



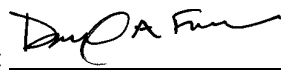
Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 15.231

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FCC ID:	PT5RC5400	GRANTEE FRN NUMBER:	0007771983
PLAT FORM:	N/A	RTL WORK ORDER NUMBER:	2003133
MODEL(S):	RC5400	RTL QUOTE NUMBER:	QRTL03-739
DATE OF TEST REPORT:	August 11, 2003		
American National Standard Institute:	ANSI/TIA/EIA603 and ANSI/TIA/EIA 603-1		
FCC Classification:	DSC; Part 15 Security/Remote Control Transmitter		
FCC Rule Part(s):	Part 15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz		
Digital Interface Information	Digital Interface was found to be compliant		
Receiver Information	Receiver was found to be compliant		

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to, or exclusions from the FCC Part 2, FCC Part 15, ANSI/TIA/EIA 603, and ANSI/TIA/EIA 603-1.

Signature: 

Date: August 11, 2003

Typed/Printed Name: Desmond A. Fraser

Position: President

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1 GENERAL INFORMATION

1.1 SCOPE

FCC Rules Part 15.231: Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

1.2 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

1.3 RELATED SUBMITTAL(S)/GRANT(S)

This is an original application for certification for Philips RCS, Model: RC5400, FCC ID: PT5RC5400.

2 TEST INFORMATION

2.1 TEST JUSTIFICATION

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. Radiated emission measurements were made of the fundamental and spurious emission levels.

The EUT is a manually operating transmitter operating under the requirements of FCC 15.231, specifically meeting the requirements of 15.231(a). The EUT transmits control signals to audio/video equipment and does not transmit data. Please see Plot 4-3 to see how the EUT meets the requirements of 15.231(a)(1). Please note that 15.231(a)(2), 15.231(a)(3) and 15.231(a)(4) do not apply to this EUT.

2.2 EXERCISING THE EUT

Two versions of the EUT were supplied for testing: one that would constantly transmit (RTL bar code 15362) and one typical of a production unit (RTL bar code 15367). The version that constantly transmitted was used to measure transmit power, spurious transmissions and occupied bandwidth. The version that represented a typical production version was used to verify that the EUT complied with the timing requirements of 15.231(a)(1) and to calculate duty cycle.

The EUT consists of a docking station which has a USB port. Per FCC 15.101, the docking station is considered a PC peripheral and is subject to DoC. Testing was done with the docking station attached to a laptop computer and the EUT exercise software also constantly transmitted and received data via the USB connection.

2.3 TEST RESULT SUMMARY

TABLE 2-1: TEST RESULT SUMMARY WITH FCC RULES AND REGULATIONS

STANDARD	TEST
FCC 15.231 (a)	Fundamental Transmit Power
FCC 15.231 (a) & 15.205	Spurious Radiated Power
FCC 15.109	Unintentional Radiated Emissions
FCC 15.231 (a) & 2.1049	Occupied Bandwidth
FCC 15.203	Antenna Requirement

2.4 TEST SYSTEM DETAILS

The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system, are shown in the tables that follows:

TABLE 2-2: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
TOUCH SCREEN REMOTE CONTROL	PHILIPS RCS	RC5400	N/A	PT5RC5400	SHIELDED USB CABLE	015367
TOUCH SCREEN REMOTE CONTROL	PHILIPS RCS	RC5400	N/A	PT5RC5400	SHIELDED USB CABLE	015362
BATTERY	PHILIPS	HHR-60AAA/F4	N/A	N/A	N/A	015364
BATTERY	PHILIPS	HHR-60AAA/F4	N/A	N/A	N/A	015369
DOCKING STATION	PHILIPS	DS5400	N/A	N/A	UNSHIELDED POWER	015361
AC ADAPTOR	PHILIPS	97-509903F	N/A	N/A	UNSHIELDED POWER	015360
AC ADAPTOR	PHILIPS	97-509903F	N/A	N/A	UNSHIELDED POWER	015365
DOCKING STATION	PHILIPS	DS5400	N/A	N/A	UNSHIELDED POWER	015366

