



Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT  
FCC PART 15.247 & INDUSTRY CANADA RSS-210

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<b>FCC ID:</b>	ONJ-3ECJ68A4D	<b>GRANTEE FRN:</b>	0007245384
<b>PLAT FORM:</b>	N/A	<b>RTL WORK ORDER #:</b>	2003018
<b>MODEL(S):</b>	ORION 5850	<b>RTL QUOTE #:</b>	QRTL03-714
<b>DATE OF TEST REPORT:</b>	July 2, 2003		
<b>American National Standard Institute:</b>	ANSI C63.4: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
<b>FCC Classification:</b>	DTS – Part 15 Digital Transmission System		
<b>FCC Rule Part(s):</b>	Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz		
<b>Industry Canada Standard:</b>	RSS-210: Low Power License-Exempt Radio Communication Devices (All Frequency Bands)		
<b>Digital Interface Information</b>	Digital Interface was found to be compliant		
<b>Receiver Information</b>	Receiver was found to be compliant		
<b>Frequency Range (MHz)</b>	<b>Output Power* (W)</b>	<b>Frequency Tolerance</b>	<b>Emission Designator</b>
5731 - 5844	0.245	N/A	N/A

\* output power is maximum peak conducted

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.

Furthermore, there was no deviation from, additions to, or exclusions from the FCC Part 2, FCC Part 15, Industry Canada RSS-210, ANSI C63.4, ANSI/TIA/EIA603, and ANSI/TIA/EIA 603-1.

Signature:   
Typed/Printed Name: Desmond A. Fraser

Date: July 2, 2003  
Position: President

## TABLE OF CONTENTS

<b>1</b>	<b>GENERAL INFORMATION .....</b>	<b>5</b>
1.1	SCOPE .....	5
1.2	TEST FACILITY .....	5
1.3	RELATED SUBMITTAL(S)/GRANT(S) .....	5
1.4	MODIFICATIONS .....	5
<b>2</b>	<b>TEST INFORMATION .....</b>	<b>6</b>
2.1	TEST JUSTIFICATION .....	6
2.2	EXERCISING THE EUT .....	6
2.3	TEST RESULT SUMMARY .....	6
2.4	TEST SYSTEM DETAILS .....	7
2.5	CONFIGURATION OF TESTED SYSTEM .....	8
<b>3</b>	<b>COMPLIANCE WITH THE RESTRICTED BAND EDGE – FCC §15.205; IC RSS-210 §6.3 .....</b>	<b>9</b>
3.1	TEST PROCEDURE .....	9
3.2	BAND EDGE TEST EQUIPMENT .....	9
3.3	COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA .....	10
<b>4</b>	<b>CONDUCTED LIMITS – FCC §15.207; IC RSS-210 §6.6 AND 7.4 .....</b>	<b>14</b>
4.1	TEST METHODOLOGY FOR CONDUCTED EMISSIONS MEASUREMENTS .....	14
4.2	CONDUCTED EMISSION TEST .....	15
4.3	CONDUCTED EMISSIONS TEST DATA .....	16
<b>5</b>	<b>RADIATED EMISSION LIMITS RECEIVER/DIGITAL INTERFACE – FCC §15.109; IC RSS-210 §7.3 .....</b>	<b>17</b>
5.1	RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST PROCEDURE .....	17
5.2	RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS TEST EQUIPMENT .....	17
5.3	RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST DATA .....	18
<b>6</b>	<b>RADIATED EMISSION LIMITS; SPURIOUS AND HARMONICS – FCC §15.247; IC RSS-210 §6.3 .....</b>	<b>19</b>
6.1	RADIATED SPURIOUS EMISSION LIMITS TEST PROCEDURE .....	19
6.2	RADIATED SPURIOUS TEST EQUIPMENT .....	19
6.3	RADIATED EMISSIONS HARMONICS/SPURIOUS TEST DATA .....	20
<b>7</b>	<b>MODULATED BANDWIDTH - §15.247(A)(2) .....</b>	<b>23</b>
7.1	MODULATED BANDWIDTH TEST PROCEDURE – MINIMUM 6 DB BANDWIDTH .....	23
7.2	BANDWIDTH TEST EQUIPMENT .....	23
7.3	BANDWIDTH TEST DATA .....	23
7.4	MODULATED BANDWIDTH PLOTS .....	24
7.5	BANDWIDTH TEST DATA .....	27
7.6	MODULATED BANDWIDTH PLOTS .....	28
<b>8</b>	<b>PEAK OUTPUT POWER - FCC §15.247(B)(3), (B)(4)(II); IC RSS-210 §6.2.2(O)(B) .....</b>	<b>31</b>
8.1	POWER OUTPUT TEST PROCEDURE .....	31
8.2	POWER OUTPUT TEST EQUIPMENT .....	31
8.3	POWER OUTPUT TEST DATA .....	31
<b>9</b>	<b>ANTENNA CONDUCTED SPURIOUS EMISSIONS - §15.247(C); IC RSS-210 §6.2.2(O)(E1) .....</b>	<b>32</b>
9.1	ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST PROCEDURES .....	32
9.2	ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST EQUIPMENT .....	32
9.3	ANTENNA CONDUCTED SPURIOUS EMISSIONS DATA FOR 16-QAM 25,392 KBPS .....	33
9.4	ANTENNA CONDUCTED SPURIOUS EMISSIONS DATA FOR 16-QAM 8464 KBPS .....	34
<b>10</b>	<b>POWER SPECTRAL DENSITY - §15.247(D) .....</b>	<b>35</b>
10.1	POWER SPECTRAL DENSITY TEST PROCEDURE .....	35
10.2	POWER SPECTRAL DENSITY TEST DATA .....	35
10.3	POWER SPECTRAL DENSITY PLOTS .....	36
10.4	POWER SPECTRAL DENSITY PLOTS .....	40
10.5	TEST EQUIPMENT USED FOR TESTING .....	42
<b>11</b>	<b>CONCLUSION .....</b>	<b>43</b>

