

EMC TEST REPORT

Report No. : EME-020269
Model No. : MI-2410IRN(RX)
Issued Date : Mar. 26, 2002

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Summary of Tests

Model: MI-2410IRN(RX)
FCC ID: QAAMI-2410RX

Test	Reference	Results
Conducted Emission of AC Power	15.207	Complies
Radiated Emission test	15.231(b), 15.209	Complies
Measured bandwidth	15.231(c)	Complies

1. General information

1.1 Identification of the EUT

Manufacturer : Million Increase Telecom International Co., Ltd.
Product : Frogfish
Model No. : MI-2410IRN(RX)
FCC ID. : QAAMI-2410RX
Frequency Range : 433.92MHz
Channel Number : 1 channels
Frequency of each channel : 433.92MHz
Type of Modulation : ASK
Power Supply : 120Vac, 60Hz with adapter (AD-0930M)
Power Cord : N/A
Sample Received : Mar. 18, 2002
Test Date(s) : Mar. 19, 2002 to Mar. 22, 2002

A DoC report has been generated for the client.

1.2 Additional information about the EUT

The main function of MI-2410IRN Video Sender is to receive the video and audio signals from transmitter unit by 2.4GHz RF signal and the RF remote control function is to cover the infrared signal to be a 433.92MHz RF signal, which can extend the effective transmitter range of infrared remote controller.

The 433.92MHz RF signal is only for sending the control code to initiate the link function between the transmitter and receiver.

For more detail features, please refer to user's Manual.

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain : -10dBi max

Antenna Type : Wire

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
Monitor	Acula	DCT-10CP	00101713	FCC DoC Approved

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section 15.231.

The AC power conducted emissions was invested over the frequency range from 0.45MHz to 30MHz using a receiver bandwidth of 9kHz. (15.207 paragraph)

Radiated testing was performed at an antenna to EUT distance of 3 meters.

The EUT setup configurations please refer to the photo of test configuration in item.

2.2 Operation mode

Get the EUT connected to a monitor with a 1.2 meter length RCA cable. Then power on the EUT and monitor.

The EUT is designed with automatic disable the transmitting function within 1 second when normal use.

For testing, the EUT was set to force the transmission continuously by manufacturer.

The duty cycle of transmitting was set to worst case condition (100% duty cycle).

2.3 Test equipment

Conducted emission

Equipment	Brand	Model No.	Series No.	Next Cal.Date
EMI Receiver	Rohde & Schwarz	ESCS 30	825788/014	May 29, 2002
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	848.766/052	N/A

Note:

1. The calibration interval of the above instruments is 12 months.

Radiated emission

Equipment	Brand	Model No.	Series No.	Next Cal.Date
EMI Receiver	Rohde & Schwarz	ESCS 30	825788/014	May 29, 2002
Pre-Amplifier	Advantest	BB525C	83120047	N/A
Horn Antenna	EMCO	3115	9906-5822	Aug. 5, 2002
Turn Table	Electro-Metrics	EM4710	350101	N/A
Bilog Antenna	Electro-Metrics	EM-6917-1	N/A	Oct. 1,2002
Antenna Tower	Electro-Metrics	EM-4720	410109	N/A

Note:

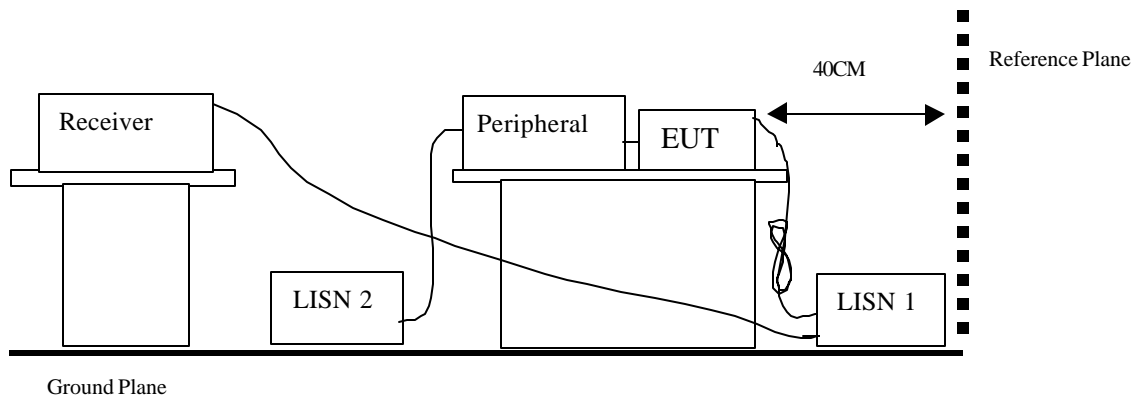
1. The calibration interval of the above instruments is 12 months.

