EMI TEST REPORT

Test Report No. : 21CE0001-YW-1

Applicant: **OPTEX CO., LTD.**

Type of Equipment: **Security Sensor**

Model No.: **MX-40PI**

Test standard: **FCC Part 15 Subpart C**

FCC ID: **FA7MX-SERIES**

Test Result: **Complies**

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.

Date of test: February 22 and 23, 2001 **Issued date:** February 28, 2001
Revised date: April 9, 2001 (*A2-4)

Tested by: Naoki Sakamoto
EMC section

Approved by: Kazutoyo Nakanishi
Section Manager of EMC section

Form Version No. 2

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CONTENTS

SECTION 1: Client information

OPTEX CO., LTD.
4-7-5 Nionohama Otsu Shiga Japan
Contact person, Norikazu Murata
Telephone No.+077-524-6990
Fax No.+077-524-9399

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

2.1 Identification of E.U.T.

Unique Type Identification	:	Security Sensor
Model No.	:	MX-40PI
Serial No.	:	3
Rating	:	DC 12V
Country of Manufacture	:	Japan
Receipt Date of Sample	:	February 7 , 2001

2.2 Product Description

Model:MX-40PI (referred to as the EUT in this report) is security sensor.
The specification is as follows;
The OPTEX MX-40PI is a range of passive infrared and microwave detectors designed to detect movement of an intruder and activate an alarm control.

Transmission frequency	:	2450MHz
Modulation	:	None
Antenna type	:	Inverted L-type antenna(Integral)

SECTION 3: Test specification, methods & procedures

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C

Title : FCC 47CFR Part15 Radio Frequency Device

Subpart C Intentional Radiators

§ 15.245 Operation within the Band 2435 – 2465MHz

3.2 Methods & Procedures

No.	Item	Test Procedure	Specification	Remarks
1	Electric Field Strength of Fundamental Emission	FCC/ANSI C63.4:1992	§ 15.245	-
2	Electric Field Strength of Spurious Emission	FCC/ANSI C63.4:1992	§ 15.245 / § 15.209	-

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

4.1 Operating Modes

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

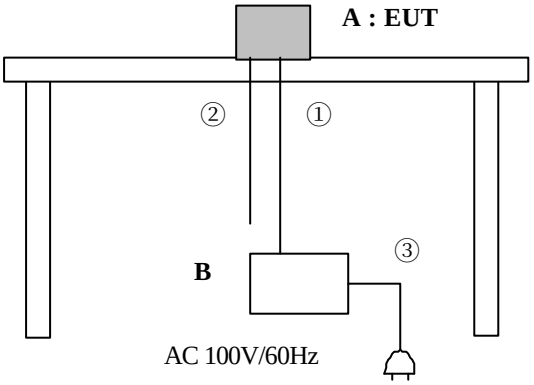
The sequence is used

Transmitting

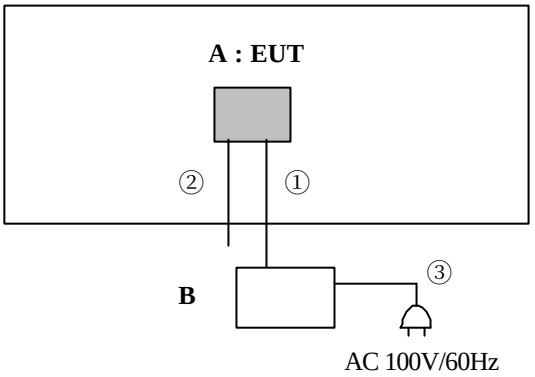
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals

Front View



Top View



Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Security Sensor	MX-40PI	3	OPTEX	EUT
B	DC Power Supply	-	-	A-Pex	-

List of cables used

No.	Name	Length (m)	Shield	Backshell Material
①	DC Cable(Alarm)	1.5	N	-
②	Signal Cable	0.9	N	-
③	AC Cable	2.0	N	-

SECTION 5: Summary of test results

5.1 Test results

No.	Item	Test Procedure	Specification	Remarks	Result
1	Electric Field Strength of Fundamental Emission	FCC/ANSI C63.4:1992	FCC Part15 Subpart C § 15.245	Test distance : 3m	Complies
2	Electric Field Strength of Spurious Emission	FCC/ANSI C63.4:1992	FCC Part15 Subpart C § 15.245 / § 15.209	Test distance : 3m	Complies

A-PEX INTERNATIONAL hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part15 Subpart C.

