

FCC CLASS B COMPLIANCE REPORT

for

Electromagnetic Emissions

of

14" COLOR MONITOR

Trade Name : COMPAL

Model Number : M454

FCC ID: GKRM454

Serial Number : Pre-production

Report Number : 980045-F

Date : April 21, 1998

Prepared for :

COMPAL ELECTRONICS, INC.

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VERIFICATION OF COMPLIANCE

Equipment Under Test: 14" COLOR MONITOR
Trade Name: COMPAL
FCC ID: GKRM454
Model Number: M454
Serial Number: Pre-production
Applicant: COMPAL ELECTRONICS, INC.
7TH FL.319 SEC 4, Pateh Road
Taipei , Taiwan , R.O.C.
Manufacturer: COMPAL ELECTRONICS, INC.
7TH FL.319 SEC 4, Pateh Road
Taipei , Taiwan , R.O.C.
Type of Test: FCC Class B
Measurement Procedure: ANSI C63.4: 1992
File Number: 980045-F
Date of test: April 10, 1998
Tested by: Garry Hsieh
Deviation: None
Condition of Test Sample: Normal

The above equipment was tested by C&C Laboratory, Co., Ltd. for compliance with the requirements set forth in the FCC Rules and Regulations Part 15, Subpart B and the measurement procedure according to ANSI C63.4, 1992. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements.

The test results of this report relate only to the tested sample identified in this report.



Charles Wang / Director

SYSTEM DESCRIPTION

EUT Test Program:

1. The EUT was set at worst case display mode.(54kHz)
2. EMI test program (file name: WINFCC) was loaded and executed in Window mode in Host PC
3. Data was sent to EUT filling the screens with upper case of "H" patterns.
4. Test program sequentially exercised printer and modem and sent "H" patterns to them individually.
5. Repeat 3 to 4. Test program is self-repeating throughout the test.

PRODUCT INFORMATION

Housing Type:	Plastic
EUT Power Rating:	100-240VAC, 1.5A, 50/60Hz
AC power during Test:	115VAC/60Hz
Power Supply Manufacturer:	Compal (On Board)
Power Supply Model Number:	N/A
Power Supply Power Rating:	96-264VAC 47-63Hz
AC Power Cord Type:	Unshielded, 1.8m
DC Power Cable Type:	N/A
Data Cable Type:	Shielded, 1.5m
OSC/Clock Frequency:	8MHz

Note: There is a ferrite core attached to Video Cable.

I/O PORT TYPES	Q'TY	TESTED WITH
VGA Port	1	1

SUPPORT EQUIPMENT

Equipment	Model #	Serial #	FCC ID	Trade Name	Data Cable	Power Cord
PC	VL SERIES 55/166	SG74903048	FCC DoC	Hewlett Packard Co.	N/A	Unshielded, 1.95m
Printer	DJ-400	MY8251C5FK	B94C2642X	Hewlett Packard Co.	Shielded, 1.87m	Unshielded, 1.72m
Modem	2400SE	94-364-176268	DK467GSM24	Computer Peripheral	Shielded, 1.8m	Unshielded, 1.8m
Keyboard	6511-T	K6568070062P	JVP6511-T	Acer Peripheral	Shielded, 1.2m	N/A
Mouse	M-S34	LTC62102369	DZL210472	Logitech	Shielded, 1.89m	N/A

All the above equipment/cables were placed in worse case positions to maximize emission signals.

Grounding: Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.

MEASUREMENT PROCEDURE (PRELIMINARY LINE CONDUCTED EMISSION TEST)

- 1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4: 1992 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2) Support equipment, if needed, was placed as per ANSI C63.4: 1992.
- 3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4: 1992.
- 4) The EUT received AC power through a Line Impedance Stabilization Network (LISN) which supplied power source of 115VAC/60Hz and was grounded to the ground plane.
- 5) All support equipment received power from a second LISN supplying power of 115VAC/60Hz.
- 6) The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum analyzer connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to analyzer and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the analyzer.
- 7) Analyzer scanned from 150kHz to 30MHz for emissions in each of the test modes. Analyzer settings were stated on the Measuring Instrument Settings page.
- 8) During the above scans, the emissions were maximized by cable manipulation.
- 9) The following test modes were scanned during the preliminary test:
Modes:
1. EUT running at video resolution: 640x480 (31.5k)
2. EUT running at video resolution: 800x600 (54k)
- 10) After the preliminary scan, we found the following test mode(s) producing the highest emission level.

Mode: 2

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

MEASUREMENT PROCEDURE (FINAL LINE CONDUCTED EMISSION TEST)

- 1) EUT and support equipment was set up on the test bench as per step 10 of the preliminary test.
- 2) A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the A.V. limit in peak mode, then the emission signal was re-checked using a Quasi-Peak/A.V. detector.
- 3) The test data of the worst case condition(s) was reported on the Summary Data page.

