



TEST REPORT

Ref. Report No.
01-341-003

Name and address of the applicant

Marshall Electronics Inc.
1910, East Maple Ave.
Elsegundo, CA 90245, U.S.A

Standard / Test regulation

FCC Part 15, Subpart C

Test result

Pass

Incoming date : February 6, 2001

Test date : March 5, 2001

Test item(s) ;

Low Power Communication Device Transmitter
(RF Color Camera)

Model/type ref. ;

V-2297RF

Manufacturer ;

Marshall Electronics Inc.

Additional information ;

- Required Authorization : Certification
- FCC ID. : PI2MEICTR24A1

Issue date : March 9, 2001

This test report only responds to the tested sample and shall not be reproduced except in full without written approval of the Korea Testing Laboratory.

Tested and reported by

Jeong-Min Kim , Senior Engineer

Reviewed by

Won-Seo Cho , EMC Team Leader

KOREA TESTING LABORATORY

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⅃ ° GENERAL INFORMATION

1. Grantee's Name and Mailing Address : Marshall Electronics Inc.
1910, East Maple Ave. Elsegundo, CA 90245, U.S.A

2. Manufacturer's Name and Mailing Address : Marshall Electronics Inc.
1910, East Maple Ave. Elsegundo, CA 90245, U.S.A

3. Equipment Descriptions

3.1 Operating Frequency : 2411.6 MHz ~ 2471.6 MHz
3.2 Type of Emission : Frequency Modulation
3.3 Power Supply : DC 12 V

4. Rules and Regulations : FCC Part 15, Subpart C

5. Measuring Procedure : ANSI C63.4-1992

6. Date of Measurement

6.1 Line Conducted : Not Applicable
6.2 Radiated Emission : March 5, 2001

Y ± GENERAL REQUIREMENTS OF THE EUT

1. Labelling Requirement (Section 15.19)

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

1.1 Location of Label : User's Guide Manual

1.2 How Applied : Printing

2. Information to User (Section 15.21)

The following or similar statements were provided in the manual for user instruction.
Please refer page 2 of the attached manual for details.

CAUTION : Any changes or modifications in construction of this device which are not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

3. Special Accessories (Section 15.27)

3.1 Were the special Accessories provided? [] yes, [x] no

3.2 If yes, details for the special accessories are as follows :

3.3 If yes, were the appropriate instructions provided on the first page of the text concerned with the device?

[] yes, [] no

3.4 Are these accessories provided of the type which can be readily obtained from multiple retail outlets ?

[] yes, [] no

And therefore does the manual specify what additional components or accessories are required to used in order to comply with the Rules?

[] yes, [] no

5.2 RADIATED EMISSION MEASUREMENT (Section 15.249)

1. Test Procedure

1.1 Preliminary Testing for Reference

This RF Color Camera (EUT) is designed to operate in the band 2411.6 MHz to 2471.6 MHz by changing the DC base signal. According to section 15.31(m), the measurements were performed with three operating frequencies which were selected as bottom, middle, and top frequency in the operating band.

Preliminary testing was performed in a KTL absorber-lined room to determine the emission characteristics of the EUT. The EUT was placed on the wooden table which has dimensions of 0.8 meters in height, 1 meter in length and 1.5 meters in width. Receiving antenna (Biconical antenna : 30 to 300 MHz, Log-periodic antenna : 200 to 1000 MHz or Horn Antenna : 1 to 18 GHz) was placed at the distance of 1 meter from the EUT.

An attempt was made to maximize the emission level with the various configurations of the EUT while rotating the table and varying antenna height.

Emission levels from the EUT with various configurations were examined on a Spectrum Analyzer connected with a RF amplifier and graphed by a plotter.

1.2 Final Radiated Emission Test at an Absorber-Lined Room

The final measurement of radiated field strength was carried out in a KTL Absorber-Lined Room that was listed up at FCC according to the "Radiated Emissions Testing" procedure specified by ANSI C63.4.