TABLE 2-3: AUXILIARY EQUIPMENT

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
LAPTOP	GATEWAY	SOLO 1400	N/A	N/A	UNSHIELDED POWER	014839

2.5 CONFIGURATION OF TESTED SYSTEM

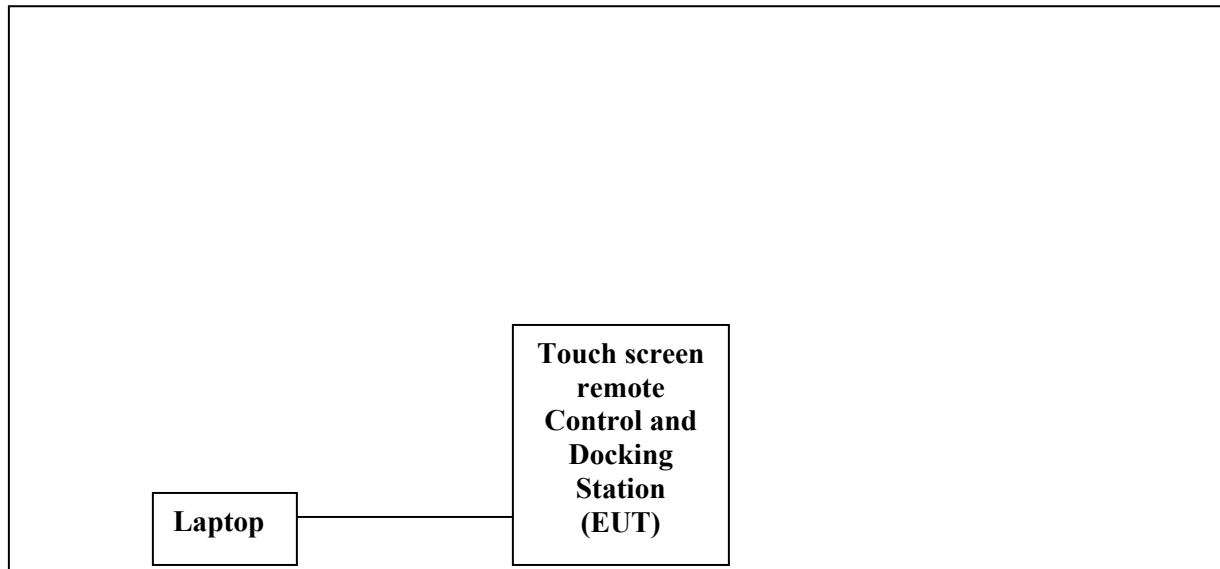


FIGURE 1: CONFIGURATION OF SYSTEM UNDER TEST

3 CONDUCTED EMISSIONS

3.1 TEST METHODOLOGY FOR CONDUCTED EMISSIONS MEASUREMENTS

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50-ohm/50 microhenry Line Impedance Stabilization Network (LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 100 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. Video filters less than 10 times the resolution bandwidth is not used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limits were measured and have been recorded.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech quality manual, section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.

3.2 CONDUCTED EMISSIONS TEST DATA

The conducted test was performed with the EUT constantly transmitting data, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and PHASE SIDE. Receiving modes were also investigated. The worst case conducted emissions data is presented.

TABLE 3-1: CONDUCTED EMISSIONS TEST (NEUTRAL SIDE)

Temperature: 79°F				Humidity: 52%				
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	CISPR B QP Limit (dBuV)	CISPR B QP Margin (dBuV)	CISPR B AV Limit (dBuV)	CISPR B AV Margin (dBuV)
0.152	Qp	49.3	2.0	51.3	65.9	-14.6	55.9	-4.6
0.275	Qp	46.4	1.2	47.6	61.0	-13.4	51.0	-3.4
0.317	Qp	43.4	1.0	44.4	59.8	-15.4	49.8	-5.4
0.419	Pk	36.8	1.0	37.8	57.5	-19.7	47.5	-9.7
0.464	Pk	34.3	0.9	35.2	56.6	-21.4	46.6	-11.4
0.616	Pk	32.0	0.8	32.8	56.0	-23.2	46.0	-13.2
4.952	Pk	33.4	2.0	35.4	56.0	-20.6	46.0	-10.6
6.345	Pk	41.5	2.1	43.6	60.0	-16.4	50.0	-6.4
10.670	Pk	27.1	2.8	29.9	60.0	-30.1	50.0	-20.1
25.130	Pk	21.2	4.3	25.5	60.0	-34.5	50.0	-24.5

TABLE 3-2: CONDUCTED EMISSIONS TEST (PHASE SIDE)

