



EMC TEST REPORT

Report No. : EME-010337

Model No. : AV-R2G4

Issued Date : May 22, 2001

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Test Engineer

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Approved By

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1. Summary of Tests

2.4GHz Wireless A/V Transmitter -Model: AV-R2G4 **FCC ID: PNK4M0-EXT**

Test	Reference	Results
Conducted Emission	15.207	Complies
Radiated Emission	15.231	Complies
Spurious Emission	15.209	Complies



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1.1 General Information

1.2 Identification of the EUT

Manufacturer	: ELANsat Technologies Inc.
Product	: 2.4GHz Wireless A/V Receiver
Model No.	: AV-R2G4
FCC ID.	: PNK4M0-EXT
Frequency Range	: 433.92MHz
Type of Modulation	: ASK
Power Supply	: 120Vac, 60Hz to 9Vdc adapter (DV-9300S)
Power Cord	: N/A
Sample Received	: April 20, 2001
Test Date(s)	: April 16, 2001 to May 12, 2001

The attached antenna on antenna port is a fixed internal antenna, no consideration of replacement. (Please refer to the photo attached as an appendix.)

1.3 Additional information about the EUT

The main function of AV-R2G4 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.

1.4 Test Standard

The equipment under test (EUT) is a Video Sender. The transmitter portion is subject to the FCC Part 15 Subpart C Section 15.231 evaluation. Test date is included in this report.

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

1.5 Support equipment

Monitor

Product No.	: DCT-14CP
Serial No.	: 00020092
Manufacturer	: Acula Technology Corporation



2. Test Condition

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 investigated over the frequency range from 0.45MHz to 30MHz using a receiver bandwidth of 9kHz.

Radiated emissions were investigated over the frequency range from 30MHz to 1000MHz using a receiver bandwidth of 120kHz and the frequency range from 1GHz to 24GHz using a receiver bandwidth of 1MHz.

Radiated emission testing was performed at a 3-meter open field test site.

The EUT setup configuration describes as follows:

Received the signal from transmitter through radiated emission, then the outputs of receiver connected to monitor via RCA cables.

2.2 Modifications Required for Compliance

No modification were installed during test performance to bring the product into compliance (Please note that this list does not include changes made specifically by ELANSat Technologies Inc. Prior to compliance testing.)



2.3 Test Equipment

Conducted Emission

Equipment	Brand	Model No.	Series No.
EMI Receiver	Rohde & Schwarz	ESCS 30	825788/014
EMI Receiver	Rohde & Schwarz	ESMI	825428/005
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	848.766/052

Note:

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

Radiated Emission

Equipment	Brand	Model No.	Series No.
EMI Receiver	Rohde & Schwarz	ESCS 30	825788/014
EMI Spectrum	Rohde & Schwarz	ESMI	825428/005
Pre-Amplifier	Advantest	BB525C	83120047
Horn Antenna	EMCO	3115	9906-5822
Turn Table	Electro-Metrics	EM4710	350101
Bilog Antenna	Electro-Metrics	EM-6917-1	N/A
Antenna Tower	Electro-Metrics	EM-4720	410109

Note:

