EMC

TEST REPORT

Report No. : EME-010791
Model No. : VC-T2G4
Issued Date : September 27, 2001

Applicant : ELANsat Technologies Inc.
No. 11, Lane 19, Pateh Road, Hsinchu, 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

J. T. CHEN
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Table of Contents

1. Summary of tests

2.4GHz Wireless CMOS Camera -Model: VC-T2G4
FCC ID: PNK2G4-CM

Test	Reference	Results
Conducted Emission	15.207	Complies
Radiated Emission	15.249	Complies
Spurious Emission	15.209	Complies
Band-edge test	15.249(c)	Complies

1.1 General information

1.2 Identification of the EUT

Manufacturer	: ELANsat Technologies Inc.
Product	: 2.4GHz Wireless CMOS Camera
Model No.	: VC-T2G4
FCC ID.	: PNK2G4-CM
Frequency Range	: 2400MHz to 2483.5MHz
Channel Number	: 4 channels
Frequency of Each Channel	: 2414MHz, 2432MHz, 2450MHz, 2468MHz
Type of Modulation	: FM
Power Supply	: 120Vac, 60Hz with adapter (DV-9300S)
Power Cord	: N/A
Sample Received	: September 24, 2001
Test Date(s)	: September 20, 2001 to September 24, 2001

The fixed antenna on Print Circuit Board is an 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 VC-T2G4 Wireless Surveillance is to send the video and audio signals to receiver unit by 2.4GHz RF signal and do the FM demodulation, then put the video and audio signals to TV, or other AV device.

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

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section 15.249.

2.2 Operation mode

The EUT was supplied with 120Vac to 9Vdc adapter, and the EUT will be in the transmitter mode after push the power button.

All the tests were performed according to the procedure above.

2.3 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.)

2.4 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
Horn Antenna	SCHWARZBECK	BBHA 9170	159
Bilog Antenna	Electro-Metrics	EM-6917-1	350101
Turn Table	Electro-Metrics	EM4710	N/A
Antenna Tower	Electro-Metrics	EM-4720	410109

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

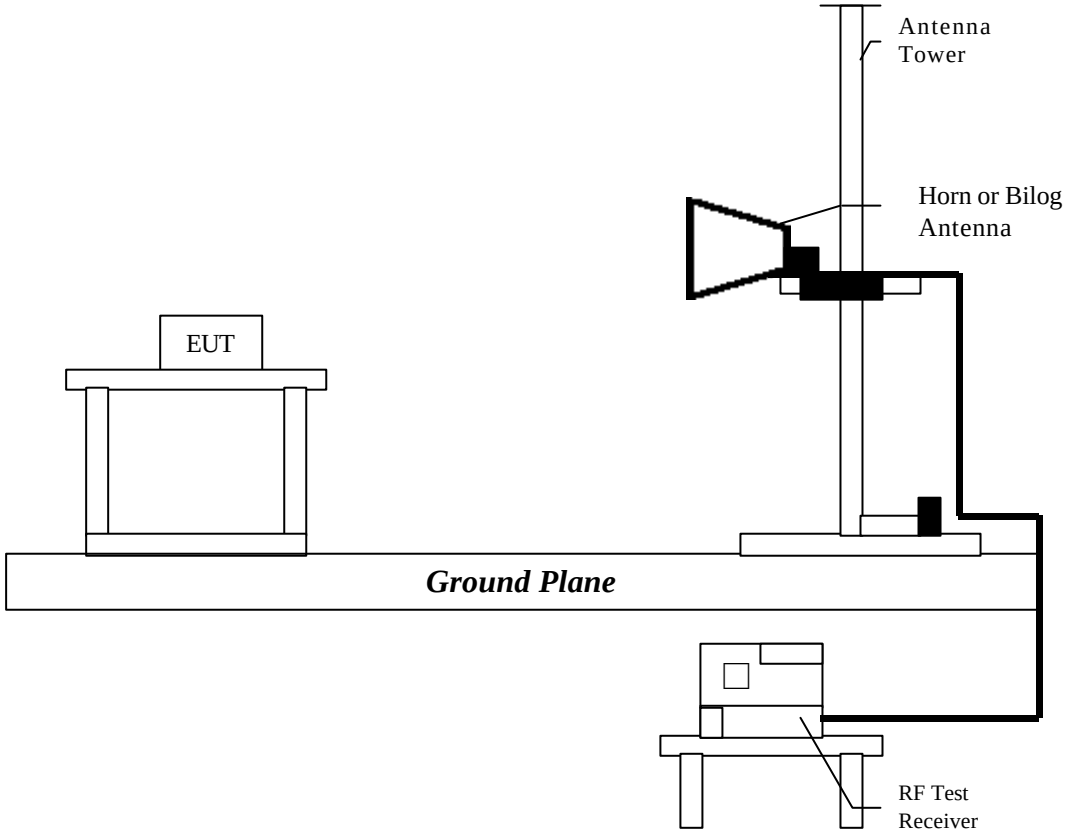
3. Radiated emission test FCC 15.249 (C)