Temperature: 79°F				Humidity: 52%				
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	CISPR B QP Limit (dBuV)	CISPR B QP Margin (dBuV)	CISPR B AV Limit (dBuV)	CISPR B AV Margin (dBuV)
0.155	Qp	48.8	2.0	50.8	65.7	-14.9	55.7	-4.9
0.295	Qp	46.5	1.1	47.6	60.4	-12.8	50.4	N/A
0.295	Av	14.9	1.1	16.0	60.4	-44.4	50.4	-34.4
0.331	Qp	44.3	1.0	45.3	59.4	-14.1	49.4	-4.1
0.500	Pk	33.8	0.9	34.7	56.0	-21.3	46.0	-11.3
0.858	Pk	27.2	0.8	28.0	56.0	-28.0	46.0	-18.0
4.976	Pk	35.2	2.0	37.2	56.0	-18.8	46.0	-8.8
5.970	Pk	40.6	2.1	42.7	60.0	-17.3	50.0	-7.3
10.160	Pk	27.8	2.7	30.5	60.0	-29.5	50.0	-19.5
25.570	Pk	22.2	4.3	26.5	60.0	-33.5	50.0	-23.5

⁽¹⁾Pk = Peak; QP = Quasi-Peak; Av = Average

*Note: Measurements utilizing the Quasi-Peak (QP) detector can be compared to the Average (Av) Limit, but if not passing, refer the QP measurement to the QP Limit/ Margin column. In this case, the Av Margin column is marked "N/A".

TEST PERSONNEL:

Franck Schuppious
Test Engineer



Signature

July 29, 2003
Date Of Test

3.3 TEST EQUIPMENT USED FOR TESTING CONDUCTED EMISSIONS

TABLE 3-3: EQUIPMENT USED FOR TESTING CONDUCTED EMISSIONS

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900897	Hewlett Packard	85650A	Spectrum Analyzer (10 kHz – 1.5 GHz)	N/A	11/09/03
900339	Hewlett Packard	N/A	Quasi-Peak Adapter	N/A	11/09/03
901084	AFJ	LS16	LISN	N/A	11/09/03

4 RADIATED EMISSIONS - §15.231

4.1 RADIATED EMISSION LIMITS TEST PROCEDURE

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable, which allows 360-degree rotation. For measurements of the fundamental signal and spurious/harmonics, a measurement antenna was positioned at a distance of 3 meters as measured from the closest point of the EUT.

4.2 DUTY CYCLE AND COMPLIANCE WITH 15.231(A)(1)

Per FCC 15.35(c), the duty cycle and duty cycle correction factor is calculated by the following, with 20 dB being the maximum allowable duty correction factor:

Number of pulse trains per 100ms = 1 (see PLOT 4-1)

Number of wide pulses in pulse train X width of pulse = 1 X 1.8 mS each = 1.8 ms (see PLOT 4-2)

