

FCC PART 15 Subpart C
EMI MEASUREMENT AND TEST REPORT
For
CRS Electronic Co., Ltd.

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FCC ID: OZBVC-10C

August 7, 2001

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: RF 2.4GHz Video Camera
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *CRS Electronic Co., Ltd.* 's product, model no.: *VC-10C* or the "EUT" as referred to in this report is a RF 2.4GHz video camera which measures approximately 4.50" L x 4.25" W x 2.00" H.

1.2 Objective

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the 2.4 GHz Video Camera, model No. *VC-10C*. The EMI measurements were performed according to the measurement procedure described in ANSI C63.6: 1992.

The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined by FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.249.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 –1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Suite 2, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1998, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Data
HP	Spectrum Analyzer	8566B	2610A02165	12/6/2001
HP	Spectrum Analyzer	8593B	2919A00242	12/20/2001
HP	Amplifier	8349B	2644A02662	12/20/2001
HP	Quasi-Peak Adapter	85650A	917059	12/6/2001
HP	Amplifier	8447E	1937A01046	12/6/2001
A.H. System	Horn Antenna	SAS0200/571	261	12/27/2001
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/2001
Com-Power	Biconical Antenna	AB-100	14012	11/2/2001
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/2001
Com-Power	LISN	LI-200	12208	12/20/2001
Com-Power	LISN	LI-200	12005	12/20/2001
BACL	Data Entry Software	DES1	0001	12/20/2001

1.7 Equipment Under Test (EUT)

Manufacturer	Description	Model	Serial Number	FCC ID
CRS Electronic Co., Ltd.	RF 2.4GHz Video Camera	VC-10C	None	OZBVC-10C

2 - SYSTEM TEST CONFIGURATION

2.1 Description of Test Configuration

The EUT was configured for testing in a typical fashion (as normally used by a typical user).

2.2 EUT Exercise Software

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The test software, provided by the customer and contained on the hard drive, is started in a DOS window under the Windows 98 operating system. Once loaded, the program sequentially exercises each system component.

The sequence used is as follows:

1. The EUT Receiver sends signal to the monitor.

The complete cycle takes approximately 5 - 10 seconds and the process is continuously repeated.

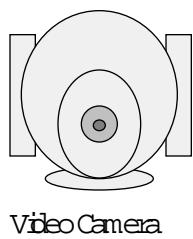
2.3 Special Accessories

As shown in section 2.5, interface cable used for compliance testing is shielded as normally supplied by customer and its respective support equipment manufacturers.

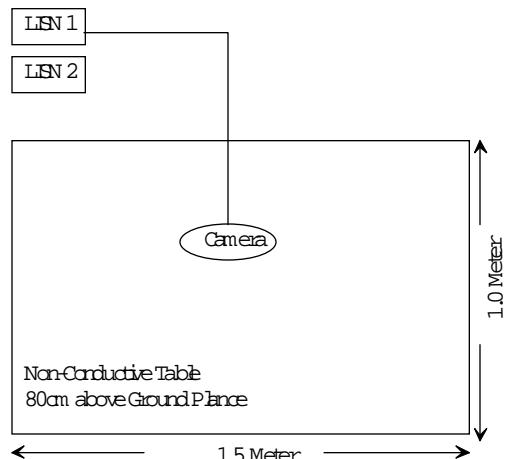
2.4 Equipment Modifications

No modification(s) to the EUT were made to comply with the applicable limits.

2.5 Configuration of Test System



2.6 Test Setup Block Diagram



3 - CONDUCTED EMISSIONS TEST DATA

3.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ± 2.4 dB.

3.2 EUT Setup

The measurement was performed at the **Open Area Test Site**, using the same setup per ANSI C63.4 - 1992 measurement procedure. Specification used was with the FCC Class B limits.

The video camera EUT was connected to a 110 Vac / 60 Hz power source and it was placed at the center back edge of the test table.

The spacing between the peripherals was 10 centimeters.

External Input / Output cables were draped over edge of the test table and bundle when necessary.

3.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conducted emission test:

Start Frequency.....	450 kHz
Stop Frequency.....	30 MHz
Sweep Speed.....	Auto
IF Bandwidth.....	100 kHz
Video Bandwidth.....	100 kHz
Quasi-Peak Adapter Bandwidth.....	9 kHz
Quasi-Peak Adapter Mode.....	Normal

3.4 Test Procedure

During the conducted emission test, the EUT power cord was connected to the auxiliary outlet of the first LISN with all support equipment power cords connected to the second.

The EUT was tested with the *ITE* (RGD35-05002) power adapter to represent worst case results for the final qualification test. Therefore, these results were used for final test data recorded in the table listed under section 3.6 of this report.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination. All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dB of specification limit). Quasi-peak readings are distinguished with a "Qp".