## FIGURE INDEX

FIGURE 1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST .....	8
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## TABLE INDEX

TABLE 2-1: TEST RESULT SUMMARY FOR FCC RULES AND REGULATIONS .....	6
TABLE 2-2: EQUIPMENT UNDER TEST (EUT) .....	7
TABLE 2-3: AUXILIARY EQUIPMENT .....	7
TABLE 3-1: BAND EDGE TEST EQUIPMENT .....	9
TABLE 4-1: CONDUCTED SPURIOUS EMISSIONS TEST EQUIPMENT .....	15
TABLE 4-2: NEUTRAL SIDE TRANSMITTING AT 5734 MHZ AND 16-QAM 25392 KBPS .....	16
TABLE 4-3: PHASE SIDE TRANSMITTING AT 5734 MHZ AND 16-QAM 25392 KBPS .....	16
TABLE 5-1: RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS TEST EQUIPMENT .....	17
TABLE 5-2: RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS .....	18
TABLE 6-1: RADIATED SPURIOUS EMISSIONS TEST EQUIPMENT .....	19
TABLE 6-2: RADIATED EMISSIONS HARMONICS/SPURIOUS 5734 MHZ – PARABOLIC ANTENNA .....	20
TABLE 6-3: RADIATED EMISSIONS HARMONICS/SPURIOUS 5804 MHZ – PARABOLIC ANTENNA .....	20
TABLE 6-4: RADIATED EMISSIONS HARMONICS/SPURIOUS 5841 MHZ – PARABOLIC ANTENNA .....	20
TABLE 6-5: RADIATED EMISSIONS HARMONICS/SPURIOUS 5734 MHZ – FLAT PANEL ANTENNA .....	21
TABLE 6-6: RADIATED EMISSIONS HARMONICS/SPURIOUS 5804 MHZ – FLAT PANEL ANTENNA .....	21
TABLE 6-7: RADIATED EMISSIONS HARMONICS/SPURIOUS 5841 MHZ – FLAT PANEL ANTENNA .....	21
TABLE 7-1: BANDWIDTH TEST EQUIPMENT .....	23
TABLE 7-2: MINIMUM 6 DB BANDWIDTH TEST DATA FOR 16-QAM 25,392 KBPS .....	23
TABLE 7-3: MINIMUM 6 DB BANDWIDTH TEST DATA FOR 16-QAM 8464 KBPS .....	27
TABLE 8-1: POWER OUTPUT TEST EQUIPMENT .....	31
TABLE 8-2: POWER OUTPUT TEST DATA .....	31
TABLE 9-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST EQUIPMENT .....	32
TABLE 9-2: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5734 MHZ .....	33
TABLE 9-3: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5804 MHZ .....	33
TABLE 9-4: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5841 MHZ .....	33
TABLE 9-5: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5734 MHZ .....	34
TABLE 9-6: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5804 MHZ .....	34
TABLE 9-7: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5841 MHZ .....	34
TABLE 10-1: POWER SPECTRAL DENSITY .....	35
TABLE 10-2: POWER SPECTRAL DENSITY .....	39
TABLE 10-3: TEST EQUIPMENT USED FOR TESTING (POWER SPECTRAL DENSITY) .....	42
TABLE 11-1: MINIMUM 20 DB MODULATED BANDWIDTHS .....	59
TABLE 11-2: TEST EQUIPMENT USED .....	59