3. Conducted emission test FCC 15.207

3.1 Operating environment

Temperature: 25
Relative Humidity: 58 %

3.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/1992 on conducted measurement. The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

3.3 Emission limit

FCC Part 15 Paragraph 15.207		
Freq. (MHz)	Maximum RF Line Voltage	
	uV	dBuV
0.45 - 30	250	48.0

3.4 Conducted emission data FCC 15.207

EUT : MI-2410IRN(RX)

Test Condition : Transmitter Mode

Power Line (circle)	Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Margin (dB) QP
LINE	0.45000	32.2	48.00	-15.80
LINE	4.05800	19.2	48.00	-28.80
LINE	9.09800	19.1	48.00	-28.90
LINE	12.64200	16.7	48.00	-31.30
LINE	15.98600	18.2	48.00	-29.80
LINE	20.00200	19.8	48.00	-28.20
NEUTRAL	0.45000	17.1	48.00	-30.90
NEUTRAL	0.55400	14.0	48.00	-34.00
NEUTRAL	3.88200	19.5	48.00	-28.50
NEUTRAL	8.49800	17.8	48.00	-30.20
NEUTRAL	13.61800	16.2	48.00	-31.80
NEUTRAL	20.07400	16.0	48.00	-32.00

Remark:

1. The reading value including cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81. In the Conducted Emission Test, the uncertainty is within ± 2 dB

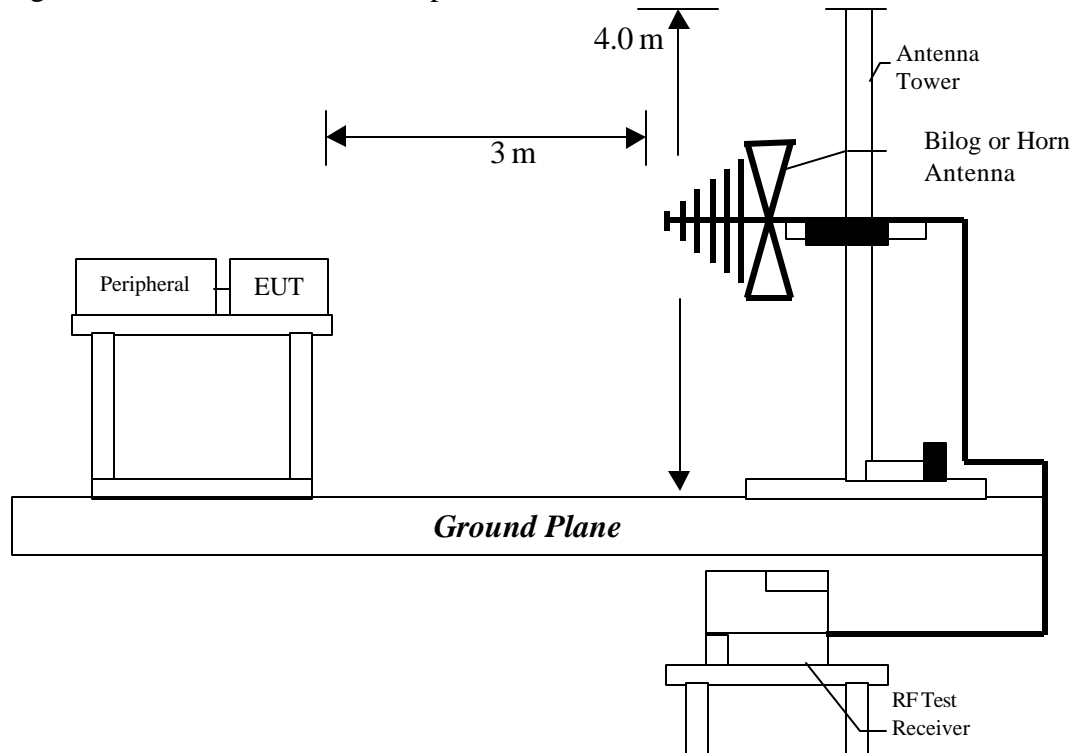
4. Radiated emission test FCC 15.231 (b)