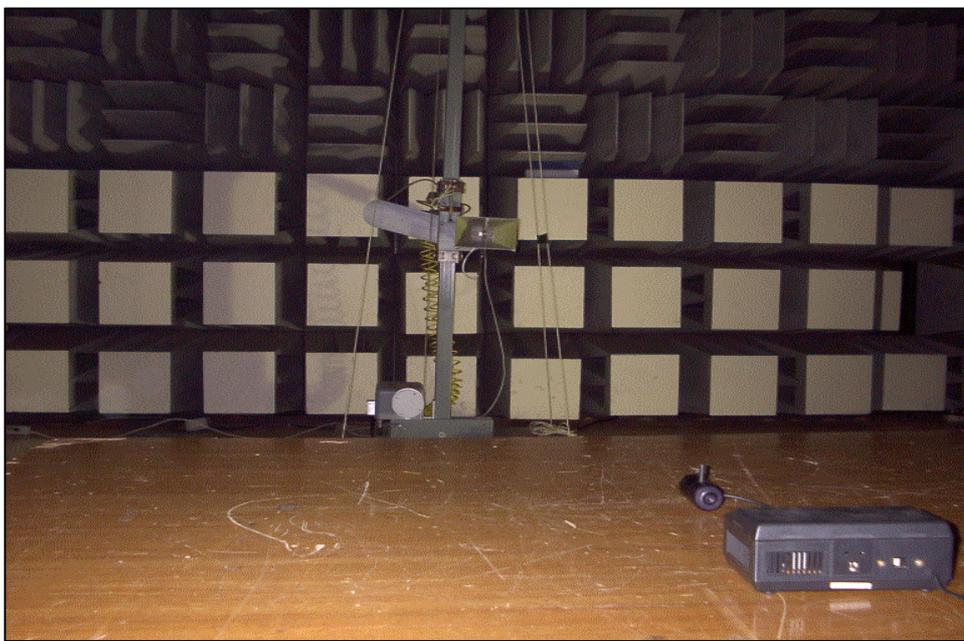
Based on the test results in preliminary test, measurement was made in same test set up and configuration which produced maximum emission level. Receiving antenna was installed at 3-meter distance from the EUT, and was connected to an EMI receiver or spectrum analyzer (for above 1GHz) with a RF amplifier.

Turntable was rotated through 360 degrees and receiving antenna height was varied from 1 to 4 meters above the ground plane to read maximum emission level.

If necessary, the radiated emission measurements could be performed at a closer distance than specified distance to ensure higher accuracy and their results were extrapolated to the specified distance using an inverse linear distance extrapolation factor(20dB/decade) as per Section 15.31(f).

The maximum emission level from the EUT occurred in such configuration as shown in the following photograph.

2. Photograph for the worst case configuration



3. Sample Calculation

The emission level measured in decibels above one microvolt (dB $\mu\text{V/m}$) was converted into microvolt per meter ($\mu\text{V/m}$) as shown in following sample calculation.

For example :

	Measured Value at	<u>2471.1 MHz</u>	80.8 dB $\mu\text{V/m}$
+	Antenna Factor		28.5 dB/m
+	Cable Loss		2.8 dB
£ -	Preamplifier		35.0 dB
£ -	Distance Correction Factor *		0.0 dB
=	Radiated Emission		76.8 dB $\mu\text{V/m}$ (= 6918.3 $\mu\text{V/m}$)

* Extrapolated from the measured distance (1 m) to the specified distance (3 m) by an inverse linear distance extrapolation.