Data Sample:

Freq. MHz	PEAK Raw dBuV	Q.P. Raw dBuV	Average Raw dBuV	Q.P. Limit dBuV	Average Limit dBuV	Q.P. Margin dB	Average Margin dB	Note
x.xx	43.95	---	---	56	46	-12.05	-2.05	L 1

Freq.	= Emission frequency in MHz
Raw dBuV	= Uncorrected Analyzer Receiver reading
Limit dBuV	= Limit stated in standard
Margin dB	= Reading in reference to limit
Note	= Current carrying line of reading
“---“	= The emission level complied with the Average limits with at least 2dB margin, so no further recheck.

LINE CONDUCTED EMISSION LIMIT

Frequency	Maximum RF Line Voltage	
	Q.P.	AVERAGE
150kHz-500kHz	66-56dBuV	56-46dBuV
500kHz-5MHz	56dBuV	46dBuV
5MHz-30MHz	60dBuV	50dBuV

MEASUREMENT PROCEDURE

(PRELIMINARY RADIATED EMISSION TEST)

- 1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane as per ANSI C63.4: 1992 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2) Support equipment, if needed, was placed as per ANSI C63.4: 1992.
- 3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4: 1992.
- 4) The EUT received 115VAC/60Hz power source from the outlet socket under the turntable. All support equipment received 115VAC/60Hz power from another socket under the turntable.
- 5) The antenna was placed at some given distance away from the EUT as stated in ANSI C63.4: 1992. The antenna connected to the analyzer via a cable and at times a pre-amplifier would be used.
- 6) The analyzer quickly scanned from 30MHz to 1000MHz. Analyzer settings were stated on the Measuring Instrument Settings page. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- 7) The following test modes were scanned during the preliminary test:

Modes:

- 1. EUT running at video resolution: 640x480 (31.5k)**
- 2. EUT running at video resolution: 800x600 (54k)**

- 8) After the preliminary scan, we found the following test mode(s) producing the highest emission level.

Mode: 2

Then, the EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for reference of final testing.

MEASUREMENT PROCEDURE (FINAL RAIDATED EMISSION TEST)

- 1) EUT and support equipment were set up on the turntable as per step 8 of the preliminary test.
- 2) The analyzer scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- 3) Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the limit in peak mode, then the emission signal was re-checked using a Quasi-Peak detector, and only Q.P. reading will record in this report.
- 4) The test data of the worst case condition(s) was reported on the Summary Data page.

Data Sample:

Freq. MHz	Raw dBuV	Site CF Db	Corr'd dBuV/m	Limit dBuV/m	Margin dB	Antenna Height (cm)	Table Pos. (deg)	Note	Detector
xx.xx	12.20	10.88	23.08	30	-6.92	150	180	Vert	Peak

Freq.	= Emission frequency in MHz
Raw dBuV	= Uncorrected Analyzer Receiver reading
Site CF	= Correction factors for antenna factor and cable losses
Corr'd dBuV/m	= Raw reading converted to dBuV and CF added
Limit dBuV/m	= Limit stated in standard
Margin dB	= Reading in reference to limit
Antenna Height	= Antenna height above ground plane
Table Position	= EUT placement in reference to antenna
Note	= Antenna polarization
Detector	= Detector function (Peak, Q.P.)

RADIATED EMISSION LIMIT

Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBu V/m)		
		Q.P.	AVERAGE	PEAK
30-230	10	30	/	/
230-1000	10	37	/	/
Above 1000	10	/	43.5	63.5

**Note: “/” means the limit line isn’t applicable.

SUMMARY DATA (LINE CONDUCTED TEST)

Model Number: M454**Location:** Site #1**Tested by:** Garry Hsieh**Test Mode:** EUT running at video resolution: 800x600 (54k)**Test Results:** Passed**Temperature:** 22°C**Humidity:** 70%RH

(The chart below shows the highest readings taken from the final data)

FREQ MHz	Peak Raw dBuV	Q.P. Raw dBuV	AVG Raw dBuV	Q.P. Limit dBuV	AVG Limit dBuV	Q.P. Margin dB	AVG Margin dB	NOTE
0.159	50.2	---	---	65.5	55.5	-15.3	-5.3	L1
0.266	45.6	---	---	61.2	51.2	-15.6	-5.6	L1
0.536	43.2	---	---	56.0	46.0	-12.8	-2.8	L1
0.806	41.7	---	---	56.0	46.0	-14.3	-4.3	L1
0.915	40.8	---	---	56.0	46.0	-15.2	-5.2	L1
14.108	51	38.7	34.0	60.0	50.0	-21.3	-26.0	L1
0.159	55.2	52.4	45.8	65.5	55.5	-13.1	-9.7	L2
0.266	49.4	48.3	45.2	61.3	51.3	-13.0	-6.1	L2
0.533	42.7	---	---	56.0	46.0	-13.3	-3.3	L2
0.644	45.2	43.3	41.2	56.0	46.0	-12.7	-4.8	L2
0.915	42.4	---	---	56.0	46.0	-13.6	-3.6	L2
14.108	51.3	37.5	32.0	60.0	50.0	-22.5	-18.0	L2