## PLOT INDEX

PLOT 3-1:	LOWER BAND EDGE WITH FLAT PANEL ANTENNA .....	10
PLOT 3-2:	LOWER BAND EDGE WITH PARABOLIC ANTENNA .....	11
PLOT 3-3:	UPPER BAND EDGE WITH FLAT PANEL ANTENNA .....	12
PLOT 3-4:	UPPER BAND EDGE WITH PARABOLIC ANTENNA .....	13
PLOT 7-1:	MODULATED BANDWIDTH 5734 MHZ .....	24
PLOT 7-2:	MODULATED BANDWIDTH 5804 MHZ .....	25
PLOT 7-3:	MODULATED BANDWIDTH 5841 MHZ .....	26
PLOT 7-4:	MODULATED BANDWIDTH 5734 MHZ .....	28
PLOT 7-5:	MODULATED BANDWIDTH 5804 MHZ .....	29
PLOT 7-6:	MODULATED BANDWIDTH 5841 MHZ .....	30
PLOT 10-1:	POWER SPECTRAL DENSITY 5734 MHZ .....	36
PLOT 10-2:	POWER SPECTRAL DENSITY 5804 MHZ .....	37
PLOT 10-3:	POWER SPECTRAL DENSITY 5841 MHZ .....	38
PLOT 10-4:	POWER SPECTRAL DENSITY 5734 MHZ .....	40
PLOT 10-5:	POWER SPECTRAL DENSITY 5804 MHZ .....	41
PLOT 10-6:	POWER SPECTRAL DENSITY 5841 MHZ .....	42
PLOT 11-1:	MODULATED BANDWIDTH 5734 MHZ .....	60
PLOT 11-2:	MODULATED BANDWIDTH 5804 MHZ .....	61
PLOT 11-3:	MODULATED BANDWIDTH 5841 MHZ .....	62

## APPENDIX INDEX

APPENDIX A:	FCC PART 1.1307, 1.1310, 2.1091, 2.1093 RF EXPOSURE .....	44
APPENDIX B:	ANTENNA SPECIFICATIONS .....	45
APPENDIX C:	AGENCY AUTHORIZATION LETTER .....	46
APPENDIX D:	CONFIDENTIALITY REQUEST LETTER .....	47
APPENDIX E:	PRODUCT DESCRIPTION .....	48
APPENDIX F:	LABEL AND LABEL LOCATION .....	49
APPENDIX G:	SCHEMATICS .....	50
APPENDIX H:	BLOCK DIAGRAM .....	51
APPENDIX I:	MANUAL .....	52
APPENDIX J:	TEST PHOTOGRAPHS .....	53
APPENDIX K:	EXTERNAL PHOTOGRAPHS .....	57
APPENDIX L:	INTERNAL PHOTOGRAPHS .....	58
APPENDIX M:	ADDITIONAL INFORMATION FOR CANADIAN CERTIFICATION .....	59

