


EMI TEST REPORT


Test Report No. : 22HE0104-YW

Applicant: Shinko Electric Co., Ltd.
Type of Equipment: SELOHT SHINKO OHT SYSTEM
Model No.: SSOHT-300
FCC ID: OPOSSOHT300VHTCOM
Test standard: FCC Part 15 Subpart C Section 15.209
FCC Part 15 Subpart B Section 15.109(b)
Test Result: Complied

1. This test report shall not be reproduced in full or partial, without the written approval of A-Pex International Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contains a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.
5. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.

Date of test: April 8 and 9, 2002

Tested by: 
Seigo Kakehi

Approved by: 
Kazutoyo Nakanishi
Site Operation Manager of EMC section

A-pex International Co., Ltd.

YOKOWA LAB.

108 Yokowa-cho, Ise-shi, Mie-ken 516-1106 JAPAN

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MF060b(22.05.01)

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SECTION 1: Client information

Company name	: Shinko Electric Co., Ltd.
Address	: 100 Takegahana-cho , Ise-shi , Mie 516-8550 , Japan
Telephone Number	: +81-596-36-2335
Facsimile Number	: +81-596-36-2162
Contact Person	: Mr.T.Kitano

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	: SELOHT SHINKO OHT SYSTEM
Model No.	: SSOHT-300 (VHT5-1 + 3ASSYC807901)
Sample No.	: 1
Condition of EUT	: Production model
Rating	: DC 24V , DC 5V , $\pm 12V$
Country of Manufacture	: Japan
Receipt Date of Sample	: April 8, 2002

2.2 Product Description

Model: VHT5-1 / SSOHT-300(VHT5-1:Vehicle / SSOHT-300:System)(referred to as the EUT in this report) is a SELOHT SHINKO OHT SYSTEM.

This equipment is a FCC part 15 subpart B class A digital device with RF unit loded.

The specification is as follows;

Communication unit's carrier frequency (Intentional Radiators)	: 88.8kHz (on off keying)
	: 353.25kHz (FSK)

Communication unit's main clock(Unintentional Radiators)	: 24MHz
CPU clock(Unintentional Radiators)	: 133MHz

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SECTION 3: Test specification, methods & procedures

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C Section 15.209
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.209 Radiated emission limits; general requirements

Test Specification : FCC Part 15 Subpart B Section 15.109(b)
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Methods & Procedures

No.	Item	Test Procedure	Specification	Remarks
1	Radiated emission	ANSI C63.4:2000	Section 15.109(b) Section 15.209(a)	3m/10m
2	Conducted emission	ANSI C63.4:2000	Section 15.107(b) Section 15.207(a)	LISN

These tests were performed without any deviations from test procedure excluding below additions or deviations.

3.3 Exclusion from standards

No.	Item	Test Procedure	Specification	Remarks
2	Conducted emission	ANSI C63.4:2000	Section 15.107(b) Section 15.207(a)	LISN

The test is not applicable since the EUT does not have AC Mains.

SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

The operating mode/system were as follows:

Operation : Transmitting (88.8kHz and 353.25kHz *FCC Part15 subpart C)
Branch Exchange Mode(Semaphore Mode *FCC Part15 subpart B)
Vehicle is at the branch section for entrance coordination.

Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

Remarks:

This is a compound equipment of FCC part 15 subpart B class A digital device and FCC part 15 subpart C Intentional radiators. The frequency from 9kHz to the maximum frequency 30MHz of intentional radiator including the tenth harmonic, measured as section 15.209 and the frequency over 30MHz measured as section 15.109.

