

FCC Part 15 Subpart C
EMI TEST REPORT

of

E.U.T. : FM 49MHz Modulator Box

FCC ID. : ATI9R3WUX

MODEL : WUX

Working Frequency : 49.1 MHz / 49.7MHz

for

APPLICANT : ACTION ELECTRONICS CO., LTD.

ADDRESS : 198, CHUNG YUAN RD., CHUNG LIND
ZONE, CHUNG LI, TAIWAN, R.O.C.

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN

NO. 8 LANE 29, WENMIMG ROAD,
LOSHAN TSUN, KWEISHAN HSIANG,
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Report Number : ET90R-04-066-02

TEST REPORT CERTIFICATION

Applicant : ACTION ELECTRONICS CO., LTD.
198, CHUNG YUAN RD., CHUNG LIND ZONE, CHUNG LI,
TAIWAN, R.O.C.

Manufacturer : ACTION INDUSTRIES (M) SON BHD
2480, TINGRAT PERUSAHAAN ENAM, PRAIFREE TRADE
ZONE, 13600 PENANG, MALAYSIA

Description of EUT :

- a) Type of EUT : FM 49MHz Modulator Box
- b) Trade Name : ACTION, ASA
- c) Model No. : WUX
- d) FCC ID : AT19R3WUX
- e) Working Frequency : 49.1 MHz / 49.7 MHz
- f) Power Supply : DC 12V

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C (1999)

I HEREBY CERTIFY THAT; The data shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Issued Date : May 15, 2001

Test Engineer : S. S. Liou
(S. S. Liou)

Approve & Authorized Signer : Will Yauo
Will Yauo, Supervisor
EMI Test Site of ELECTRONICS
TESTING CENTER, TAIWAN

Table of Contents

Page

1. GENERAL INFORMATION	1
1.1 PRODUCT DESCRIPTION	1
1.2 CHARACTERISTICS OF DEVICE:	1
1.3 TEST METHODOLOGY	1
1.4 TEST FACILITY.....	1
2. DEFINITION AND LIMITS	2
2.1 DEFINITION	2
2.2 RESTRICTED BANDS OF OPERATION.....	2
2.3 LIMITATION	2
2.4 LABELING REQUIREMENT.....	3
2.5 USER INFORMATION	3
3. RADIATED EMISSION MEASUREMENT.....	4
3.1 APPLICABLE STANDARD	4
3.2 MEASUREMENT PROCEDURE	4
3.3 TEST DATA	6
3.4 FIELD STRENGTH CALCULATION	8
3.5 RADIATED TEST EQUIPMENT.....	8
3.6 MEASURING INSTRUMENT SETUP	8
3.7 RADIATED MEASUREMENT PHOTOS	9
4 CONDUCTED EMISSION MEASUREMENT.....	10
4.1 DESCRIPTION.....	10
5 ANTENNA REQUIREMENT.....	11
5.1 STANDARD APPLICABLE	11
5.2 ANTENNA CONSTRUCTION	11

1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT	: FM 49MHz Modulator Box
b) Trade Name	: ACTION, ASA
c) Model No.	: WUX
d) FCC ID	: AT19R3WUX
e) Working Frequency	: 49.1MHz / 49.7MHz
f) Power Supply	: DC 12V

1.2 Characteristics of Device:

When applying audio signal into the modulator box, it can transmit RF signal to the receiver using channel 1 (49.1MHz) or channel 2 (49.7MHz).

1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in chapter 13 of ANSI C63.4.

The FM 49MHz Modulator Box under test was operated in its normal operating mode for the purpose of the measurements.

The receiving antenna polarized horizontally was varied from 1 to 4 meters and the wooden turntable was rotated through 360 degrees to obtain the highest reading on the field strength meter or on the display of the spectrum analyzer. And also, each emission was to be maximized by changing the orientation of the FM 49MHz Modulator Box under test.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No. 34, Lin 5, Ding Fu Tsun, Linkou Hsiang, Tapei Hsien, Taiwan 244, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Feb. 10, 2000.