L1 = Line One (Hot side) / L2 = Line Two (Neutral side)

****NOTE:** "----" denotes the emission level complied with the Average limit, so no re-check anymore.

SUMMARY DATA (RADIATED EMISSION TEST)

Model Number: M454

Location: Site #1

Tested by: Garry Hsieh

Test Mode: EUT running at video resolution: 800x600 (54k)

Test Results: Passed

Temperature: 22°C

Humidity: 70%RH

(The chart below shows the highest readings taken from the final data)

FREQ MHz	RAW dBuV/m	SITE CF	CORR'D dBuV/m	LIMIT (dBuV/m)			MARGIN (dB)			ANT HEG (cm)	TBL POS. (deg)	Detector	NOTE
				QP	PK	AVG	QP	PK	AVG				
57.35	16.7	6.4	23.1	30.0	/	/	-6.9	/	/	100.3	0.0	PEAK	Vert
64.66	20.2	6.5	26.7	30.0	/	/	-3.3	/	/	100.3	0.0	PEAK	Vert
154.24	11.3	14.2	25.5	30.0	/	/	-4.5	/	/	160.9	150.9	PEAK	Vert
196.30	9.0	13.1	22.1	30.0	/	/	-7.9	/	/	125.6	64.6	PEAK	Vert
224.75	8.5	13.8	22.3	30.0	/	/	-7.7	/	/	111.9	320.8	PEAK	Vert
238.06	10.6	14.8	25.4	37.0	/	/	-11.6	/	/	100.3	178.7	PEAK	Vert
77.95	16.0	9.3	25.3	30.0	/	/	-4.7	/	/	327.8	212.4	PEAK	Horz
189.30	8.9	12.7	21.6	30.0	/	/	-8.4	/	/	294.1	276.1	PEAK	Horz
196.32	14.0	12.7	26.7	30.0	/	/	-3.3	/	/	350.4	263.1	PEAK	Horz
210.32	14.7	12.9	27.6	30.0	/	/	-2.4	/	/	384.7	294.3	PEAK	Horz
224.34	11.9	13.3	25.2	30.0	/	/	-4.8	/	/	400.0	305.4	PEAK	Horz
238.07	10.5	14.6	25.1	37.0	/	/	-11.9	/	/	400.0	240.2	PEAK	Horz

****NOTE:** "/" denotes the item is not applicable.

APPENDIX 6

TEST FACILITY

TEST FACILITY

Location: No. 15, 14 Line, Chin Twu Chi, Lu Chu Hsiang, Taoyuan, Taiwan, R.O.C.

Description: There one two 3/10m open area test sites and two line conducted labs for final test, and one 3/10m open area test site for engineering lab. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 1992 and CISPR 22/EN 55022 requirements.

Site Filing: A site description is on file with the Federal Communications Commission, 7435 Oakland Mills Road, Columbia, MD 21046.

Registration also was made with Voluntary Control Council for Interference (VCCI).

Site Accreditation: Accredited by NEMKO (Authorization #: ELA 124) for EMC & A2LA (Certificate #: 824.01) for Emission

Instrument Tolerance: All measuring equipment is in accord with ANSI C63.4 and CISPR22 requirement that meet industry regulatory agency and accreditation agency requirement.

Ground Plane: Two conductive reference ground planes were used during the Line Conducted Emission, one in vertical and the other in horizontal. The dimensions of these ground planes are as below. The vertical ground plane was placed distancing 40 cm to the rear of the wooden test table on where the EUT and the support equipment were placed during test. The horizontal ground plane projected 50 cm beyond the footprint of the EUT system and distanced 80 cm to the wooden test table. For Radiated Emission Test, one horizontal conductive ground plane extended at least 1m beyond the periphery of the EUT and the largest measuring antenna, and covered the entire area between the EUT and the antenna. It has no holes or gaps having longitudinal dimensions larger than one-tenth of a wavelength at the highest frequency of measurement up to 1GHz.