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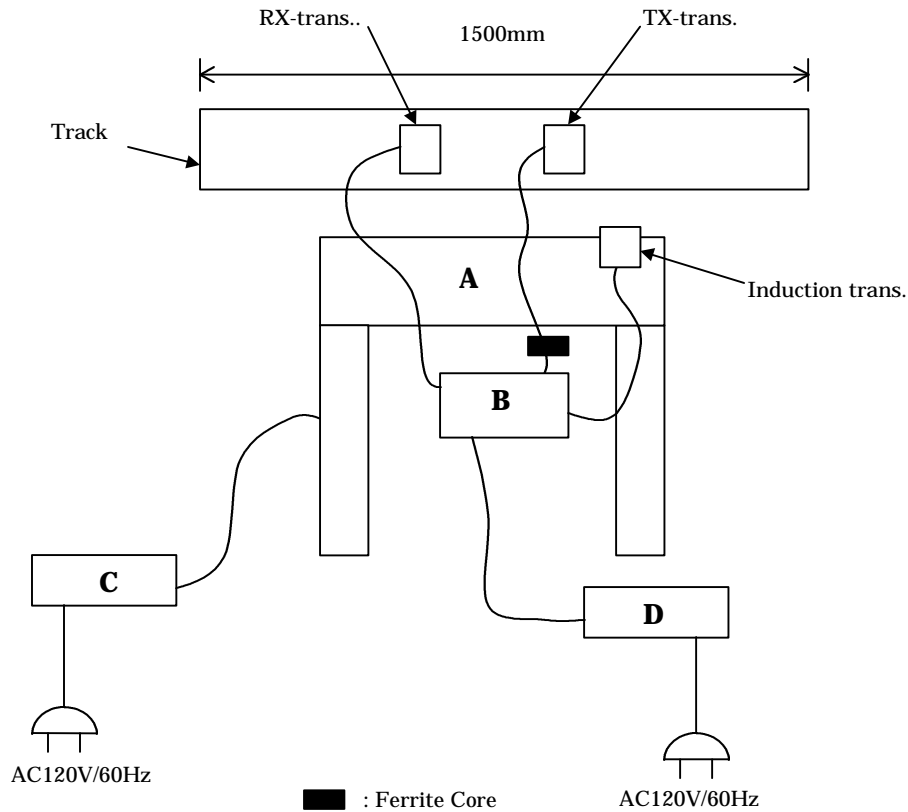
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4.2 Configuration and peripherals



*Cabling was taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Vehicle	VHT5-1	-	SHINKO	EUT
B	Communication Board (M-COM2)	3ASSYC807901	-	SHINKO	EUT
C	Power Supply	PAB25-1TR	30081818	KIKUSUI	-
D	Host (Vehicle Controller)	-	-	SHINKO	-

List of cables used

No.	Name	Length (m)	Shield	Backshell Material	Remark
1	Interconnection Cable	1.0	Y	Polyvinyl chloride	-
2	Interconnection Cable	1.0	Y	Polyvinyl chloride	-
3	Interconnection Cable	2.0	Y	Polyvinyl chloride	-
4	Power Cable	3.0	N	Polyvinyl chloride	-
5	Interconnection Cable	3.0	N	Polyvinyl chloride	-

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SECTION 5: Summary of test results

5.1 Test results

No.	Item	Test Procedure	Specification	Worst margin	Result
1	Radiated emission	ANSI C63.4:2000	Section 15.209(a)	<u>Carrier 353.25kHz</u> We recorded the frequency detected highly after carrier frequency was modulated. 23.0dB (378.81kHz : 90deg) <u>Carrier 88.8kHz</u> 38.7dB (88.44kHz : 0deg) <u>Spurious(9kHz-30MHz)</u> 16.3dB (1379.90kHz : 0deg Carrier 353.25kHz) 20.9dB (888.80kHz : 90deg Carrier 88.8kHz)	Complied
			Section 15.109(b)	<u>Spurious(30MHz-1000MHz)</u> 5.5dB (72.00MHz: Vertical) <u>Spurious(1000MHz-2000MHz)</u> 10.9dB (1417.54MHz: Horizontal)	Complied

A-PEX INTERNATIONAL hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart B and C Section 15.109 and 15.209.

<-20dB Bandwidth>

Refer to Appendix 3.