3.5 Summary of Test Results

According to the data in section 3.6, the EUT complied with the FCC Class B Conducted margin and these test results is deemed satisfactory evidence of compliance with RSS-210 of the Canadian Interference-Causing Equipment Regulations, with the *worst* margin reading of:

-2.5 dB μ V at 2.020 MHz in the **Neutral** mode for Video Camera with the **ITE** power adapter,

M/N: RGD35-05002, **0.45 – 30 MHz**

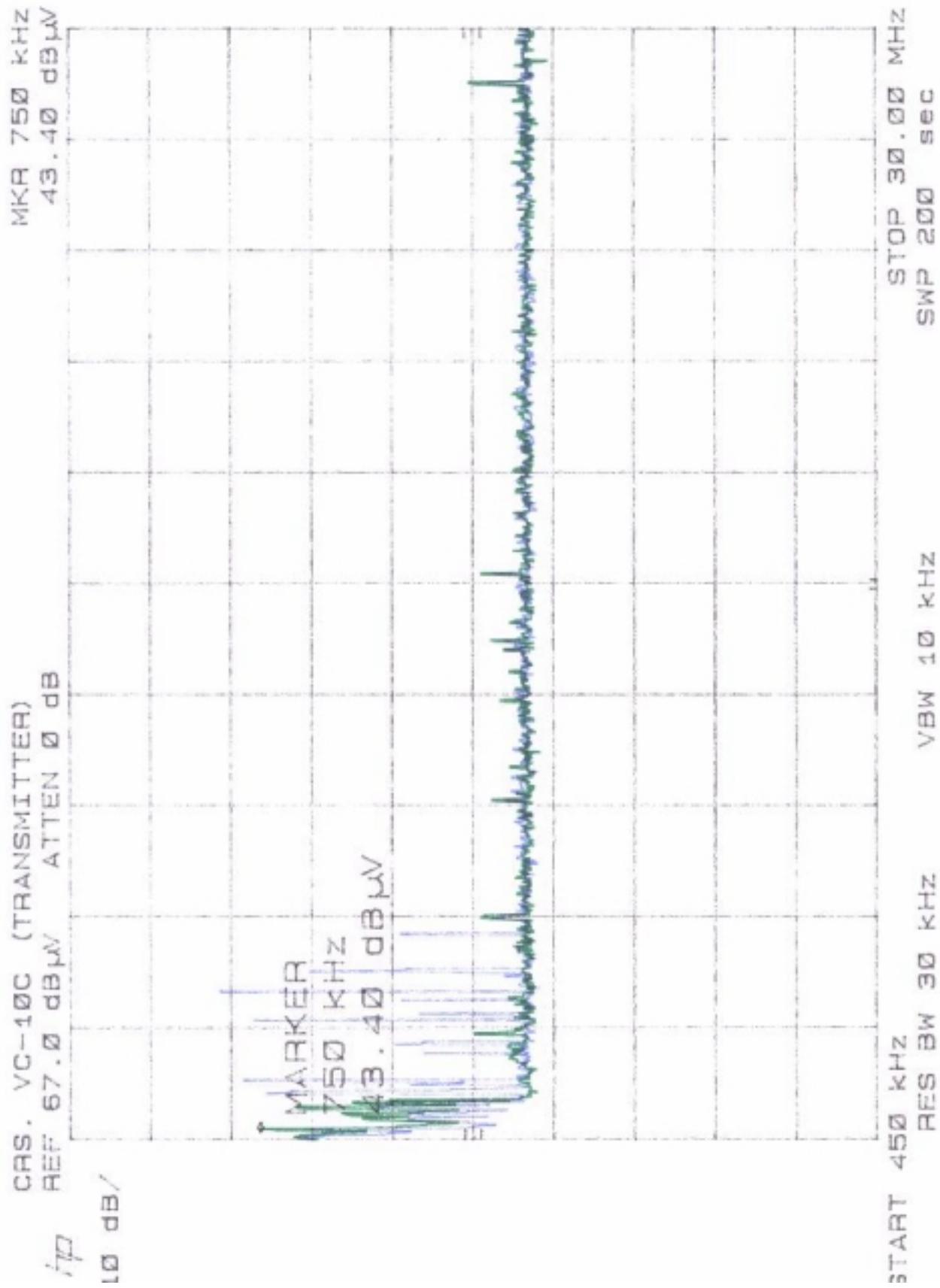
3.6 Conducted Emissions Test Data

3.6.1 Test Data for Video Camera with ITE Adapter, model RGD35-05002, 0.45 - 30 MHz.

LINE CONDUCTED EMISSIONS				FCC CLASS B	
Frequency	Amplitude	Detector	Phase	Limit	Margin
MHz	dB μ V	Qp/Ave/Peak	Line/Neutral	dB μ V	dB
2.020	45.5	QP	Neutral	48	-2.5
3.640	44.3	QP	Neutral	48	-3.7
0.750	43.4	QP	Line	48	-4.6
1.310	39.0	QP	Line	48	-9.0
0.750	37.2	QP	Neutral	48	-10.8
1.510	27.5	QP	Line	48	-20.5

3.7 Plot of Conducted Emissions Test Data

Plot of Conducted Emissions test data for the *ITE* Power Adapter, model RGD35-05002 is presented hereinafter as reference.