2. DEFINITION AND LIMITS

2.1 Definition

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands 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
4.17725-4.17775	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	3360-4400	Above 38.6
13.36-13.41			

Remark "***" : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.3 Limitation

(1) Conducted Emission Limits :

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the conducted limit is the following:

Frequency (MHz)	Emission (μ V)	Emission (dB μ V)
0.45 - 30.0	250	48.0

(2) Radiated Emission Limits :

According to 15.209(a), the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequencies (MHz)	Field Strength		Measurement Distance (meters)
	$\mu\text{V}/\text{meter}$	$\text{dB}\mu\text{V}/\text{meter}$	
30 - 88	100	40.0	3
88 - 216	150	43.5	3
216 - 960	200	46.0	3
Above 960	500	54.0	3

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

(3) Antenna Requirement :

For intentional device, according to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device:

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 interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

3. RADIATED EMISSION MEASUREMENT

3.1 Applicable Standard

1. The field strength of any emissions shall not exceed the general radiated emission limits in Section 15.209.

3.2 Measurement Procedure

A. Preliminary Measurement For Portable Devices

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

B. Final Measurement

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

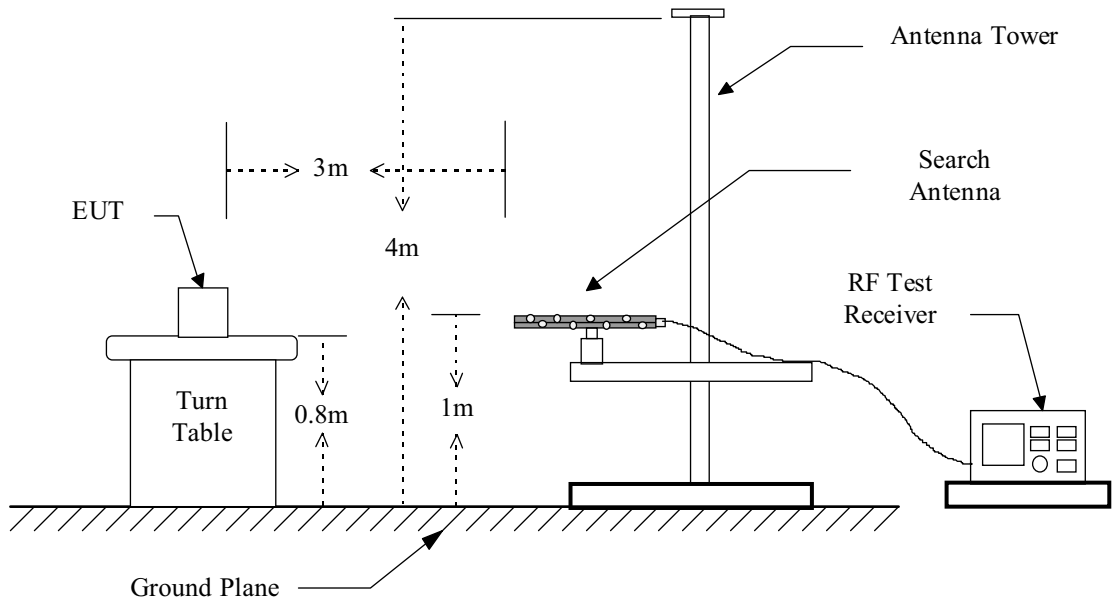
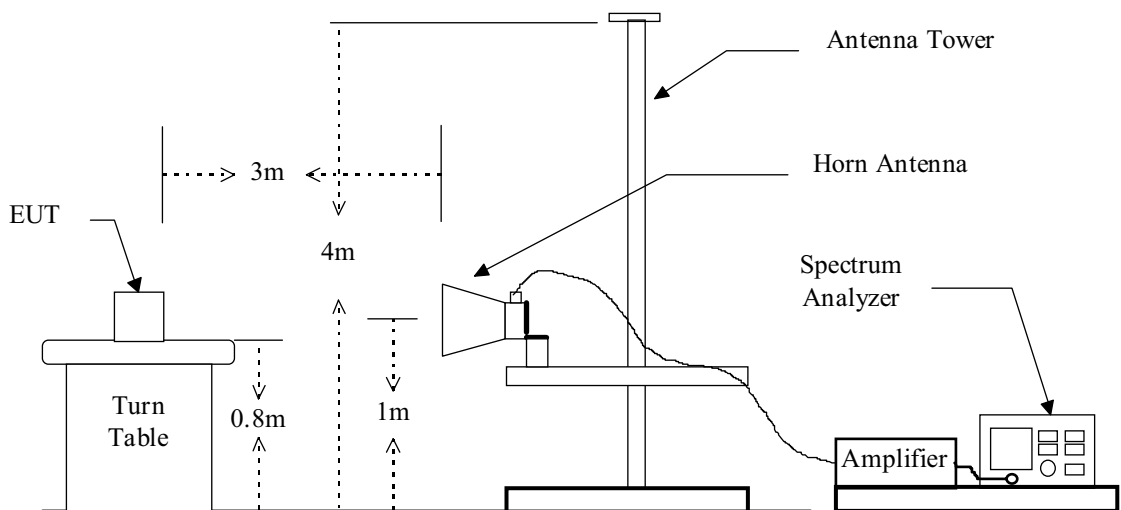