5.1.1 Electric Field Strength Measurement of Fundamental Frequency

The initial step in collecting radiated data was a spectrum analyzer peak scan of the measurement range
The final data was reported in the worst-case emissions.
The follwing table lists frequency at which emissions were measured using a Peak detector.
The minimum margin to the limit is as follows :(A2-1 : DC12V)

Frequency (MHz)	Ant. Pol.	S/A Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2449.62	Hor	92.3	1.0	93.3	113.9	20.6

Field strength calculation

The field strength is calculated by adding the Antenna Factor, Cable Factor 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 Amplitude
AF = Antenna Factor
CF = Cable Factor
AG = Amplifier Gain
Assume a Spectrum Analyzer reading of 92.3 dBμV is obtained. The antenna Factor of 28.8 dB, and Cable Factor of 6.7 dB is added. The Amplifier Gain of 34.5 dB is subtracted, giving a field strength of 93.3 dBμV/m.
FS = 92.3 + 28.8 + 6.7 – 34.5 = 93.3dBμV/m

5.1.2 Electric Field Strength of Spurious Emission

The initial step in collecting radiated data was a spectrum analyzer peak scan of the measurement range
The final data was reported in the worst-case emissions.

Detector : 30MHz to 1GHz Quasi peak
: 1GHz to 26GHz Peak and Average

The minimum margin to the limit is as follows (A2-4)

Frequency (MHz)	Ant. Pol.	S/A(AV) Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4899.13	Ver	44.5	9.0	53.5	54.0	0.5

Field strength calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor , 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 Amplitude
AF = Antenna Factor
CF = Cable Factor
AG = Amplifier Gain

Assume a Spectrum Analyzer reading of 44.5 dBμV is obtained. The antenna Factor of 33.9 dB and Cable Factor of 9.6 dB is added. The Amplifier Gain of 34.5 dB is subtracted, giving a field strength of 53.5 dBμV/m.

FS = 44.5 + 33.9 + 9.6 – 34.5 =53.5 dBμV/m

5.2 Uncertainty

Radiated Emission Test

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

5.3 Test equipment used

See SECTION 6: TEST EQUIPMENT USED

5.4 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

This site has been fully described in a report submitted to FCC office, and listed on September 12, 2000 (Registration number: 90412).

5.5 Test Configuration Photographs

See Appendix 1.

5.6 Data of EMI Test

See Appendix 2.

SECTION 6: Test instruments

EMI test instrument

Instrument	Mfr.	Model No.	Control No.	Calibration date / Interval
Pre Amplifier	Hewlett Packard	8447D	AF-01	November 6, 2000 / 1 year
Pre Amplifier	Hewlett Packard	8449B	AF-04	November 5, 2000 / 1 year
Biconical Antenna	Schwarzbeck	BBA9106	BA-03	April 29, 2000 / 1 year
Logperiodic Antenna	Schwarzbeck	UKLP9108-A	LA-06	April 30, 2000 / 1 year
Horn Antenna	AH system, Inc	SAS-200/571	HA-01	February 1, 2000 / 3 year
Horn Antenna	EMCO	3160-09	APANT14	February 3, 2000 / 3 year
Spectrum Analyzer	Hewlett Packard	8567A	SA-04	November 6, 2000 / 6 months
Spectrum Analyzer	Advantest	R3271	SA-05	February 1, 2001 / 1 year
Test Receiver	Rohde & Schwarz	ESVS10	TR-06	August 10, 2000 / 1 year

*All measurement equipment is traceable to national standard.

SECTION 7 Radiated emission

7.1 Operating environment

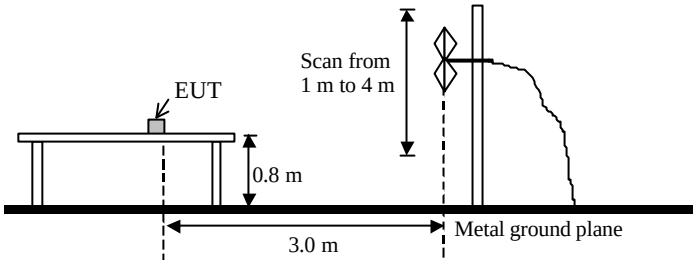
The test was carried out in an open site.