## PHOTOGRAPH INDEX

PHOTOGRAPH 1:	RADIATED EMISSION FRONT VIEW – PARABOLIC ANTENNA .....	53
PHOTOGRAPH 2:	RADIATED EMISSIONS REAR VIEW - PARABOLIC ANTENNA .....	54
PHOTOGRAPH 3:	RADIATED EMISSIONS FRONT VIEW – FLAT PANEL ANTENNA .....	55
PHOTOGRAPH 4:	RADIATED EMISSIONS REAR VIEW – FLAT PANEL ANTENNA .....	56

## **1 GENERAL INFORMATION**

### **1.1 SCOPE**

FCC Rules Part 15.247: Operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

IC RSS-210 Section 6.2.2(o): 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz (Spread Spectrum) and RSS-210 Issue 5: Amendment which permits certification of systems employing digital modulation techniques.

The EUT is considered a “Digital Transmission System (DTS)” because of the digital modulation used. The EUT is also characterized as a fixed, point-to-point system. Two antennas were tested and included as part of this report and application.

### **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 Tellumat (Pty) Ltd, Model Name: ORION 5850, Model Number: 651-04253-01, FCC ID: ONJ-3ECJ68A4D . The IF and LO's were investigated and tested.

### **1.4 MODIFICATIONS**

No modifications were necessary to achieve compliance.

## 2 TEST INFORMATION

### 2.1 TEST JUSTIFICATION

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. Frequencies from 9 kHz to 40 GHz were investigated.

Worst-case data is presented in this report. The unit was tested for the maximum power output. The conducted testing was performed with the widest and narrowest modulation bandwidths: 16-QAM 25,392 kbps 15 Mhz and 16-QAM 8,464 kbps 6 MHz, respectively. Per Part 15.31(m), the EUT was tested at the following frequencies representing one frequency near the bottom, one frequency near the middle and one frequency near the top of the EUT's range of operation: 5731 MHz, 5804 MHz and 5844 MHz. The following additional frequencies were tested representing the highest and lowest center frequencies for the 16-QAM 25,392 kbps setting: 5734 MHz and 5841 MHz.

The EUT was tested with two antennas: Gabriel Electronics parabolic antenna, model number SSP2-52B and a Harris Corporation flat panel antenna, model number MT-20004. Only one antenna is used with the EUT in a given installation. The sole antenna receives and transmits.

The EUT is used in fixed, point-to-point applications.

### 2.2 EXERCISING THE EUT

The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted.

### 2.3 TEST RESULT SUMMARY

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

STANDARD	TEST	PASS/FAIL OR N/A
FCC 15.205	Compliance with the Restricted Band Edge	Pass
FCC 15.207	Conducted Emissions	N/A
FCC 15.209	Radiated Emissions	Pass
FCC 15.247(a)(2)	Modulated Bandwidth	Pass
FCC 15.247(b)(3), (b)(4)(ii)	Power Output	Pass
FCC 15.247(c)	Antenna Conducted Spurious Emissions	Pass
FCC 15.247(d)	Power Spectral Density	Pass

## 2.4 TEST SYSTEM DETAILS

The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system, are identified in Table 2-2. Auxiliary equipment is identified in Table 2-3.