Figure 2 : Frequencies measured above 1 GHz configuration



3.3 Test Data**A. CH 1**

Operation Mode : TX
 Temperature : 26 °C
 Humidity : 75 %
 Test Date : May 10, 2001

Frequency (MHz)	Meter Reading (dBuV)		Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
	H	V						
39.840	---	40.8	-11.8	29.0	40.0	-11.0	140	1.20
49.126	47.5	49.1	-13.9	35.2	40.0	-4.8	80	1.10
80.002	---	40.4	-15.0	25.4	40.0	-14.6	125	1.20
98.268	45.3	37.7	-13.9	31.4	43.5	-12.1	110	1.80
147.378	---	---	-10.2	---	43.5	---	---	---
197.986	33.6	---	-7.4	26.2	43.5	-17.3	90	1.00
245.630	---	---	-4.2	---	46.0	---	---	---
294.756	---	---	-1.4	---	46.0	---	---	---
343.882	---	---	-9.6	---	46.0	---	---	---
393.008	---	---	-6.3	---	46.0	---	---	---
442.134	---	---	-5.6	---	46.0	---	---	---
491.260	---	---	-4.4	---	46.0	---	---	---

Note :

1. Remark “---” means that the emission level is too low to be measured.

B. CH 2

Operation Mode : TX
 Temperature : 26 °C
 Humidity : 75 %
 Test Date : May 10, 2001

Frequency (MHz)	Meter Reading (dBuV)		Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
	H	V						
40.434	36.7	46.7	-11.9	34.8	40.0	-5.2	130	1.00
49.723	51.2	52.4	-14.0	38.4	80.0	-41.6	100	1.20
80.896	29.9	39.9	-14.9	25.0	40.0	-15.0	130	1.20
99.461	50.7	42.1	-13.9	36.8	43.5	-6.7	120	2.00
149.204	35.3	---	-10.1	25.2	43.5	-18.3	80	1.70
161.806	31.8	---	-9.4	22.4	43.5	-21.1	90	1.80
198.892	---	---	-7.2	---	43.5	---	---	---
248.615	---	---	-4.0	---	46.0	---	---	---
298.338	---	---	-1.0	---	46.0	---	---	---
348.061	---	---	-10.2	---	46.0	---	---	---
397.784	---	---	-6.4	---	46.0	---	---	---
447.507	---	---	-5.6	---	46.0	---	---	---
497.230	---	---	-4.4	---	46.0	---	---	---

Note :

- Remark “---” means that the emission level is too low to be measured.

3.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

3.5 Radiated Test Equipment

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	Hewlett-Packard	8568B	12/21/2001
Pre-selector	Hewlett-Packard	85685A	01/01/2002
Quasi Peak Detector	Hewlett-Packard	85650A	01/01/2002
RF Test Receiver	Rohde & Schwarz	ESVS 30	07/27/2001
Log periodic Antenna	EMCO	3146	11/02/2001
Biconical Antenna	EMCO	3110B	11/02/2001
Preamplifier	Hewlett-Packard	8447D	12/29/2001

3.6 Measuring Instrument Setup

Explanation of measuring instrument setup in frequency band measured is as following :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz

3.7 Radiated Measurement Photos

Please see Setup Photos in Exhibit F.

4 CONDUCTED EMISSION MEASUREMENT

4.1 Description

This EUT is excused from investigation of conducted emission, for it is powered by DC 12V only. According to § 15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

5 ANTENNA REQUIREMENT

5.1 Standard Applicable

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

5.2 Antenna Construction

The antenna is permanently mounted on PCB, no consideration of replacement.