4 - RADIATED EMISSION DATA

4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is ± 4.0 dB.

4.2 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with the ANSI C63.4 - 1992. The specification used was the FCC 15 Subpart C limits.

The Video Camera EUT was connected to a 110 Vav / 60 Hz power source and it was placed at the center back edge of the test table.

The spacing between the peripherals was 10 centimeters.

External Input / Output cables were draped over edge of the test table and bundle when necessary.

4.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33 (a) (1), the system was tested to 24000 MHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Start Frequency	30 MHz
Stop Frequency	24000 MHz
Sweep Speed	Auto
IF Bandwidth	1 MHz
Video Bandwidth	1 MHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	1MHz

4.4 Test Procedure

For the radiated emissions test, both the EUT and all support equipment power cords were connected to the AC floor outlet since the power supply (RGD35-05002) used in the EUT did not provide an accessory power outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "Qp" in the data table.

4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB μ V means the emission is 7dB μ V below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Class B Limit}$$

4.6 Summary of Test Results

According to the data in section 4.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.249 after tested to 10th harmonics as required by FCC and had the worst margin of:

Video Camera:

-2.1 dB μ V (Ave.) at 4856.80 MHz in the Vertical polarization, 30MHz to 24000 MHz, 3 meters.

4.7 Radiated Emissions Test Result Data

4.7.1 Final Test Data for Video Camera, 30 MHz to 24000 MHz, 3 meters.

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart C	
Frequency MHz	Ampl. dB μ V/m	Comments	Angle Degree	Height Meter	Polar H/V	Antenna dB μ V/m	Cable dB	Amp. dB	Corr. Ampl. dB μ V/m	Limit dB μ V/m	Margin dB
2428.70	80.30		0	1.0	H	28.1	3.4	30.0	81.8		
2428.70	79.60		90	1.0	V	28.1	3.4	30.0	81.1		
4856.8	44.50	Ave.	0	1.5	V	32.5	4.9	30.0	51.9	54.0	-2.1
71.51	51.50		315	1.0	V	9.6	1.6	25.0	37.7	40.0	-2.3
85.85	49.80		315	1.2	V	9.7	2.2	25.0	36.7	40.0	-3.3
114.45	52.20		315	1.5	V	11.7	1.3	25.0	40.2	43.5	-3.3
4856.8	41.00	Ave.	90	1.5	H	32.5	4.9	30.0	48.4	54.0	-5.6
4856.8	60.17	Peak	225	1.5	H	32.5	4.9	30.0	67.6	74.0	-6.4
4856.8	59.67	Peak	45	1.6	V	32.5	4.9	30.0	67.1	74.0	-6.9
501.00	42.00		45	1.8	H	18.2	3.1	25.0	38.3	46.0	-7.7
400.93	43.00		45	2.0	H	16.5	2.9	25.0	37.4	46.0	-8.6
286.93	41.70		0	1.0	H	14.6	5.8	25.0	37.1	46.0	-8.9
601.38	38.30		180	1.2	H	20.1	3.0	25.0	36.4	46.0	-9.6
228.88	45.10		270	1.2	H	12.1	3.9	25.0	36.1	46.0	-9.9
55.83	42.90		135	1.2	V	10.0	0.6	25.0	28.5	40.0	-11.5
171.66	42.20		315	1.0	V	13.3	1.4	25.0	31.9	43.5	-11.6
343.30	38.20		315	1.8	H	15.2	3.1	25.0	31.5	46.0	-14.5
243.39	39.70		315	2.1	H	12.6	2.3	25.0	29.6	46.0	-16.4

5 - BAND EDGES TESTING

Requirements: Per FCC 15.249 (c), the emission power at the START and STOP frequencies shall be at least 50 dB below the level of the fundamental or to the general radiated emission limits in FCC 15.209, whichever is the lesser attenuation.

5.1 Test Procedure

The antenna was removed and a low loss RF cable was connected to the transmitter output. The other end of cable was connected to a spectrum analyzer with the START and STOP frequencies set to the operation band. Transmitter output was read off the spectrum analyzer in dBm. The power output at the transmitter was determined by adding the value of the attenuator to the spectrum analyzer reading.

The test was performed for handset and the base respectively.

5.2 Test Equipment

HP 8566B Spectrum Analyzer
HP 7470A Plotter

5.3 Test Results

Passed. Refer to the attached plots.