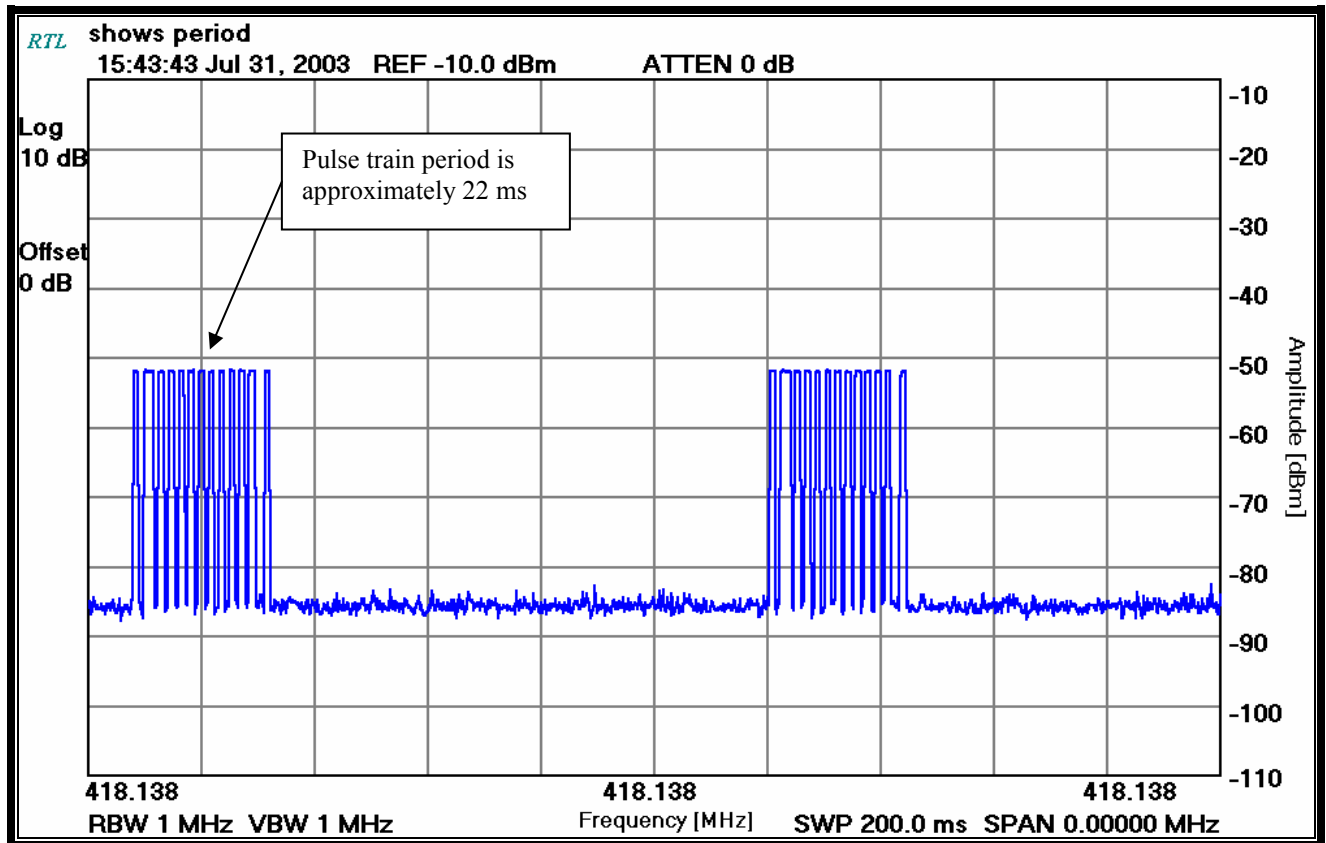
Number of narrow pulses in pulse train X width of pulse = 12 X 0.9 mS each = 10.8 ms (see PLOT 4-2)