Temperature : 21(2001/2/22) 19(2001/2/23)
Humidity : 46(2001/2/22) 41(2001/2/23)

7.2 Test configuration

EUT was placed on a table of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.
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.

Figure 1 Drawing of the test set-up



7.3 Test conditions

Test distance : 3m
EUT position : Table top(Center)

7.4 Test procedure

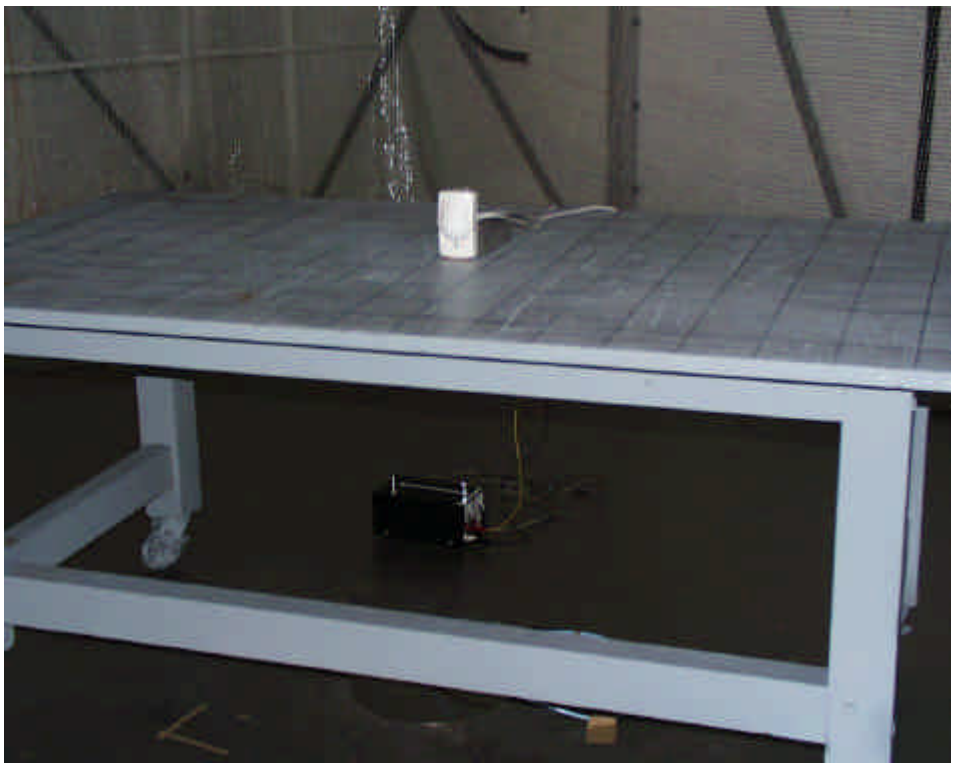
The Radiated Electric Field Strength intensity has been measured on an open test site with a ground plane at a distance of 3m from the EUT to the antenna.
Pre check measurements were performed in a shielded room or used search coil for ambient noise at high-level, especially from 272MHz to 288MHz.
The measuring antenna height was varied between 1m 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.