5.2 Uncertainty

Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test using Loop antenna is ± 2.5 dB.
The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ± 4.4 dB.
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ± 4.8 dB.
The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is ± 5.8 dB.

The data listed in this test report may exceed the test limit because it does not have enough margin.

5.3 Test Location

A-PEX International Co.,Ltd. Yokowa No.1 test site
108 Yokowa-cho, Ise-shi, Mie-ken 516-1106 Japan
Telephone number : +81-596-39-1485
Facsimile number : +81-596-39-0232

No.1 test site has been fully described in a report submitted to FCC office, and listed on October 26, 2000
(Registration number: 90412).

*NVLAP Lab. code : 200109-0

5.4 Photographs of test setup

Refer to Appendix 1.

5.5 Test instruments

Refer to Appendix 2.

5.6 Data of EMI Test

Refer to Appendix 3.

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SECTION 6: Radiated emission

6.1 Operating environment

The test was carried out in an open site.

Temperature : See data
Humidity : See data

6.2 Test configuration

EUT was placed on a carpet for insulation above a reference ground plane. EUT was set up typical spacing for the other equipments. I/O cables that were connected to the peripherals were bundled in center. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

A drawing of the set up is shown in the photos of Appendix 1.

6.3 Test conditions

Frequency range : 9kHz to 30MHz (Loop Antenna) / 30MHz to 300MHz (Biconical antenna) /
300MHz to 1000MHz (Logperiodic antenna) / 1GHz to 2GHz (Horn Antenna)
Test distance : 3m(9kHz to 30MHz and 1GHz to 2GHz)
: 10m(30MHz to 1000MHz)
EUT position : Floor Standing

6.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on an open test site with a ground plane and at a distance of 3m and 10m.

Pre check measurements were performed at high-level of 80-90MHz, 270-290MHz and 500-700MHz in a screened room. Otherwise the noise from EUT might have been concealed by the ambient noise.

Measurements were performed with quasi-peak, average and peak detector.

The measuring antenna height was varied between 1 to 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

The EUT was put into operation at Transmitting mode.

The radiated emission measurements were made with the following detector function of the test receiver and spectrum analyzer.

Frequency : 9kHz -90kHz(BW 200Hz), 110kHz -150kHz(BW 200Hz), 150kHz -490kHz(BW 10kHz)
Detector Type : AV (Test Receiver)

Frequency : 90kHz -110kHz(BW 200Hz), 490kHz -30MHz(BW 10kHz), 30MHz-1000MHz(BW 120kHz)
Detector Type : QP (Test Receiver)

Frequency : 1GHz -2GHz
Detector Type : PK (Spectrum Analyzer: RBW 1MHz / VBW 1MHz)

6.5 Results

Summary of the test results: Pass

Date: April 8 and 9, 2002

Tested by: Seigo Kakehi

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APPENDIX 1: Photographs of test setup

Page 9: Radiated emission

APPENDIX 2: Test instruments

Page 10: Test instruments

APPENDIX 3: Data of EMI test

Page A1: -20dB Bandwidth

Page A2-A3: Data of carrier and spurious (9kHz to 30MHz)

Page A4: Data of radiation test (30MHz to 1000MHz)

Page A5: Data of radiation test (1GHz to 2GHz)