4. Measurement Data

4.1 Operating Frequency (Bottom : 2411.6 MHz)

- Detect Mode : CISPR Quasi-Peak (6 dB Bandwidth : 120 kHz for 1 GHz below)
Peak (3 dB Bandwidth : 1 MHz for 1 GHz above)
- Measurement Distance : 3 Meter

Frequency (MHz)	* D.M.	* A.P.	Measured Value (dB μ V/m)	* A.F. + C.L. (dB/m)	* A.G. (dB)	* D.C.F. (dB)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	** Margin (dB)
2411.6	P	V	80.6	31.3	- 35.0	-	76.9	94.0	- 17.1
*** 4823.2	P	H/V	< 40.0	37.5	- 35.0	- 9.5	< 33.0	54.0	< - 21.0
*** 7234.8	P	H/V	< 40.0	42.0	- 35.0	- 9.5	< 37.5	54.0	< - 16.5
*** 9646.4	P	H/V	< 40.0	43.3	- 35.0	- 9.5	< 38.8	54.0	< - 15.2
-	-	-	-	-	-	-	-	-	-

Note

The observed spectrum analyzer noise floor level with RF preamplifier was 40.0 dB μ V/m And all other emissions not reported on data were more than 25dB below the permitted level.

- * D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
- A.P. : Antenna Polarization (H : Horizontal, V : Vertical)
- A.F. : Antenna Factor
- C.L. : Cable Loss
- A.G. : Amplifier Gain
- D.C.F. : Distance Correction Factor
- < : Less than

** Margin (dB) = Emission Level (dB) - Limit (dB)

*** In case of these frequencies, the EUT was measured at 1.0 m distance for sufficient sensitivity of measurement system.

4.2 Operating Frequency (Middle : 2440.0 MHz)

- Detect Mode : CISPR Quasi-Peak (6 dB Bandwidth : 120 kHz for 1 GHz below)
Peak (3 dB Bandwidth : 1 MHz for 1 GHz above)
- Measurement Distance : 3 Meter

Frequency (MHz)	* D.M.	* A.P.	Measured Value (dB μ V/m)	* A.F. + C.L (dB/m)	* A.G. (dB)	* D.C.F. (dB)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	** Margin (dB)
2440.0	P	V	80.5	31.3	- 35.0	-	76.8	94.0	- 17.2
*** 4880.0	P	H/V	< 40.0	37.5	- 35.0	- 9.5	< 33.0	54.0	< - 21.0
*** 7320.0	P	H/V	< 40.0	42.0	- 35.0	- 9.5	< 37.5	54.0	< - 16.5
*** 9760.0	P	H/V	< 40.0	43.3	- 35.0	- 9.5	< 38.8	54.0	< - 15.2
-	-	-	-	-	-	-	-	-	-

Note

The observed spectrum analyzer noise floor level with RF preamplifier was 40.0 dB μ V/m And all other emissions not reported on data were more than 25dB below the permitted level.

- * D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
- A.P. : Antenna Polarization (H : Horizontal, V : Vertical)
- A.F. : Antenna Factor
- C.L. : Cable Loss
- A.G. : Amplifier Gain
- D.C.F. : Distance Correction Factor
- < : Less than

** Margin (dB) = Emission Level (dB) - Limit (dB)

*** In case of these frequencies, the EUT was measured at 1.0 m distance for sufficient sensitivity of measurement system.

4.3 Operating Frequency (Top : 2471.1 MHz)

- Detect Mode : CISPR Quasi-Peak (6 dB Bandwidth : 120 kHz for 1 GHz below)
Peak (3 dB Bandwidth : 1 MHz for 1 GHz above)
- Measurement Distance : 3 Meter

Frequency (MHz)	* D.M.	* A.P.	Measured Value (dB μ V/m)	* A.F. + C.L (dB/m)	* A.G. (dB)	* D.C.F. (dB)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	** Margin (dB)
2471.1	P	V	80.8	31.3	- 35.0	-	77.1	94.0	- 16.9
*** 4942.2	P	H/V	< 40.0	37.5	- 35.0	- 9.5	< 33.0	54.0	< - 21.0
*** 7413.3	P	H/V	< 40.0	42.0	- 35.0	- 9.5	< 37.5	54.0	< - 16.5
*** 9884.4	P	H/V	< 40.0	43.3	- 35.0	- 9.5	< 38.8	54.0	< - 15.2
-	-	-	-	-	-	-	-	-	-

Note

The observed spectrum analyzer noise floor level with RF preamplifier was 40.0 dB μ V/m And all other emissions not reported on data were more than 25dB below the permitted level.

