, Transformer for receive

Using frequency (Adopted the frequency shift keying method, therefore two frequency are used for each transmit)
From ground side to vehicle side : 285.7 kHz and 315.8 kHz
From vehicle side to ground side : 342.9 kHz and 363.6 kHz

3 Tested Equipment Details

The FCC IDs for all equipment, plus description of all cables used in the tested system are:

Model	FCC ID	Description	Cable description	Backshell Material
(1) SHINKO M/N: COM S/N: - (EUT)		SELOHT	-	-
(2) SHINKO M/N: CMC S/N: - (EUT)		SELOHT	Shielded Coaxial Cable	-

4 SYSTEM TEST CONFIGURATION

4.1 Justification

The measurement was performed with the system configuration shown in Figure 4.2.
Running mode was taken for the EUT operation mode.

4.2 Test Procedure

The loop antenna shall be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT.
For certain applications, the loop antenna may also need to be positioned horizontally at the specified distance from the EUT.
The center of the loop shall be 1m above the ground.

Figure 4.2 Configuration of Tested System

Front View

Top View

5 ELECTRIC AND MAGNETIC FIELD MEASUREMENT PHOTOS

Figure 5.1 Electric and Magnetic Field Measurement Photos

5.1 Measurement Uncertainty

Electric Field Test (30 MHz - 1000 MHz)

The measurement uncertainty (with a 95% confidence level) for this test was 3.3dB.

The data listed in this test report may exceed the test limit because it does not have enough margin (more than 3.3dB).

Magnetic Field Test (9kHz - 30MHz)

The measurement uncertainty (with a 95% confidence level) for this test was ±3.3dB.

The data listed in this test report has enough margin, more than 3.3dB.

6 ELECTRIC AND MAGNETIC FIELD TEST DATA

1) ELECTRIC FIELD TEST DATA

Since this communication system incorporates a class A digital devices, electric field tests was performed using the radiated emission limits of 15.109 (b) from 30 to 1000 MHz as specified in 15.209 (f).

The initial step in collecting radiated data was a spectrum analyzer peak scan of the measurement range (30MHz-1000MHz).
The final data was reported in the worst-case emissions.
The minimum margin to the limit is as follows :

Frequency (MHz)	Receiver Reading (dBuV)	Correction Factor (dB/m)	Field Strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)
53.82	51.3	-14.4	36.9	39.0	2.1

2) MAGNETIC FIELD TEST DATA

Magnetic field test was performed using the radiated emission limits of 15.209 (a) for the intentional radiator from each fundamental frequencies to tenth harmonic frequency as specified in 15.33 (a) (1).

The initial step in collecting radiated data was a spectrum analyzer peak scan of the measurement range (Fundamental Frequency - Tenth harmonics).
The final data was reported in the worst-case emissions. (Running/HOR (315.8kHz))
The minimum margin to the limit is as follows :

Frequency (MHz)	Receiver Reading (dBuV)	Correction Factor (dB/m)	Field Strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1.5790	60.2	-3.5	56.6	63.6	7.0

6.1 Field Strength Calculation

1) ELECTRIC FIELD TEST DATA

The field strength is calculated by adding the Antenna Factor, Cable Factor and Antenna Pad, and subtracting the Amplifier Gain from the measured reading. The sample calculation is as follows :

FS = RA + AF + CF + AT - AG

where FS = Field Strength
RA = Receiver Reading
AF = Antenna Factor
CF = Cable Factor
AT = Antenna Pad
AG = Amplifier Gain

Assume a receiver reading of 51.3 dBuV is obtained. The antenna Factor of 9.9 dB/m, Cable Factor of 2.5 dB is added The Antenna Pad of 3.0 dB and Amplifier Gain of 29.8 dB is subtracted, giving a field strength of 36.9 dBuV/m.

FS = 51.3+ 9.9 + 2.5 + 3.0 - 29.8 = 36.9 dBuV/m

2) MAGNETIC FIELD TEST DATA

The field strength is calculated by adding the Antenna Factor, Cable Factor and Antenna Pad, and subtracting the Amplifier Gain from the measured reading. The sample calculation is as follows :

FS = RA + AF + CF + AT - AG

where FS = Field Strength
RA = Receiver Reading
AF = Antenna Factor
CF = Cable Factor
AT = Antenna Pad
AG = Amplifier Gain

Assume a receiver reading of 60.2 dBuV is obtained. The antenna Factor of 19.7 dB/m, Cable Factor of 0.7 dB is added The Antenna Pad of 6.0 dB and Amplifier Gain of 29.9 dB is subtracted, giving a field strength of 56.6 dBuV/m.

FS = 60.2+ 19.7 + 0.7 + 6.0 - 29.9 = 56.6 dBuV/m

7 TEST EQUIPMENT USED

NAME	MANUFACTURER	MODEL	Control No.	Calibrated Until
Pre Amplifier	Hewlett Puckered	8447D	AF2	November 30, 1999
Biconical Antenna	Schwarzbeck	BBA9106	BA1	April 30, 2000
Logperiodic Antenna	Schwarzbeck	UKLP9140-ALA7		February 14 , 2000
Loop Antenna	Rohde & Schwarz	HFH2-Z2	LP1	October 20, 1999
Spectrum Analyzer	Hewlett Packard	8567A	SA1	November 30, 1999
Test Receiver	Rohde & Schwarz	ESHS-20	TR1	March 31, 2000
Test Receiver	Rohde & Schwarz	ESVS-30	TR2	July 4, 2000

indicates EMI Test Equipment used.

All measurement equipment is traceable to national standard

APPENDIX

Test Data

Magnetic Field Test:

HOR (285.7kHz)	A 1 - A 2
HOR (315.8kHz)	A 3 - A 4
HOR (342.9kHz)	A 5 - A 6
HOR (363.6kHz)	A 7 - A 8
VER (285.7kHz)	A 9 - A10
VER (315.8kHz)	A11 - A12
VER (342.9kHz)	A13 - A14
VER (363.6kHz)	A15 - A16
HOR/VER	A17

Electric Field Test

FCC Part15 Subpart B Class A	A18 - A19