Maximum duty cycle = (total on time) / 100 ms = 12.6 ms / 100 ms = 0.126

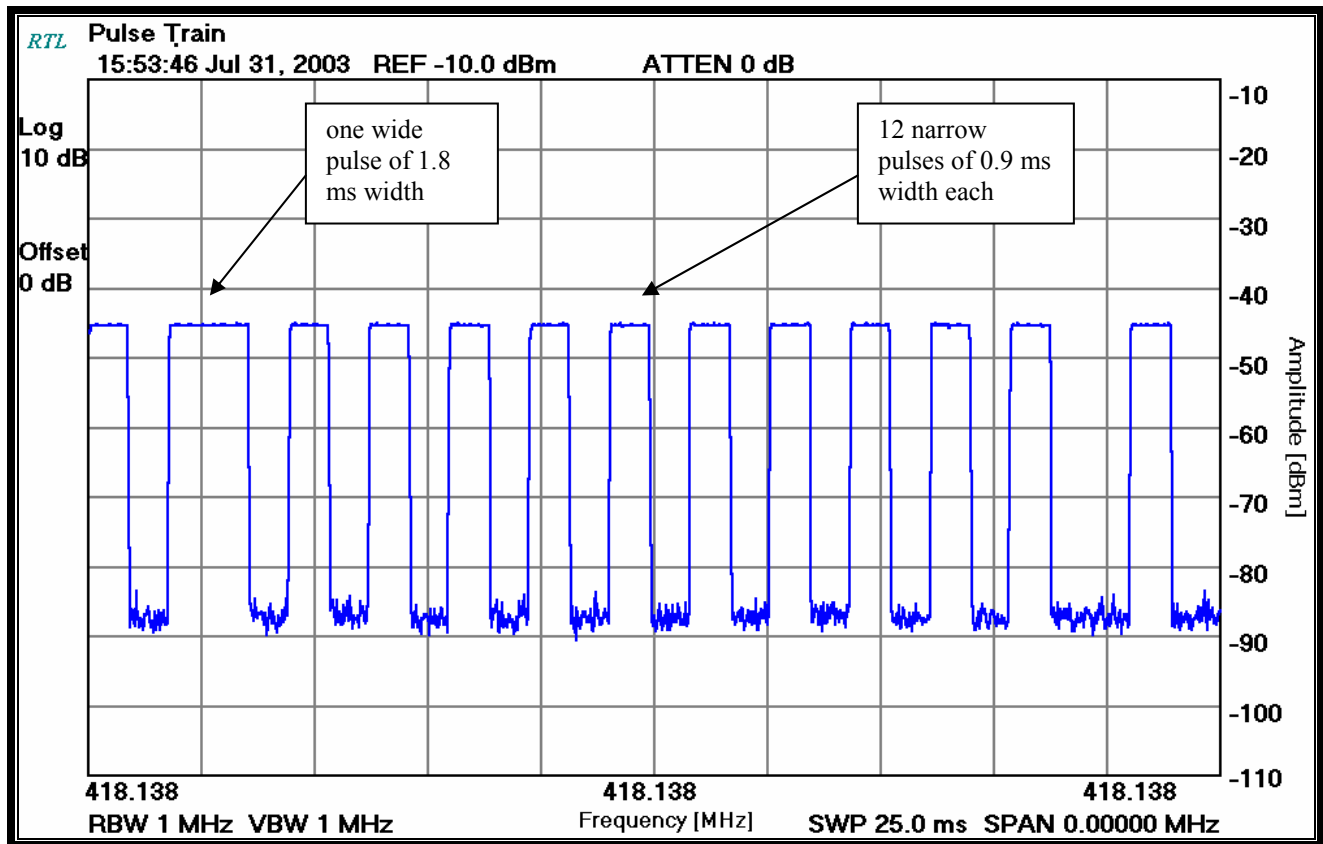
Duty cycle correction factor = $20 \log (1 / 0.126) = 18 \text{ dB}$