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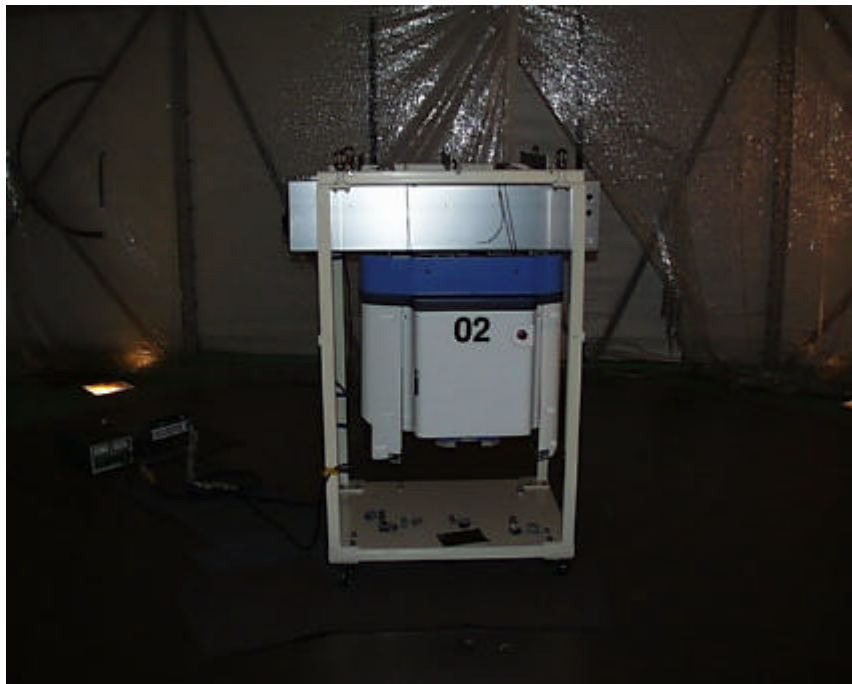
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Radiated emission



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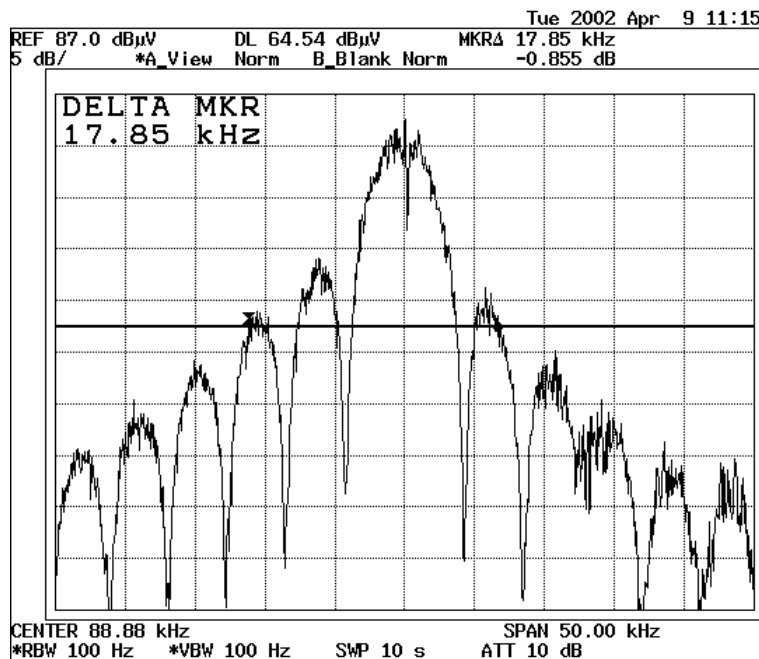
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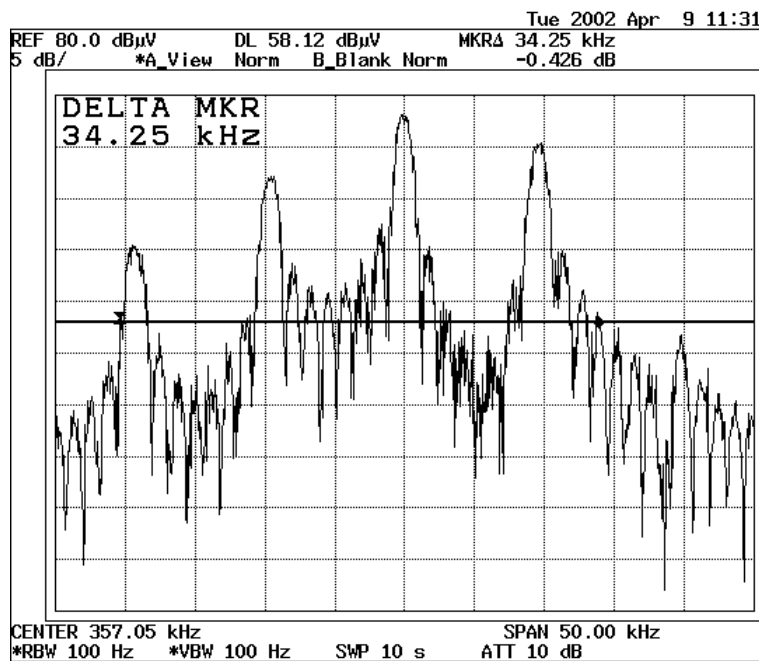
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Radiated emission -20dB Bandwidth (88.8kHz Transmitting)