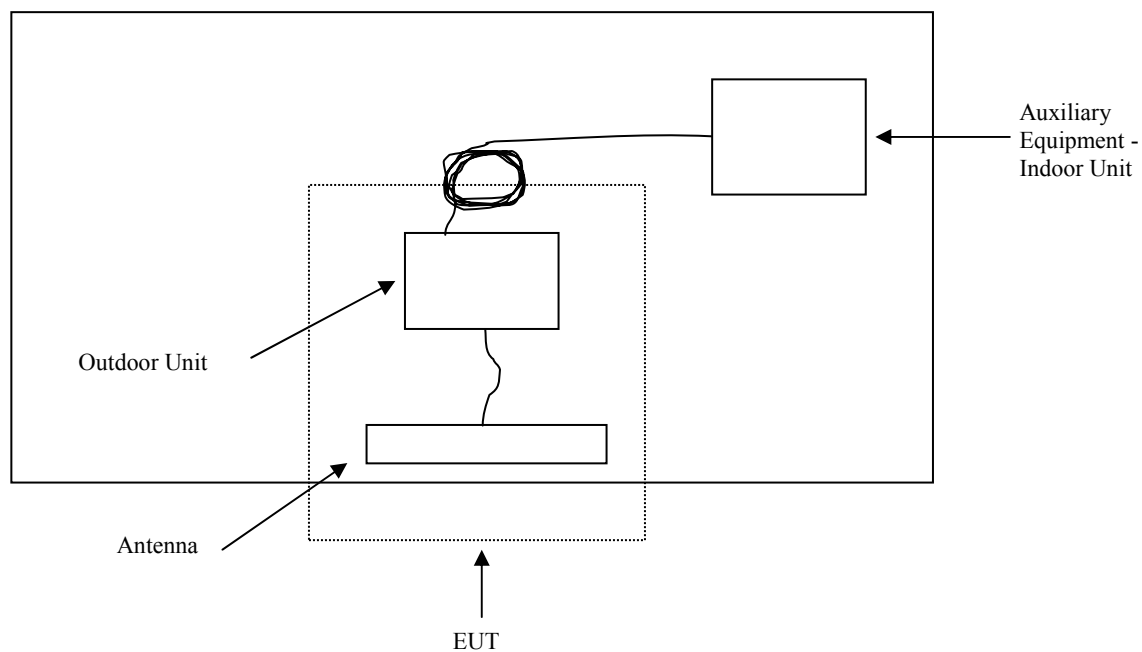
**TABLE 2-2: EQUIPMENT UNDER TEST (EUT)**

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
Outdoor Unit (L)	Tellumat (Pty) Ltd	ORION 5850	BA7200000005	ONJ-3ECJ68A4D	Shielded CAT 5 Cable, Unshielded DC Power Cable	15144
Outdoor Unit (H)	Tellumat (Pty) Ltd	ORION 5850	BA90000000006	ONJ-3ECJ68A4D	Shielded CAT 5 Cable, Unshielded DC Power Cable	15138
Parabolic Antenna	Gabriel Electronics	SSP2-52B	T92457	N/A	RTL Asset 901238	15025
Flat Panel Antenna	Harris Corporation	MT-20004	00621	N/A	RTL Asset 901238	15024

**TABLE 2-3: AUXILIARY EQUIPMENT**

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
Indoor Unit	Tellumat (Pty) Ltd	ORION 25	AA6900000009	N/A - Verification	Shielded CAT 5 Cable, Unshielded DC Power Cable	15145

## 2.5 CONFIGURATION OF TESTED SYSTEM



**FIGURE 1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST**



### 3 COMPLIANCE WITH THE RESTRICTED BAND EDGE – FCC §15.205; IC RSS-210 §6.3

#### 3.1 TEST PROCEDURE

Compliance with the band edges was performed using the guidance in FCC 97-114. The final data derived below was from radiated measurements only. Both antennas presented in this report were tested; data for both antennas is presented below. The restricted bands surrounding the EUT's operating frequency range are 5.35 – 5.46 GHz and 7.25 – 7.75 GHz. All measurements were found to be compliant with the maximum permitted average field strength listed in FCC 15.209.