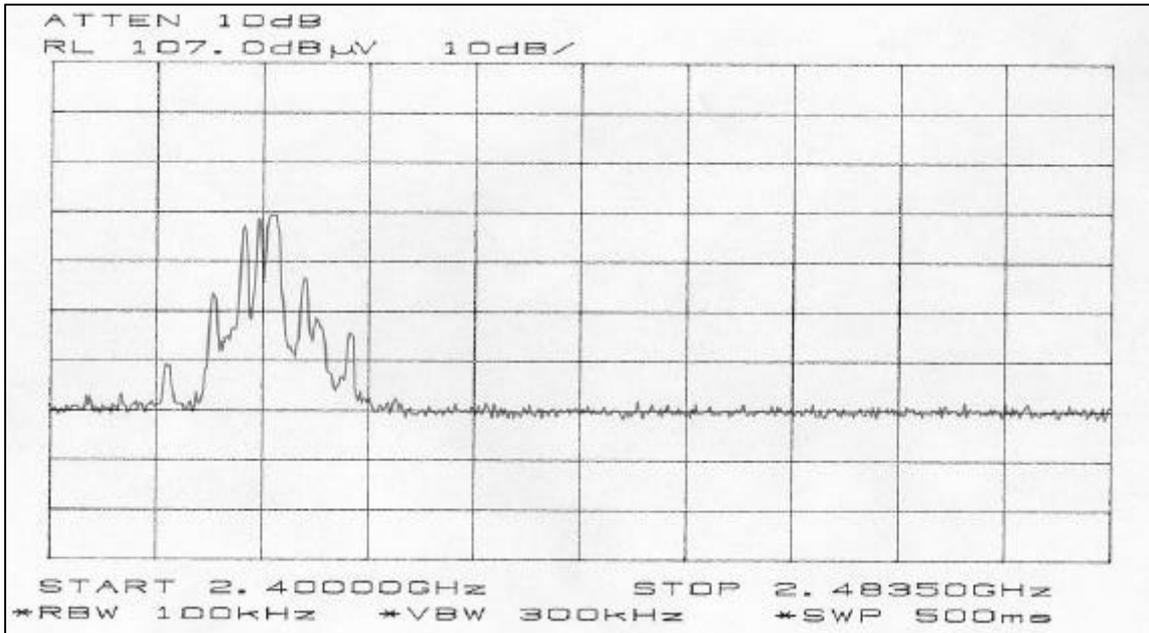
- * D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
- A.P. : Antenna Polarization (H : Horizontal, V : Vertical)
- A.F. : Antenna Factor
- C.L. : Cable Loss
- A.G. : Amplifier Gain
- D.C.F. : Distance Correction Factor
- < : Less than