4.1 Operating environment

Temperature: 20
Relative Humidity: 58 %

4.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



The signal is maximized through rotation and placement in the three orthogonal axes. Radiated emission measurements were performed from 30MHz to tenth harmonic of the highest fundamental frequency or to 40GHz, which is lower. Spectrum Analyzer Resolution Bandwidth is 100kHz or greater for frequencies 30MHz to 1GHz, 1MHz – for frequencies above 1GHz.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

4.3 Radiated emission limit

4.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(uV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
433.92	10996	80.8	1099.6	60.8

4.3.2 General radiated emission limit

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency MHz	15.209 Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81. In the General Radiated Emission Test, the uncertainty is within ± 2.5 dB

4.4 Radiated emission test data FCC 15.231

4.4.1 Fundamental & Harmonics Radiated Emission Data

EUT : MI-2410IRN(RX)
Test Condition : Transmitter Mode

Freq. (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading Level (dBuV)	Corrected Reading (dBuV/m)	Limit At 3m (dBuV/m)	Margin (dB)
433.91	PK	V	17.7	56.5	74.2	80.8	-6.6
95.9	QP	V	10.6	12.5	23.1	43.5	-20.4
107.8	QP	V	11.7	10.7	22.4	43.5	-21.1
118	QP	V	12.7	8.4	21.1	43.5	-22.4
159.6	QP	V	14.9	7.6	22.5	43.5	-21
867.85	QP	V	24.3	9.5	33.8	60.8	-27
*1301.56	AV	V	29.3	16.7	46	54	-8
1735.65	AV	V	30.17	17.4	47.57	60.8	-13.23
2169.6	AV	V	32.87	-	-	60.8	-

Remark:

1. Corrected Level = Reading Level + Correction Factor.
2. All the Harmonics don't show on the above table were undetectable.
2. “-” means the emission is below the noise floor.
4. “*” means the emission within the restricted band meets the requirement of part 15.205. The corresponding limit as per 15.209 is based on Quasi peak detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000MHz.

EUT : MI-2410IRN(RX)
Test Condition : Transmitter Mode

Freq. (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading Level (dBuV)	Corrected Reading (dBuV/m)	Limit At 3m (dBuV/m)	Margin (dB)
433.92	PK	H	17.7	54.5	72.2	80.8	-8.6
64.1	QP	H	13	11.7	24.7	40	-15.3
120.7	QP	H	12.9	8.2	21.1	43.5	-22.4
283.3	QP	H	14.2	9.9	24.1	46	-21.9
867.77	QP	H	24.3	9.7	34	60.8	-26.8
*1300.96	AV	H	28.87	16.3	45.17	54	-8.83
1735.05	AV	H	30.17	18.3	48.47	60.8	-12.33
2169.6	AV	H	32.87	-	-	60.8	-

Remark:

1. Corrected Level = Reading Level + Correction Factor
2. All the Harmonics don't show on the above table were undetectable.
3. “-” means the emission is below the noise floor.
4. “*” means the emission within the restricted band meets the requirement of part 15.205. The corresponding limit as per 15.209 is based on Quasi peak detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000MHz.

4.7 Measured bandwidth FCC 15.231(C)

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

$$\text{B.W(20dBc) Limit} = 0.25\% \times f(\text{MHz}) = 0.25\% \times 433.92\text{MHz} = 1.0848\text{MHz}$$

From the plot, the bandwidth is observed to be 220kHz, at 20dBc where the bandwidth limit is 1.0848MHz. and the Measured bandwidth plot is saved with file name "Measured bandwidth plot.pdf"