The EUT was tested using the widest and the narrowest modulation available. The 16 QAM- 25,392 kbps was found to be the worst case and is shown below.

#### 3.2 BAND EDGE TEST EQUIPMENT

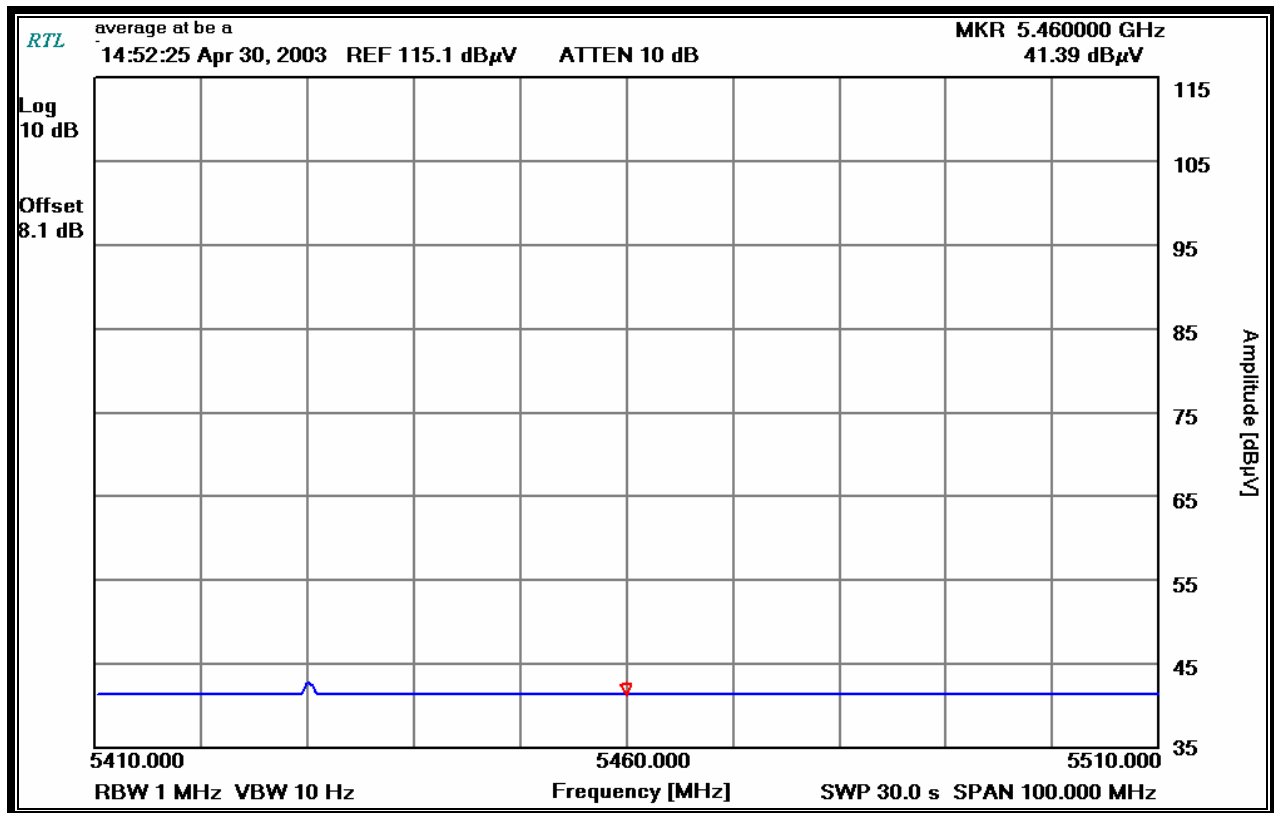
**TABLE 3-1: BAND EDGE TEST EQUIPMENT**

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
900814	Electrometrics	RGA-60	Horn Antenna	2310	2/17/04
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/2/03