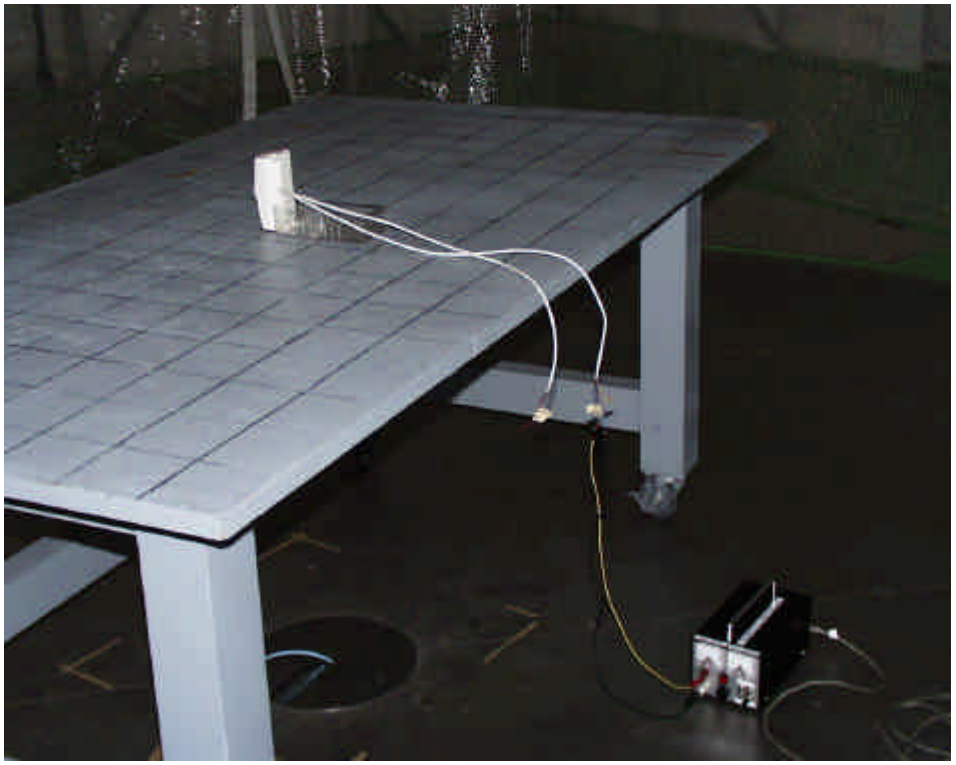
7.5 Results

Summary of the test results: Pass

Date: 2001-01-22 and 23 Tested by: Naoki Sakamoto

APPENDIX 1: Photographs of test setup(Radiated emission)





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APPENDIX 2: Data of EMI test

This section contains the following data

Fundamental emissions :	A2- 1
Carrier frequency Band width:	A2- 2
Spurious emissions :	A2- 3 to A2-4

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Test of Fundamental emissions(2450MHz)

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

COMPANY	: OPTEX CO.,LTD.	REPORT NO	: 21CE0001-YW-1
TRADE NAME	: OPTEX	REGULATION	: FCC15.245 / 31(e)
EQUIPMENT	: Security Sensor	TEST DISTANCE	: 3m
MODEL	: MX-40PI	ATTENUATOR	: NONE
POWER	: *DC12.0V / DC10.2V / DC13.8V	FCC ID	: FA7MX SERIES
Mode	: Transmitting		
DATE	: 2001/02/22	ENGINEER	: Naoki.Sakamoto