3.1 Operating environment

Temperature: 23 ℃
Relative Humidity: 63 %

3.2 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. 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. Radiated emission measurement were performed from 30MHz to 25GHz.
The bandwidth below 1GHz setting on the field strength meter (ESMI) is 120kHz and above 1GHz is 1MHz.

3.3 Emission limit

3.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
2400-2483.5	50	94(Average)	500	54(Average)
2400-2483.5		114 (Peak)		74(Peak)

3.3.2 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 (dBμV/m @3m)	15.209 Limits (dBμV/m@3m)	General Radiated Limits (dBμV/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. 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 ±2.5dB

3.4 Radiated emission test data FCC 15.249

Worst case radiated emission
at Channel 1, 2414 MHz, margin: -0.33 dB

3.5.1 Fundamental & harmonics radiated emission data

EUT : VC-T2G4
Test Mode : Channel 1
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)
2414	AV	V	60.19	29.4	3.9	93.49	94	-0.51
2414	PK	V	68.24	29.4	3.9	101.54	114	-12.46
2414	AV	H	60.37	29.4	3.9	93.67	94	-0.33
2414	PK	H	67.94	29.4	3.9	101.24	114	-12.76
*4828	AV	V	-0.45	34.7	5.7	39.95	54	-14.05
*4828	PK	V	7.05	34.7	5.7	47.45	74	-26.55
*4828	AV	H	-0.13	34.7	5.7	40.27	54	-13.73
*4828	PK	H	7.98	34.7	5.7	48.38	74	-25.62
7242	AV	V	-0.55	36.5	7.36	43.31	54	-10.69
7242	PK	V	7.03	36.5	7.36	50.89	74	-23.11
7242	AV	H	-0.43	36.5	7.36	43.43	54	-10.57
7242	PK	H	8.22	36.5	7.36	52.08	74	-21.92
9656	AV	V	-1.35	38.4	8.5	45.55	54	-8.45
9656	PK	V	6.87	38.4	8.5	53.77	74	-20.23
9656	AV	H	-1.75	38.4	8.5	45.15	54	-8.85
9656	PK	H	6.23	38.4	8.5	53.13	74	-20.87

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. “-“ means the value was undetectable.
5.“*” 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 : VC-T2G4
Test Mode : Channel 3
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)
2450	AV	V	58.51	29.4	3.9	91.81	94	-2.19
2450	PK	V	64.82	29.4	3.9	98.12	114	-15.88
2450	AV	H	59.27	29.4	3.9	92.57	94	-1.43
2450	PK	H	66.1	29.4	3.9	99.4	114	-14.6
*4900	AV	V	-0.21	34.7	5.7	40.19	54	-13.81
*4900	PK	V	7.43	34.7	5.7	47.83	74	-26.17
*4900	AV	H	-0.13	34.7	5.7	40.27	54	-13.73
*4900	PK	H	7.11	34.7	5.7	47.51	74	-26.49
*7350	AV	V	-0.55	37.8	7.39	44.64	54	-9.36
*7350	PK	V	7.67	37.8	7.39	52.86	74	-21.14
*7350	AV	H	-0.43	37.8	7.39	44.76	54	-9.24
*7350	PK	H	7.81	37.8	7.39	53	74	-21
9800	AV	V	-1.35	38.5	8.48	45.63	54	-8.37
9800	PK	V	5.64	38.5	8.48	52.62	74	-21.38
9800	AV	H	-1.75	38.5	8.48	45.23	54	-8.77
9800	PK	H	5.27	38.5	8.48	52.25	74	-21.75

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. "-" means the value was undetectable.
5. "*" 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 above 1000MHz.

