

Intertek Testing Services

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FCC ID. : PNKSHIU02

Report No.: EME-020806

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EMC

TEST REPORT

Report No. : EME-020806

Model No. : AV-R2G4B

Issued Date : Aug. 9, 2002

Applicant : ELANSat Technologies Inc.
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Hsinchu, 300, Taiwan, R.O.C.

Test By : Intertek Testing Services Taiwan Ltd.
No. 11, Ko-Tze-Nan Chia-Tung Li, Shiang-Shan District,
Hsinchu, Taiwan, R.O.C.

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Approved By



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Summary of Tests

Shiu -Model: AV-R2G4B

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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

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1. General information

1.1 Identification of the EUT

Manufacturer	: ELANsat Technologies Inc.
Product	: Shiu
Model No.	: AV-R2G4B
FCC ID.	: PNKSHIU02
Operating Frequency (Rx)	: 2414MHz to 2468MHz
Operating Frequency (Tx)	: 433.92MHz
Channel Number (Rx)	: 4 channels
Channel Number (Tx)	: 1 channels
Frequency of Each Channel (Rx)	: 2414MHz, 2432MHz, 2450MHz, 2468MHz
Frequency of Each Channel (Tx)	: 433.92MHz
Type of Modulation (Rx)	: FM
Type of Modulation (Tx)	: ASK
Power Supply	: 120Vac, 60Hz with adapter (DV-9300S)
Power Cord	: N/A
Sample Received	: July 18, 2002
Test Date(s)	: July 23, 2002 to July 29, 2002

A DoC report has been generated for the client.

1.2 Additional information about the EUT

The main function of AV-R2G4B 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 action of peripheral (e.g. DVD player)

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

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1.3 Peripherals equipment

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

1.4 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain : -10dBi

Antenna Type : Monopole antenna

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2. Test specifications

2.1 Test standard

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

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.

For testing, the EUT was set to force the transmission continuously, and the duty cycle was set to the worst case condition 100% duty cycle. This test set-up is provided by manufacture and it's NOT for normal use.

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2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Series No.	Cal.Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	825788/014	May 24, 2002
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	825428/005	June 10, 2002
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	100137	July 10, 2002
Horn Antenna	EMCO	1GHz~18GHz	3115	9906-5822	Sep. 10, 2001
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	159	June 20, 2002
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	3111	June 20, 2002
Turn Table	HDGmbH	N/A	DS 420S	420/669/01	N/A
Antenna Tower	HDGmbH	N/A	MA 240	240/573	N/A
Microwave Amplifier	Agilent	2GHz~26.5GHz	8348A	3111A00567	Dec. 20, 2001

Note:

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

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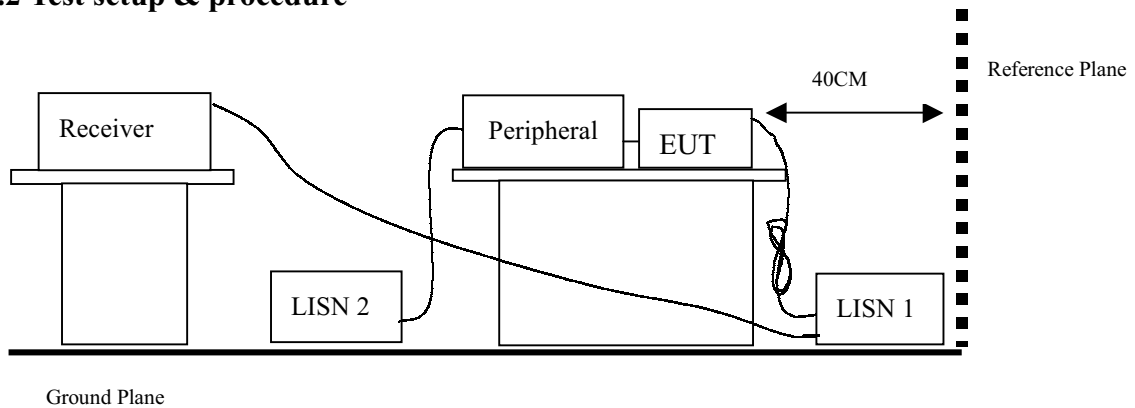
3. Conducted emission test FCC 15.207

3.1 Operating environment

Temperature: 25 °C

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

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3.4 Conducted emission data FCC 15.207

EUT : AV-R2G4B
Test Condition : Tx at 433.92MHz

Power Line (circle)	Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Margin (dB) QP
LINE	0.47400	31.7	48.00	-16.30
LINE	1.02600	18.7	48.00	-29.30
LINE	2.04200	7.5	48.00	-40.50
LINE	7.95400	12.7	48.00	-35.30
LINE	11.56200	9.5	48.00	-38.50
LINE	15.91400	13.8	48.00	-34.20
NEUTRAL	0.49000	27.2	48.00	-20.80
NEUTRAL	0.91400	7.8	48.00	-40.20
NEUTRAL	1.52200	6.7	48.00	-41.30
NEUTRAL	7.77000	10.2	48.00	-37.80
NEUTRAL	15.91400	12.9	48.00	-35.10
NEUTRAL	19.90600	12.7	48.00	-35.30

Remark:

1. The reading value including cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81. Expanded uncertainty (k=2) of conducted emission measurement is ± 2.6 dB.