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



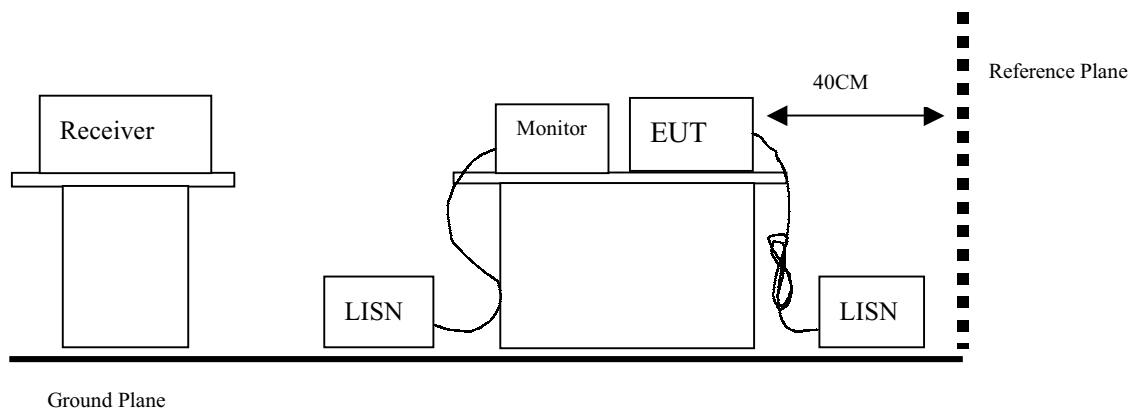
3. Conducted emission test FCC 15.207

3.1 Operating Environment

Temperature: 23 °C

Relative Humidity: 63 %

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

**Worst Case Conducted Emission
at Line 15.85234MHz ,margin:-16.2 dB**

EUT : AV-R2G4

Worst Case Condition : Transmitter Mode

Power Line (circle)	Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Margin (dB) QP
LINE	0.45	29.3	48	-18.70
LINE	0.46953	27.8	48	-20.20
LINE	0.48516	26.4	48	-21.60
LINE	1.00078	20.4	48	-27.60
LINE	15.85234	31.8	48	-16.20
NEUTRAL	0.57109	31.7	48	-16.30
NEUTRAL	0.59844	30.6	48	-17.40
NEUTRAL	0.63359	29.2	48	-18.80
NEUTRAL	1.68438	19.3	48	-28.70
NEUTRAL	15.85625	30.5	48	-17.50
NEUTRAL	26.4266	28	48	-20.00

Remark:

1. The reading value including cable loss and LISN factor.
2. The average measurement was not performed when the peak measured data under the limit of average detection.



3.4.1 Conducted Emission Configuration Photograph

For electronic filing, the worst case conducted emission configuration photographs are saved with filename: **CE1.pdf, CE2.pdf**

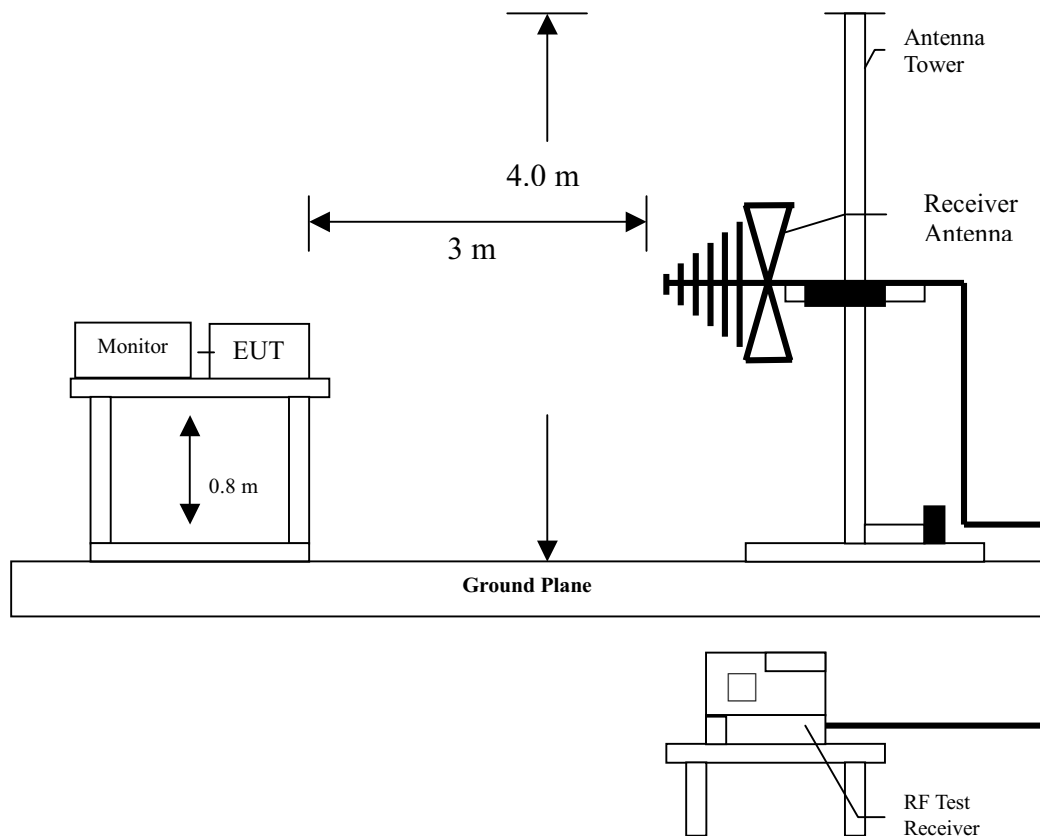
4. Radiated Emission Test FCC 15.231 (b)

4.1 Operating Environment

Temperature: 16 °C
Relative Humidity: 62 %

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 measurement were performed from 30MHz to tenth harmonics. The EUT and its peripherals are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters. The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4/1992 on radiated measurement. The bandwidth below 1GHz setting on the field strength meter (R&S Receiver ESCS 30) is 120kHz and above 1GHz is 1MHz.