The EUT is a manually operating transmitter meeting the requirements of FCC 15.231(a). Plot 4-3 shows compliance with FCC 15.231(a)(1), which states that “a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released”.

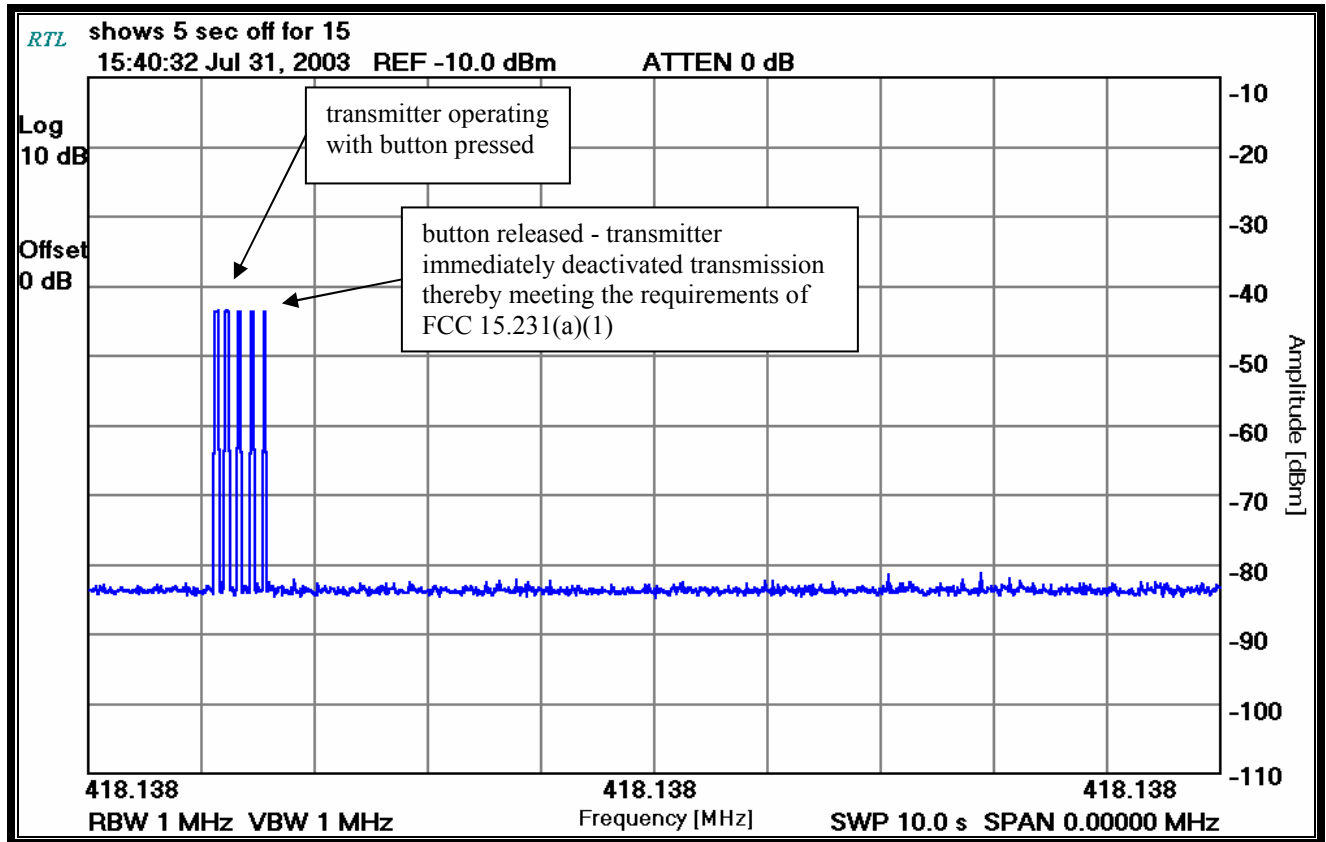
PLOT 4-1: PULSE TRAIN PERIOD PLOT



PLOT 4-2: PULSE TRAIN PLOT



PLOT 4-3: TRANSMITTER DEACTIVATION PER FCC 15.231(A)(1)



TEST PERSONNEL:

Franck Schuppiss
 Test Engineer

Signature

July 31, 2003
 Date Of Test

4.3 RADIATED EMISSION TEST DATA

TABLE 4-1: RADIATED EMISSIONS FUNDAMENTAL/ HARMONICS

Temperature: 74°F Humidity: 93%											
Emission Frequency (MHz)	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m) (Pk)	Emission Level (dBuV/m) (Av)	Limit (dBuV/m) (Pk)	Limit (dBuV/m) (Av)	Margin (dB) (Pk)	Margin (dB) (Av)
417.986	V	45	1	98.1	-10.7	87.4	69.4	100.3	80.3	-12.9	-10.9
835.972	V	90	1	53.1	-4.6	48.5	30.5	80.3	60.3	-31.8	-29.8
1253.958	V	45	1	37.5	-0.6	36.9	18.9	80.3	60.3	-43.4	-41.4
1671.992	V	45	1	36.6	4	40.6	22.6	80.3	60.3	-39.7	-37.7
2089.99	V	270	1	36.5	9.7	46.2	28.2	80.3	60.3	-34.1	-32.1
2507.976	V	45	1.2	33.2	9.8	43	25	80.3	60.3	-37.3	-35.3
2925.962	V	180	1	31.4	9.8	41.2	23.2	80.3	60.3	-39.1	-37.1
3343.948	V	155	1.5	34	10.3	44.3	26.3	80.3	60.3	-36	-34
3761.934	V	180	1	33.5	10	43.5	25.5	80.3	60.3	-36.8	-34.8
4179.92	V	270	1	32.1	10.6	42.7	24.7	80.3	60.3	-37.6	-35.6
4597.906	V	45	1	36.4	10.5	46.9	28.9	80.3	60.3	-33.4	-31.4