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

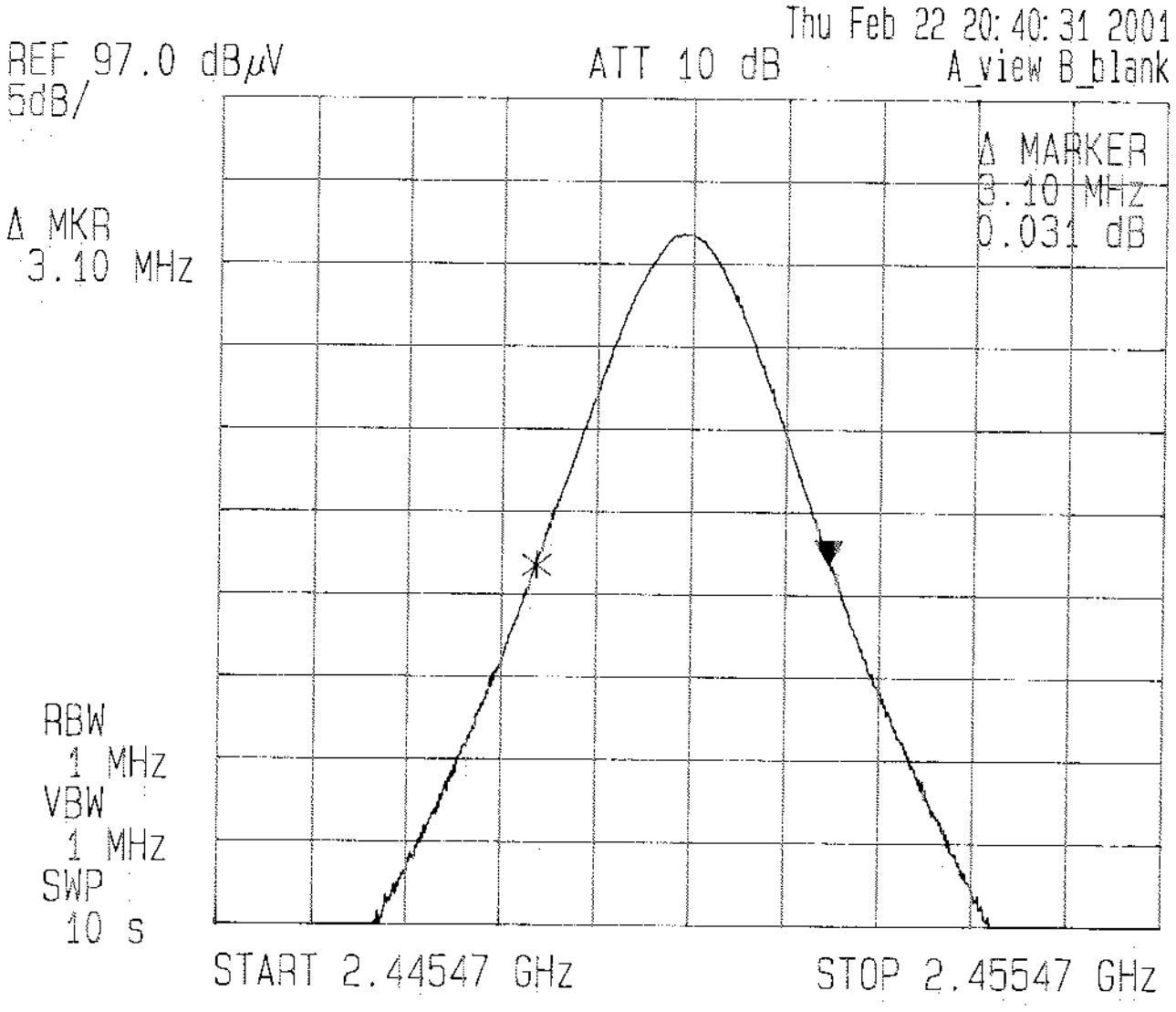
No.	FREQ	S/A READING		ANT	CABLE	AMP	RESULT		LIMIT	MARGIN	
		HOR	VER	Factor	LOSS	Gain	HOR	VER		HOR	VER
	[MHz]	[dBμV]	[dBμV]	[dB]	[dB]	[dB]	[dBμV]	[dBμV]	[dBμV]	[dB]	[dB]
1 *DC12.0V	2449.62	92.3	90.7	28.8	6.7	34.5	93.3	91.7	113.9	20.6	22.2
2 *DC10.2V	2449.55	92.1	90.6	28.8	6.7	34.5	93.1	91.6	113.9	20.8	22.3
3 *DC13.8V	2449.54	92.0	90.5	28.8	6.7	34.5	93.0	91.5	113.9	20.9	22.4

Sample Calculation:
Result = S/A Reading + Ant Factor + Cable Loss - AMP Gain

* DC12.0V = Normal Voltage
  DC10.2V = Normal Voltage * 0.85
  DC13.8V = Normal Voltage * 1.15

BAND WIDTH

FCC ID. FA7MX-SERIES



Test of Spurious emissions(Below 1GHz)

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

COMPANY : OPTEX CO.,LTD.
TRADE NAME : OPTEX
EQUIPMENT : Security Sensor
MODEL : MX-40PI
POWER : DC12.0V
Mode : Transmitting
DATE : 2001/02/23

REPORT NO : 21CE0001-YW-1
REGULATION : FCC15.245 / 209
TEST DISTANCE : 3m
ATTENUATOR : NONE
FCC ID : FA7MX-SERIES

ENGINEER : Naoki.Sakamoto

T/R QP Detect

No.	FREQ	T/R READING(QP)		ANT	CABLE	ATTEN.	AMP	RESULT		LIMIT	MARGIN	
		HOR	VER	Factor	LOSS		Gain	HOR	VER		HOR	VER
	[MHz]	[dBμV]	[dBμV]	[dB]	[dB]	[dB]	[dB]	[dBμV]	[dBμV]	[dBμV]	[dB]	[dB]
1	31.96	22.5	24.2	17.9	1.0	6.1	28.3	19.1	20.8	40.0	20.9	19.2
2	65.11	26.2	25.4	7.5	1.5	5.9	28.1	13.1	12.3	40.0	26.9	27.7
3	70.93	24.9	23.5	6.7	1.6	5.9	28.0	11.2	9.8	40.0	28.8	30.2
4	89.29	23.8	24.6	8.1	1.8	5.9	27.9	11.8	12.6	43.5	31.7	30.9
5	100.00	25.8	24.8	10.2	1.8	5.9	28.0	15.8	14.8	43.5	27.7	28.7
6	175.00	22.0	22.1	15.8	2.6	6.0	27.8	18.6	18.7	43.5	24.9	24.8
7	320.00	22.2	22.3	14.6	3.7	6.0	27.7	18.8	18.9	46.0	27.2	27.1