-20dB Bandwidth (353.25kHz Transmitting)



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MF060b(22.05.01)

Data of Carrier and Spurious Test(9kHz to 30MHz)

A-PEX INTERNATIONAL CO., LTD.
YOKOWA NO.1 OPEN SITE

Company : Shinko Electric Co.,Ltd.
Equipment : OHT System (Transceiver)
Model : SSOHT-300
Power : DC 24.0V
Mode : Transmitting
Fundamental : 88.88kHz
Serial No. : sample No.1
Temperature : 20deg.C
Humidity : 69%

Report No : 22HE0104-YW
Regulation : FCC 15.209(a)
Test Distance : 3m
Date : 2002/4/8
Reviced Date : 2002/5/17
FCC ID : OPOSSOHT300VHTCOM



Frequency Rage :9kHz-90kHz AV DETECT(Test Receiver: BW 200Hz)

ENGINEER : Seigo Kakehi

Frequency Rage :110kHz-490kHz AV DETECT

(Test Receiver: 110-150kHz BW 200Hz,150kHz-490kHz BW 10kHz)

Frequency Rage :490kHz-30MHz QP DETECT(Test Receiver: BW 10kHz)

No.	FREQ [kHz]	ANT TYPE	READING		ANT Factor [dB]	ATTEN [dB]	CABLE LOSS [dB]	AMP GAIN [dB]	RESULT		LIMIT [dBuV/m]	MARGIN	
			0 deg	90 deg					0deg	90deg		0deg	90deg
			[dBuV]						[dBuV/m]			[dB]	
1	88.44	BB	74.8	74.7	20.1	0.0	0.1	25.0	70.0	69.9	108.7	38.7	38.8
2	177.76	BB	71.6	66.5	20.1	0.0	0.1	27.6	64.2	59.1	102.6	38.4	43.5
3	283.18	BB	61.3	64.6	20.1	0.0	0.2	28.3	53.3	56.6	98.6	45.3	42.0
4	358.10	BB	56.6	62.5	20.1	0.0	0.2	28.7	48.2	54.1	96.5	48.3	42.4
5	443.16	BB	33.8	33.7	20.1	0.0	0.2	28.9	25.2	25.1	94.7	69.5	69.6
6	530.60	BB	47.0	56.3	20.1	0.0	0.3	29.1	38.3	47.6	73.1	34.8	25.5
7	625.29	BB	50.7	47.1	20.1	0.0	0.3	29.2	41.9	38.3	71.7	29.8	33.4
8	708.65	BB	49.2	52.0	20.1	0.0	0.3	29.3	40.3	43.1	70.6	30.3	27.5
9	796.47	BB	48.0	47.6	20.1	0.0	0.3	29.3	39.1	38.7	69.6	30.5	30.9
10	888.80	BB	53.4	56.5	20.1	0.0	0.3	29.2	44.6	47.7	68.6	24.0	20.9

REMARKS

ANTENNA TYPE : 10kHz-30MHz (Loop Antenna)

CALCULATION : RESULT = READING + ANT Factor + ATTEN + Cable Loss - AMP Gain

LIMIT (0.009 to 0.490MHz) : 2400/FREQ(CONVERTED dBuV/m) + 40log(300/3)

LIMIT (0.490 to 1.705MHz) : 24000/FREQ(CONVERTED dBuV/m) + 40log(30/3)

LIMIT (1.705 to 30MHz) : 30(CONVERTED dBuV/m) + 40log(30/3)

All other spurious emissions are more than 20dB below the limits.