TABLE 4-2: RADIATED EMISSIONS DIGITAL/RECEIVER

Temperature: 73°F					Humidity: 81%				
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
36.868	Qp	V	45	1.0	42.4	-15.6	26.8	40.0	-13.2
57.135	Qp	H	90	1.0	57.8	-22.1	35.7	40.0	-4.3
144.000	Qp	V	90	1.0	49.9	-16.6	33.3	43.5	-10.2
169.578	Qp	V	90	1.0	44.6	-18.0	26.6	43.5	-16.9
191.696	Qp	V	45	1.0	39.9	-18.4	21.5	43.5	-22.0
221.184	Qp	V	45	1.0	50.9	-17.5	33.4	46.0	-12.6
228.557	Qp	V	45	1.0	53.7	-17.2	36.5	46.0	-9.5
235.930	Qp	H	270	1.6	58.2	-16.8	41.4	46.0	-4.6
250.676	Qp	H	135	2.0	55.6	-15.1	40.5	46.0	-5.5
258.052	Qp	V	45	1.0	46.3	-15.3	31.0	46.0	-15.0
265.424	Qp	V	0	1.0	50.5	-15.1	35.4	46.0	-10.6
272.016	Qp	V	90	1.0	42.2	-15.3	26.9	46.0	-19.1
272.797	Qp	V	45	1.0	42.4	-15.4	27.0	46.0	-19.0
280.170	Qp	V	225	1.0	44.5	-15.1	29.4	46.0	-16.6
351.987	Qp	V	180	1.0	48.0	-13.1	34.9	46.0	-11.1
418.000	Qp	V	45	1.0	35.8	-10.7	25.1	46.0	-20.9

PEAK: RES. =100 kHz, VID= 100 kHz FOR LESS THAN 1 GHz; 1 MHz/1MHz RESOLUTION ABOVE 1 GHz

TEST PERSONNEL:

Franck Schuppius
Test Engineer



Signature

July 30, 2003
Date Of Test

4.4 TEST EQUIPMENT USED FOR TESTING RADIATED SPURIOUS EMISSIONS

TABLE 4-3: EQUIPMENT USED FOR TESTING RADIATED SPURIOUS EMISSIONS

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	3/15/04
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	4/10/04
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	4/22/04
900724	Antenna Research Associates, Inc.	LPB-2520	LOG Periodic / Biconal Antenna (25 – 1000 MHz)	1037	3/27/04

5 MODULATED BANDWIDTH - §15.231(c)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz.

$$\text{Limit} = 418 \text{ MHz} \times 0.25\% = 1.045 \text{ MHz}$$

5.1 MODULATED BANDWIDTH TEST PROCEDURE

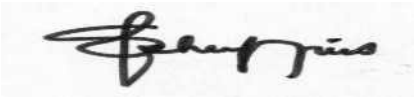
The minimum 20 dB bandwidth per FCC 15.231(c) was performed as radiated testing with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz. The minimum 20 dB modulated bandwidth is listed in Table 5-1.

5.2 MODULATED BANDWIDTH TEST DATA

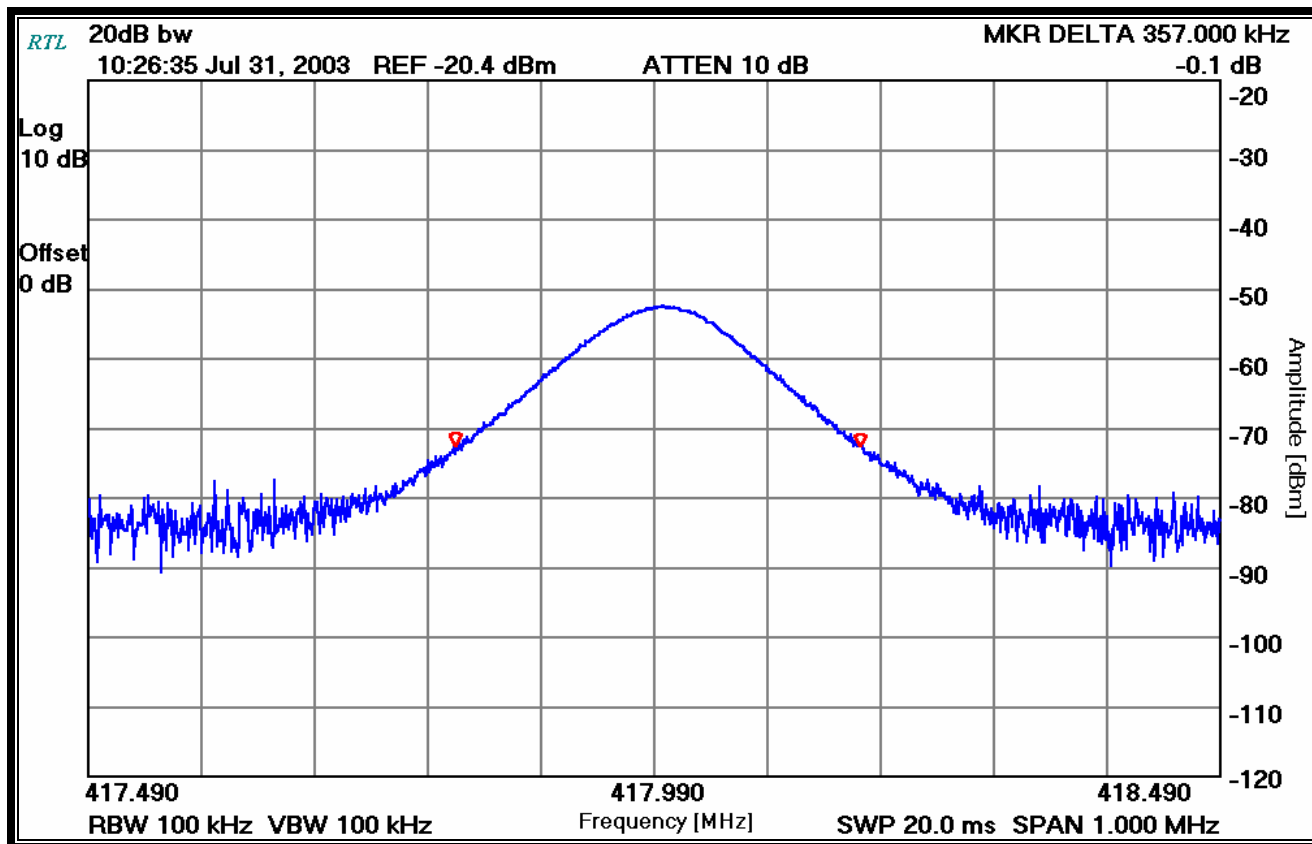
TABLE 5-1: MINIMUM 20 DB MODULATED BANDWIDTH