Site #1 and # 3 Line Conducted Test Site: Vertical ground plane (2.2m x 2.2m)
Horizontal ground plane (2.5m x 2.5m)

APPENDIX 7

TEST EQUIPMENT

MEASURING INSTRUMENT SETTING

TEST TYPE	DETECTOR	FREQUENCY RANGE	RESOLUTION BANDWIDTH	VIDEO BANDWIDTH
Conducted	Peak/Avg	10kHz-150kHz	300Hz	100kHz
Conducted	Peak/QP/Avg	150kHz-30MHz	9kHz	100kHz
Radiated	Peak	30MHz-1GHz	100kHz	100kHz
Radiated	QP	30MHz-1GHz	120kHz	120kHz
Radiated	Peak/Avg	Above 1GHz	1MHz	1MHz

Note: All readings on data pages are taken with the detector in peak mode unless otherwise stated.

UNITS OF MEASUREMENT

Measurements of radiated interference are reported in terms of dBuV/m, at a specified distance. The indicated readings on the spectrum analyzer are converted to dBuV/m by use of appropriate conversion factors. Measurements of conducted interference are reported in terms of dBuV.

TEST EQUIPMENT LIST

Instrumentation: The following list contains equipment used at C & C Laboratory, Co., Ltd. for testing. The equipment conforms to the American National Standard Specifications for Electromagnetic Interference and Field Strength Instrumentation from 10kHz to 2GHz.

Equipment used during the tests:

Open Area Test Site: ☒ # 1 ; ☐ # 3

EQUIPMENT TYPE	* MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL. DUE
Spectrum Analyzer (100Hz-1.5GHz)	HP	8568B	3001A05004 3014A18846	03/25/1998	03/24/1999
Quasi-Peak Adapter	HP	85650A	2811A01399	03/25/1998	03/24/1999
RF Preselector (20Hz-2GHz)	HP	85685A	2947A01064	03/25/1998	03/24/1999
Precision Dipole (30-300MHz)	ROHDE & SCHWARZ	HZ-12	846932/0004	06/06/1997	06/06/1998
Precision Dipole (300-1000MHz)	ROHDE & SCHWARZ	HZ-13	846556/0008	06/06/1997	06/06/1998
Horn Antenna (1GHz-18GHz)	EMCO	3115	9602-4659	N/A	N/A
Bilog Antenna (30MHz-2GHz)	CHASE	CBL6112A	2309	03/14/1998	03/14/1999

EQUIPMENT TYPE	*MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL. DUE
Spectrum Analyzer	ADVANTEST	R3261C	71720533	12/17/1997	12/17/1998
Pre-Amplifier	HP	8447D	2944A09173	01/14/1998	01/14/1999
Receiver (20MHz-1GHz)	ROHDE & SCHWARZ	ESVS10	846285/016	12/4/1997	12/3/1998
Precision Dipole	ROHDE & SCHWARZ	HZ-12	846932/0004	06/06/1997	06/06/2000
Precision Dipole	ROHDE & SCHWARZ	HZ-13	846556/0008	06/16/1997	06/16/2000
Horn Antenna (1GHz-18GHz)	EMCO	3115	9602-4659	N/A	N/A
Bilog Antenna (30MHz-2GHz)	CHASE	CBL6112A	2179	7/3/1997	7/2/1998

Conducted Emission Test Site:



1 ;



3

EQUIPMENT TYPE	*MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL. DUE
Spectrum Analyzer (100Hz-1.5GHz)	HP	8568B	3001A05004 3014A18846	03/25/1998	03/24/1999
Quasi-Peak Adapter	HP	85650A	2811A01399	03/25/1998	03/24/1999
RF Preselector (20Hz-2GHz)	HP	85685A	2947A01064	03/25/1998	03/24/1999
LISN (10kHz-100MHz)	EMCO	3825/2	9106-1809	03/13/1998	03/12/1999
LISN (10kHz-100MHz)	EMCO	3825/2	9106-1810	03/13/1998	03/12/1999

EQUIPMENT TYPE	*MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL. DUE
Receiver (9KHz-2.75GHz)	ROHDE& SCHWARZ	ESCS30	844793/012	12/19/1997	12/18/1998
LISN(10KHz-100MHz)	EMCO	3825/2	9106-1810	N/A	N/A
LISN(10KHz-100MHz)	ROHDE& SCHWARZ	ESH3-Z5	848773/014	11/19/1997	11/18/1998

The calibrations of the measuring instruments, including any accessories that may effect such calibration, are checked frequently to assure their accuracy. Adjustments are made and correction factors applied in accordance with instructions contained in the manual for the measuring instrument.

APPENDIX 8

BLOCK DIAGRAM OF TEST SETUP

System Diagram of Connections between EUT and Simulators

EUT: MONIOR

Trade Name: COMPAL

Model Number: M454

Power Cord: Unshielded, 1.8m