** Margin (dB) = Emission Level (dB) - Limit (dB)

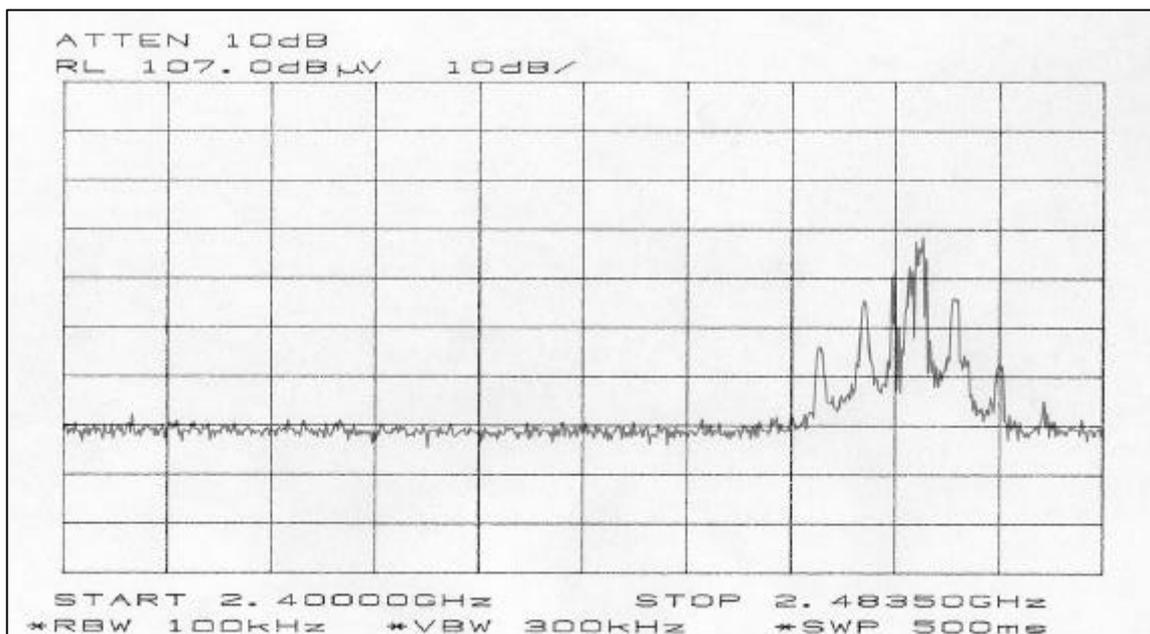
*** In case of these frequencies, the EUT was measured at 1.0 m distance for sufficient sensitivity of measurement system.

¥ . FREQUENCY STABILITY (Section 15.215)

It was found that the fundamental frequency was kept within at least the central 80% of the permitted band as recommended by the regulation. The fundamental frequency was measured as shown below.



(Bottom Frequency)



(Top Frequency)

3. TEST EQUIPMENT USED FOR MEASUREMENTS

<u>Equipment</u>	<u>Model No.</u>	<u>Manufacturer</u>	<u>Serial No.</u>	<u>Effective Cal. Duration</u>
[x] EMI Receiver (20MHz-1GHz)	ESVS30	R & S	830516/002	06/13/00-06/12/01
[x] Spectrum Analyzer (9kHz-26.5GHz)	8563A	H. P.	3222A02069	02/18/01-02/17/02
[] Spectrum Analyzer (100Hz-22GHz)	8566B	H. P.	3014A07057	05/24/00-05/23/01
[] Quasi-Peak Adapter (10kHz-1GHz)	85650A	H. P.	3107A01511	05/24/00-05/23/01
[] RF-Preselector (20Hz-2GHz)	85685A	H. P.	3010A01181	05/24/00-05/23/01
[] Test Receiver (9kHz-30MHz)	ESH3	R & S	860905/001	06/13/00-06/12/01
[x] Pre-Amplifier (0.1-3000MHz, 30dB)	8347A	H. P.	2834A00543	05/24/00-05/23/01
[x] Pre-Amplifier (1-26.5GHz, 35dB)	8449B	H. P.	3008A00302	06/13/00-06/12/01
[] LISN(50 , 50 H) (10kHz-100MHz)	3825/2	EMCO	9010-1710	-
[] LISN(50 , 50 H) (10kHz-100MHz)	3825/2	EMCO	9011-1720	-
[x] Plotter	7470A	H. P.	3104A21292	-
[x] Tuned Dipole Ant. (30MHz-300MHz)	VHA 9103	Schwarzbeck	-	*
[x] Tuned Dipole Ant. (300MHz-1GHz)	UHA 9105	Schwarzbeck	-	*
[x] Biconical Ant. (30MHz-300MHz)	BBA 9106	Schwarzbeck	-	*
[x] Log Periodic Ant. (200MHz-1GHz)	3146	EMCO	-	*
[x] Horn Ant. (1GHz-18GHz)	3115	EMCO	-	*
[x] DC Power Supply	6260B	H.P.	1145A04822	-
[] Shielded Room (5.0m x 4.5m)	-	SIN-MYUNG	-	-

* Each set of antennas has been calibrated to ensure correlation with ANSI C63.5 standard. The calibration of antennas is traceable to Korea Standard Research Institute(KSRI).