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4. Radiated emission test FCC 15.231 (b)

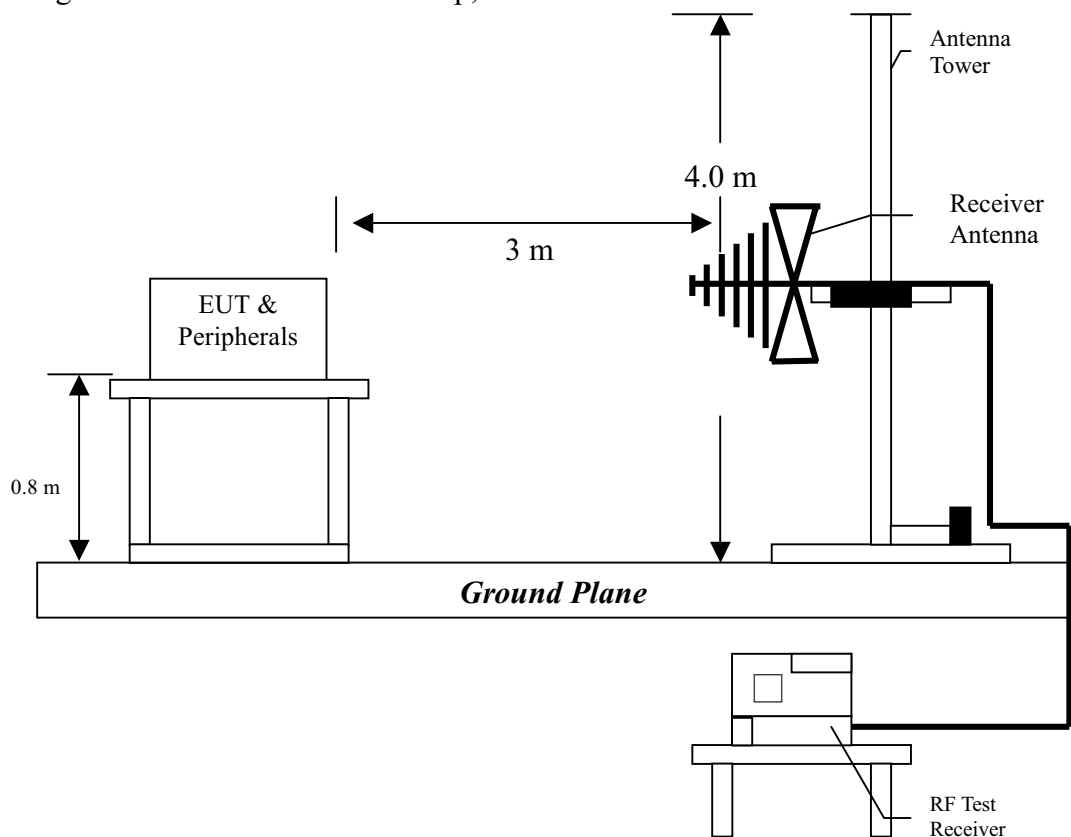
4.1 Operating environment

Temperature: 25 °C

Relative Humidity: 59 %

4.2 Test setup & procedure

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



Radiated emission measurements were performed from 30MHz to 25GHz. 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.

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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	10958	80.8	1096.5	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. Expanded uncertainty (k=2) of radiated emission measurement is ± 3.078 dB.

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4.4 Radiated emission test data FCC 15.231

4.4.1 Fundamental & Harmonics Radiated Emission Data

EUT : AV-R2G4B
 Test Condition : Tx at 433.92MHz

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	V	17.7	24.8	42.5	80.8	-38.3
433.92	PK	H	17.7	28.91	46.61	80.8	-34.19
55.2	QP	V	13.09	17.51	30.6	40	-9.4
92.1	QP	V	8.61	13.59	22.2	43.5	-21.3
198.8	QP	V	12.59	18.81	31.4	43.5	-12.1
359.8	QP	V	18.53	10.17	28.7	46	-17.3
703.2	QP	V	24.12	7.78	31.9	46	-14.1
899.1	QP	V	27.51	7.59	35.1	46	-10.9
*1240	AV	V	28.8	4.2	33	54	-21
*1662	AV	V	35	5.6	40.6	54	-13.4
84.3	QP	H	8.67	16.83	25.5	40	-14.5
107.6	QP	H	10.18	14.52	24.7	43.5	-18.8
*134.8	QP	H	9.73	11.77	21.5	43.5	-22
198.8	QP	H	12.59	16.41	29	43.5	-14.5
491.7	QP	H	22.33	6.27	28.6	46	-17.4
895.2	QP	H	27.51	6.29	33.8	46	-12.2
*1384	AV	H	31.1	4.6	35.7	54	-18.3
*1676	AV	H	35.4	6	41.4	54	-12.6

Remark:

1. Corrected Level = Reading Level + Correction Factor
2. Correction Factor = Antenna Factor + Cable Loss
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.

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4.5 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 260kHz, at 20dBc where the bandwidth limit is 1.0848MHz. and the plot is saved with file name: 20dB bandwidth plot.pdf