EUT : VC-T2G4
Test Mode : Channel 4
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)
2468	AV	V	58.18	29.4	3.9	91.48	94	-2.52
2468	PK	V	65.2	29.4	3.9	98.5	114	-15.5
2468	AV	H	57.78	29.4	3.9	91.08	94	-2.92
2468	PK	H	63.84	29.4	3.9	97.14	114	-16.86
*4936	AV	V	-0.9	34.7	5.74	39.54	54	-14.46
*4936	PK	V	7.15	34.7	5.74	47.59	74	-26.41
*4936	AV	H	-0.75	34.7	5.74	39.69	54	-14.31
*4936	PK	H	7.09	34.7	5.74	47.53	74	-26.47
*7404	AV	V	-2.51	37.8	7.39	42.68	54	-11.32
*7404	PK	V	5.31	37.8	7.39	50.5	74	-23.5
*7404	AV	H	-2.06	37.8	7.39	43.13	54	-10.87
*7404	PK	H	4.82	37.8	7.39	50.01	74	-23.99
9872	AV	V	-2.64	38.5	8.48	44.34	54	-9.66
9872	PK	V	4.42	38.5	8.48	51.4	74	-22.6
9872	AV	H	-2.72	38.5	8.48	44.26	54	-9.74
9872	PK	H	4.11	38.5	8.48	51.09	74	-22.91

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. "-" means the value was undetectable.
5. "*" 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.

3.6 General radiated emission data FCC 15.209

Worst case radiated emission

at Polarization Vertical, 47.7 MHz, margin: -15.3 dB

3.6.1 General radiated emission data

EUT : VC-T2G4
Worst Case Condition : Transmitter Mode

Polar (circle)	Freq. (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
VER.	35.7	12.4	0.3	9.90	22.60	40	-17.4
VER.	42.8	12.7	0.3	11.40	24.40	40	-15.6
VER.	47.7	12.6	0.4	11.70	24.70	40	-15.3
VER.	57	12.5	0.5	7.90	20.90	40	-19.1
VER.	157.3	13.9	1	7.40	22.30	43.5	-21.2
VER.	171.6	13.1	1	8.10	22.20	43.5	-21.2
HOR.	143.1	13.5	0.9	4.10	18.50	43.5	-25
HOR.	157.3	13.9	1	4.90	19.80	43.5	-23.7
HOR.	162.3	13.7	1	5.50	20.20	43.5	-23.2
HOR.	171.6	13.1	1	6.80	20.90	43.5	-22.6
HOR.	214.3	10.7	1	5.10	16.80	43.5	-26.7
HOR.	229.1	11.2	1.1	4.70	17.00	46	-29

Remark:
1. Emission Level = Reading Level + Antenna Factor + Cable Loss
2. Uncertainty was calculated in accordance with NAMAS NIS 81. In the General Radiated Emission Test, the uncertainty is within ±4dB
3. All Readings below 1GHz are Quasi-Peak, above are average value
4. All the Harmonics don't show on the above table were undetectable.

3.6 Radiated emission configuration photograph

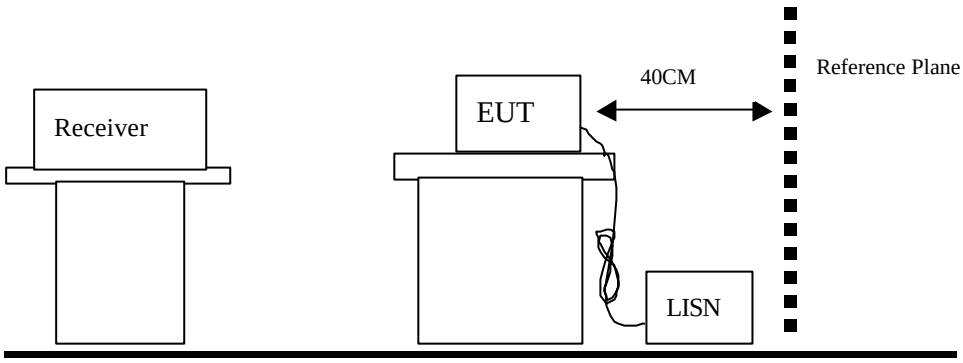
For electronic filing, the worst case radiated emission configuration photographs are saved as filename: **Re.pdf**

4. Conducted emission test FCC 15.207

4.1 Operating environment

Temperature: 27 ℃
Relative Humidity: 59 %

4.2 Test setup & procedure



Ground Plane

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.