Data of Carrier and Spurious Test(9kHz to 30MHz)

A-PEX INTERNATIONAL CO., LTD.
YOKOWA NO.1 OPEN SITE

Company : Shinko Electric Co.,Ltd.
Equipment : OHT System (Transceiver)
Model : SSOHT-300
Power : DC 24.0V
Mode : Transmitting
Fundamental : 353.25kHz
Serial No. : sample No.1
Temperature : 20deg.C
Humidity : 69%

Report No : 22HE0104-YW
Regulation : FCC 15.209(a)
Test Distance : 3m
Date : 2002/4/8
FCC ID : OPOSSOHT300VHTCOM



ENGINEER : Seigo Kakehi

Frequency Range :9kHz-90kHz AV DETECT(Test Receiver: BW 200Hz)

Frequency Range :110kHz-490kHz AV DETECT

(Test Receiver: 110-150kHz BW 200Hz,150kHz-490kHz BW 10kHz)

Frequency Range :490kHz-30MHz QP DETECT(Test Receiver: BW 10kHz)

No.	FREQ [kHz]	ANT TYPE	READING		ANT Factor [dB]	ATTEN [dB]	CABLE LOSS [dB]	AMP GAIN [dB]	RESULT		LIMIT [dBuV/m]	MARGIN	
			0 deg	90 deg					0deg	90deg		0deg	90deg
			[dBuV]	[dBuV]					[dBuV/m]	[dBuV/m]		[dB]	[dB]
1	378.81	BB	70.1	81.4	20.1	0.0	0.2	28.7	61.7	73.0	96.0	34.3	23.0
2	704.05	BB	49.4	56.2	20.1	0.0	0.3	29.3	40.5	47.3	70.7	30.2	23.4
3	1032.87	BB	54.6	43.8	20.1	0.0	0.4	29.4	45.7	34.9	67.3	21.6	32.4
4	1379.90	BB	57.4	52.4	20.1	0.0	0.4	29.4	48.5	43.5	64.8	16.3	21.3
5	1726.81	BB	42.2	41.8	20.1	0.0	0.4	29.4	33.3	32.9	69.5	36.2	36.6
6	2081.02	BB	35.6	35.7	20.1	0.0	0.4	29.4	26.7	26.8	69.5	42.8	42.7
7	2472.75	BB	35.2	35.7	20.1	0.0	0.4	29.4	26.3	26.8	69.5	43.2	42.7
8	2826.00	BB	36.0	31.2	20.0	0.0	0.4	29.4	27.0	22.2	69.5	42.5	47.3
9	3155.82	BB	48.6	43.6	20.0	0.0	0.4	29.4	39.6	34.6	69.5	29.9	34.9
10	3492.57	BB	45.8	45.0	20.0	0.0	0.5	29.4	36.9	36.1	69.5	32.6	33.4

REMARKS

ANTENNA TYPE : 10kHz-30MHz (Loop Antenna)

CALCULATION : RESULT = READING + ANT Factor + ATTEN + Cable Loss - AMP Gain

LIMIT (0.009 to 0.490MHz) : 2400/FREQ(CONVERTED dBuV/m) + 40log(300/3)

LIMIT (0.490 to 1.705MHz) : 24000/FREQ(CONVERTED dBuV/m) + 40log(30/3)

LIMIT (1.705 to 30MHz) : 30(CONVERTED dBuV/m) + 40log(30/3)

All other spurious emissions are more than 20dB below the limits.