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	10958	80.8	1096.5	60.8

4.3.2 General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

Frequency MHz	50dB below of the fundamental (dB μ V/m @3m)	15.209 Limits (dB μ V/m@3m)	General Radiated Limits (dB μ V/m@3m)
30-88	40	40	40
88-216	43.5	43.5	43.5
216-960	44	46	46
Above 960	44	54	54

Remark:

1. RF Line Voltage (dB μ V) = 20 log RF Line Voltage(μ V)
2. In the above table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system



4.4 Radiated Emission Test Data FCC 15.231

Worst Case Radiated Emission
at Horizontal Polarization 433.82 MHz, margin: -10.99 dB

4.4.1 Fundamental & Harmonics Radiated Emission Data

EUT : AV-R2G4
Worst Case Condition : Transmitter Mode

Freq. (MHz)	Spec. Analyz Detector	Antenna Polariz. (H/V)	Reading (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Reading (dBuV/m)	Limit At 3m (dBuV/m)	Margin (dB)
433.82	Qp	H	53.37	16.32	0.12	69.81	80.8	-10.99
867.82	Qp	H	8.43	22.21	0.2	30.84	60.8	-29.96
*1301.65	Av	H	2.11	25.3	1.09	28.5	54	-25.5
1735.53	Av	H	0.12	27.1	1.28	28.5	60.8	-32.3
2169.41	Av	H	-2.4	28.6	1.38	27.58	60.8	-33.22

Remark:

1. Corrected Level = Reading Level + Antenna Factor + Cable Loss
2. All Readings below 1GHz are Quasi-Peak, above are average value
3. All the Harmonics don't show on the above table were undetectable.

* 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.



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Worst Case Condition : Transmitter Mode

Freq. (MHz)	Spec. Analyz Detector	Antenna Polariz. (H/V)	Reading (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Reading (dBuV/m)	Limit At 3m (dBuV/m)	Margin (dB)
433.82	Qp	V	53.14	16.32	0.12	69.58	80.8	-11.22
867.82	Qp	V	7.08	22.21	0.2	29.49	60.8	-31.31
*1301.65	Av	V	1.64	25.3	1.09	28.03	54	-25.97
1735.53	Av	V	-0.6	27.1	1.28	27.78	60.8	-33.02
2169.41	Av	V	-2.1	28.6	1.38	27.88	60.8	-32.92

Remark:

1. Corrected Level = Reading Level + Antenna Factor + Cable Loss
2. All Readings below 1GHz are Quasi-Peak, above are average value
3. All the Harmonics don't show on the above table were undetectable.

- * 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.



4.5 General Radiated Emission Data FCC 15.209

**Worst Case Spurious Radiated Emission
at Vertical Polarization, 74.62 MHz, margin: -21.40 dB**

4.5.1 General Radiated Emission Data

EUT : AV-R2G4
Worst Case Condition : Transmitter Mode

Polar (circle)	Freq. (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Reading (dB μ V)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
VER.	74.62	8.69	1.95	7.96	18.60	40	-21.40
VER.	104.69	8.64	2.45	4.49	15.58	43.5	-27.92
VER.	438.37	16.97	4.75	-0.38	21.34	46	-24.66
HOR.	30	13.61	1.6	-1.44	13.77	40	-26.23
HOR.	72.68	8.69	1.95	0.38	11.02	40	-28.98
HOR.	105.66	7.75	2.88	1.31	11.94	43.5	-31.56

Remark:

1. Corrected Level = Reading Level + Antenna Factor + Cable Loss
2. All Readings below 1GHz are Quasi-Peak, above are average value
3. All the Harmonics don't show on the above table were undetectable.



4.5.2 Radiated Emission Configuration Photograph

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: **opensite-setup.pdf**



4.6 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.

$$B.W(20dBc) \text{ Limit} = 0.25\% \times f(\text{MHz}) = 0.25\% \times 433\text{MHz} = 1.0825\text{MHz}$$

From the plot, the bandwidth is observed to be 345kHz, at 20dBc where the bandwidth limit is 1.0825MHz. and the plot is saved with file name: **bandwidth.pdf**