4.3 Emission limit

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

4.4 Conducted emission data FCC 15.207

Worst case conducted emission
at Channel 3, Line 0.5060MHz ,margin:-14.9 dB

EUT : VC-T2G4
Test Mode : Channel 1
Worst Case Condition : Transmitter Mode

Power Line (circle)	Freq. (MHz)	Reading (dBμV) QP	Limit (dBμV) QP	Margin (dB) QP
LINE	0.5060	31.70	48.00	-16.30
LINE	1.2100	12.50	48.00	-35.50
LINE	1.5460	8.30	48.00	-39.70
LINE	3.3060	9.10	48.00	-38.90
LINE	5.2900	12.40	48.00	-35.60
LINE	7.8580	10.70	48.00	-37.30
NEUTRAL	0.5060	26.40	48.00	-21.60
NEUTRAL	0.7540	7.90	48.00	-40.10
NEUTRAL	1.4980	6.40	48.00	-41.60
NEUTRAL	2.7220	7.20	48.00	-40.80
NEUTRAL	4.0740	9.10	48.00	-38.90
NEUTRAL	5.2820	15.20	48.00	-32.80

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 ±2dB
3. The average measurement was not performed when the peak measured data under the limit of average detection.

EUT : VC-T2G4
Test Mode : Channel 3
Worst Case Condition : Transmitter Mode

Power Line (circle)	Freq. (MHz)	Reading (dBμV) QP	Limit (dBμV) QP	Margin (dB) QP
LINE	0.5060	33.10	48.00	-14.90
LINE	0.9620	12.90	48.00	-35.10
LINE	1.3140	11.40	48.00	-36.60
LINE	1.4820	9.40	48.00	-38.60
LINE	1.6260	8.10	48.00	-39.90
LINE	7.3460	11.10	48.00	-36.90
NEUTRAL	0.4980	28.10	48.00	-19.90
NEUTRAL	0.7780	7.80	48.00	-40.20
NEUTRAL	0.9620	8.10	48.00	-39.90
NEUTRAL	1.3140	11.30	48.00	-36.70
NEUTRAL	5.2820	10.90	48.00	-37.10
NEUTRAL	9.1460	10.40	48.00	-37.60

Remark:
1. 1. The reading value included cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81. In the Conducted Emission Test, the uncertainty is within ±2dB
3. The average measurement was not performed when the peak measured data under the limit of average detection.

EUT : VC-T2G4
Test Mode : Channel 4
Worst Case Condition : Transmitter Mode

Power Line (circle)	Freq. (MHz)	Reading (dBμV) QP	Limit (dBμV) QP	Margin (dB) QP
LINE	0.4980	31.20	48.00	-16.80
LINE	0.9940	13.40	48.00	-34.60
LINE	1.2660	9.80	48.00	-38.20
LINE	1.5700	8.20	48.00	-39.80
LINE	1.9140	7.50	48.00	-40.50
LINE	9.2260	9.40	48.00	-38.60
NEUTRAL	0.4980	28.10	48.00	-19.90
NEUTRAL	0.7460	8.50	48.00	-39.50
NEUTRAL	1.2740	7.50	48.00	-40.50
NEUTRAL	1.9780	7.60	48.00	-40.40
NEUTRAL	3.7940	9.10	48.00	-38.90
NEUTRAL	7.5220	11.70	48.00	-36.30

Remark:
1. 1. The reading value included cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81. In the Conducted Emission Test, the uncertainty is within ±2dB
3. The average measurement was not performed when the peak measured data under the limit of average detection.

4.4.1 Conducted emission configuration photograph

For electronic filing, the worst case conducted emission configuration photographs are saved as filename: **Ce.pdf**

5. Radiated emission on the band edge FCC 15.249(C)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental (2400~2483.5MHz). Please refer to the attachment plots.

Band-edge test result please refers to filename: **band-edge-low.pdf, band-edge-high.pdf**