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)
418	357	1045

TEST PERSONNEL:

Franck Schuppius		July 31, 2003
Test Engineer	Signature	Date Of Test

PLOT 5-1: MODULATED BANDWIDTH



TEST PERSONNEL:

Franck Schuppius
 Test Engineer

Signature

July 31, 2003
 Date Of Test

5.3 TEST EQUIPMENT USED FOR TESTING MODULATED BANDWIDTH

TABLE 5-2: EQUIPMENT USED FOR TESTING MODULATED BANDWIDTH

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900970	Hewlett Packard	85662A	Spectrum Analyzer Display	2542A11239	4/17/04
900968	Hewlett Packard	8567A	Spectrum Analyzer (10 kHz - 1.5 GHz)	2602A00160	4/17/04

6 ANTENNA REQUIREMENT - §15.203

The EUT has an integral helical antenna, which therefore meets the requirements of FCC 15.203. There is no means to use or connect an external antenna.

7 SAMPLE CALCULATIONS - §2.1033(a)(6)

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$\begin{aligned} \text{FI(dBuV/m)} &= \text{SAR(dBuV)} + \text{SCF(dB/m)} \\ \text{FI} &= \text{Field Intensity} \\ \text{SAR} &= \text{Spectrum Analyzer Reading} \\ \text{SCF} &= \text{Site Correction Factor} \end{aligned}$$

The Site Correction Factor (SCF) used in the above equation is determined empirically, and is expressed in the following equation:

$$\begin{aligned} \text{SCF(dB/m)} &= - \text{PG(dB)} + \text{AF(dB/m)} + \text{CL(dB)} \\ \text{SCF} &= \text{Site Correction Factor} \\ \text{PG} &= \text{Pre-amplifier Gain} \\ \text{AF} &= \text{Antenna Factor} \\ \text{CL} &= \text{Cable Loss} \end{aligned}$$

The field intensity in microvolts per meter can then be determined according to the following equation:

$$\text{FI(uV/m)} = 10^{\text{FI(dBuV/m)}/20}$$

For example, assume a signal at a frequency of 125 MHz has a received level measured as 49.3 dBuV. The total Site Correction Factor (antenna factor plus cable loss minus preamplifier gain) for 125 MHz is -11.5 dB/m. The actual radiated field strength is calculated as follows:

$$\begin{aligned} 49.3 \text{ dBuV} - 11.5 \text{ dB/m} &= 37.8 \text{ dBuV/m} \\ 10^{37.8/20} &= 10^{1.89} = 77.6 \text{ uV/m} \end{aligned}$$

8 CONCLUSION

The data in this measurement report shows that the Philips RCS, Model: RC5400, FCC ID: PT5RC5400 complies with all the requirements of Part 15.231(a), 15.231(b) and 15.231(c) of the FCC Rules.