Sample Calculation:
Result = S/A Reading + Ant Factor + Cable Loss + ATTEN. -AMP Gain
Except for the above table : All other spurious emissions are more than 20dB below the limit

Test of Spurious emissions(1GHz to 26GHz)

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

COMPANY	: OPTEX CO.,LTD.	REPORT NO	: 21CE0001-YW-1
TRADE NAME	: OPTEX	REGULATION	: FCC15.245 / 209
EQUIPMENT	: Security Sensor	TEST DISTANCE	: 3m
MODEL	: MX-40PI	ATTENUATOR	: NONE
POWER	: DC12.0V	FCC ID	: FA7MX-SERIES
Mode	: Transmitting		
TEST DATE	: 2001/02/22		
REVISED DATE	: 2001/04/09(Data No7/8 Limit)	ENGINEER	: Naoki.Sakamoto

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

No.	FREQ	S/A READING(PK)		ANT	CABLE	AMP	RESULT		LIMIT	MARGIN	
		HOR	VER	Factor	LOSS	Gain	HOR	VER	(PK)	HOR	VER
	[MHz]	[dBμV]	[dBμV]	[dB]	[dB]	[dB]	[dBμV]	[dBμV]	[dBμV]	[dB]	[dB]
1	4899.13	48.6	49.9	33.9	9.6	34.5	57.6	58.9	74.0	16.4	15.1
2	7348.76	44.5	45.5	36.3	12.1	34.9	58.0	59.0	74.0	16.0	15.0
3	9798.22	44.4	44.6	37.4	14.3	34.9	61.2	61.4	84.0	22.8	22.6
4	12248.05	46.1	45.0	38.4	15.1	34.3	65.3	64.2	74.0	8.7	9.8
5	14697.41	*	*	42.1	15.6	33.2	-	-	84.0	-	-
6	17147.01	*	*	43.3	16.1	33.3	-	-	84.0	-	-
7	19596.57	*	*	40.2	17.0	33.4	-	-	107.9	-	-
8	22046.11	*	*	40.3	17.5	33.0	-	-	107.9	-	-
9	24495.68	*	*	40.3	19.8	33.2	-	-	84.0	-	-

AV DETECT (S/A : RBW 1MHz and VBW 10Hz)

No.	FREQ	S/A READING(AV)		ANT	CABLE	AMP	RESULT		LIMIT	MARGIN	
		HOR	VER	Factor	LOSS	Gain	HOR	VER	(PK)	HOR	VER
	[MHz]	[dBμV]	[dBμV]	[dB]	[dB]	[dB]	[dBμV]	[dBμV]	[dBμV]	[dB]	[dB]
1	4899.13	43.3	44.5	33.9	9.6	34.5	52.3	53.5	54.0	1.7	0.5
2	7348.76	36.8	36.7	36.3	12.1	34.9	50.3	50.2	54.0	3.7	3.8
3	9798.22	33.6	33.3	37.4	14.3	34.9	50.4	50.1	64.0	13.6	13.9
4	12248.05	33.8	34.1	38.4	15.1	34.3	53.0	53.3	54.0	1.0	0.7
5	14697.41	*	*	42.1	15.6	33.2	-	-	64.0	-	-
6	17147.01	*	*	43.3	16.1	33.3	-	-	64.0	-	-
7	19596.57	*	*	40.2	17.0	33.4	-	-	87.9	-	-
8	22046.11	*	*	40.3	17.5	33.0	-	-	87.9	-	-
9	24495.68	*	*	40.3	19.8	33.2	-	-	64.0	-	-

Sample Calculation:
Result = S/A Reading + Ant Factor + Cable Loss -AMP Gain
Except for the above table : All other spurious emissions are more than 20dB below the limit
*Emissions did not detect.