DATA OF RADIATION TEST(30MHz to 1000MHz)

A-PEX INTERNATIONAL CO., LTD.
YOKOWA NO.1 OPEN SITE

Company : Shinko Electric Co.,Ltd.
Equipment : OHT System
Model : SSOHT-300
Power : DC 24.0V
Mode : Branch Exchange Mode
Serial No. : sample No.1
Temperature : 21deg.C
Humidity : 42%

Report No : 22HE0104-YW
Regulation : FCC Part15B Class A
Test Distance : 10m
Date : 2002/4/8
FCC ID(*15C) : OPOSSOHT300VHTCOM



ENGINEER : Seigo Kakehi

QP DETECT(Test Receiver: BW 120kHz)

No.	FREQ [MHz]	READING		ANT Factor [dB]	ATTEN [dB]	CABLE LOSS [dB]	AMP GAIN [dB]	RESULT		LIMIT [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
		[dBuV]						[dBuV/m]			[dB]	
1	54.580	33.2	52.6	3.0	3.0	1.8	29.2	11.8	31.2	39.0	27.2	7.8
2	69.740	43.3	52.6	3.8	3.0	2.0	29.3	22.8	32.1	39.0	16.2	6.9
3	72.000	44.9	53.9	3.9	3.0	2.0	29.3	24.5	33.5	39.0	14.5	5.5
4	120.000	45.1	45.6	6.6	3.0	2.6	29.2	28.1	28.6	43.5	15.4	14.9
5	144.010	39.4	39.7	7.9	3.0	2.9	28.9	24.3	24.6	43.5	19.2	18.9
6	166.690	32.8	39.0	9.1	3.1	3.2	29.2	19.0	25.2	43.5	24.5	18.3
7	257.750	45.4	42.3	14.1	3.1	4.1	29.0	37.7	34.6	46.4	8.7	11.8
8	432.000	34.7	37.4	18.5	3.1	5.4	29.7	32.0	34.7	46.4	14.4	11.7
9	515.470	38.3	30.6	19.2	3.1	6.1	29.7	37.0	29.3	46.4	9.4	17.1

REMARKS

ANTENNA TYPE: 30-300MHz Biconical / 300-1000MHz Logperiodic

CALCULATION(30MHz to 1000MHz) : READING + ANT Factor + ATTEN + Cable Loss - AMP Gain

DATA OF RADIATION TEST(1GHz to 2GHz)

A-PEX INTERNATIONAL CO., LTD.
YOKOWA NO.1 OPEN SITE

Company : Shinko Electric Co.,Ltd.
Equipment : OHT System
Model : SSOHT-300
Power : DC 24.0V
Mode : Branch Exchange Mode
Serial No. : sample No.1
Temperature : 21deg.C
Humidity : 42%

Report No : 22HE0104-YW
Regulation : FCC Part15B Class A
Test Distance : 3m
Date : 2002/4/8
FCC ID (*15C) : OPOSSOHT300VHTCOM



ENGINEER : Seigo Kakehi

PK DETECT(S/A : RBW 1MHz and VBW 1MHz)

No.	FREQ [GHz]	READING		ANT Factor [dB]	ATTEN [dB]	CABLE LOSS [dB]	AMP GAIN [dB]	RESULT		LIMIT AV [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
		[dBuV]						[dBuV/m]			[dB]	
1	1.15988	52.9	51.5	25.6	0.0	1.7	35.2	45.0	43.6	59.9	14.9	16.3
2	1.41754	55.5	52.3	26.5	0.0	1.8	34.8	49.0	45.8	59.9	10.9	14.1
3	1.67391	47.7	52.4	28.1	0.0	1.9	34.6	43.1	47.8	59.9	16.8	12.1

REMARKS

ANTENNA TYPE: 1 to 2GHz DRG Horn

CALCULATION(1GHz to 2GHz) : READING + ANT Factor + ATTEN + Cable Loss - AMP Gain

*Except for the above table : All other spurious emissions were less than 20dB for the limit.