Operating Frequency (MHz): 5734  
 RBW/VBW: 1 MHz/10 Hz  
 Distance (m): 3

### 3.3 COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA

**PLOT 3-1: LOWER BAND EDGE WITH FLAT PANEL ANTENNA**



### TEST PERSONNEL:

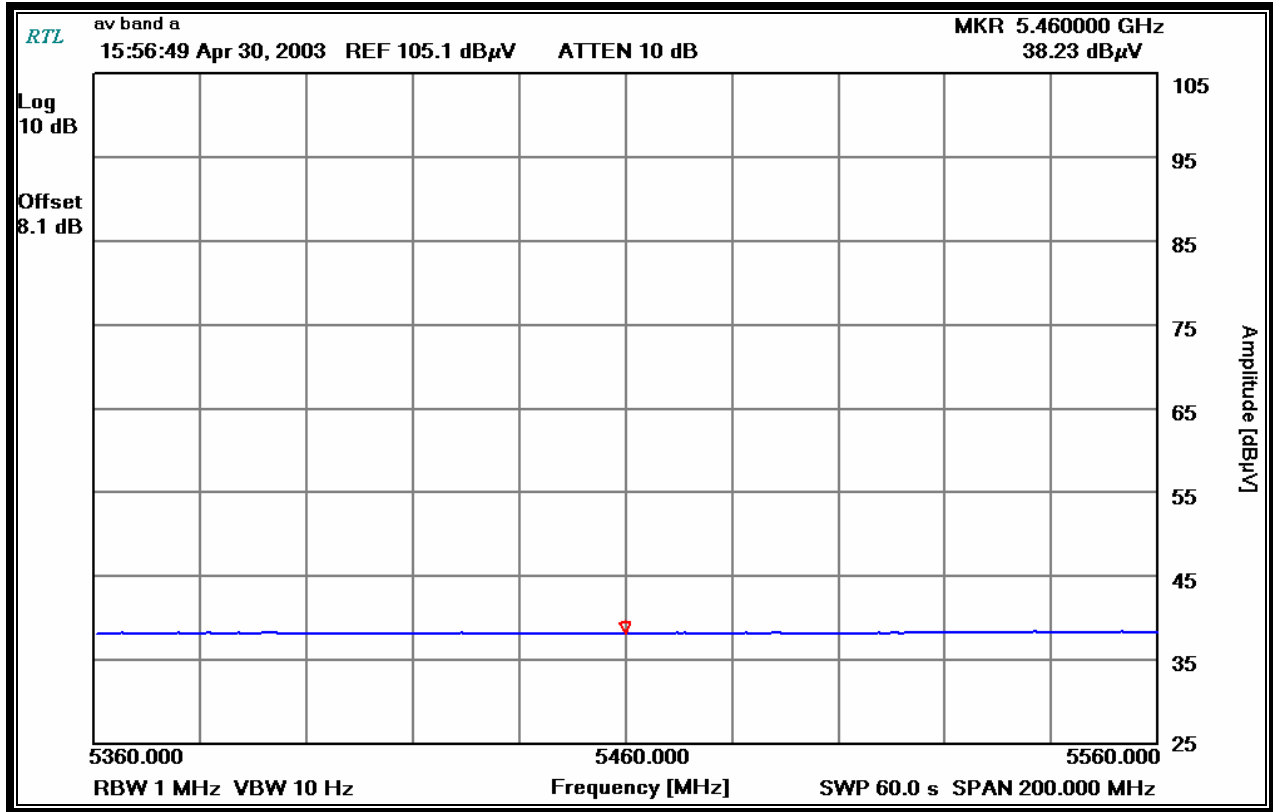
Rachid Sehb  
 EMC Test Engineer

*See*  
 Signature

April 30, 2003  
 Date of Test

Operating Frequency (MHz): 5734  
RBW/VBW: 1 MHz/10 Hz  
Distance (m): 3

**PLOT 3-2: LOWER BAND EDGE WITH PARABOLIC ANTENNA**



**TEST PERSONNEL:**

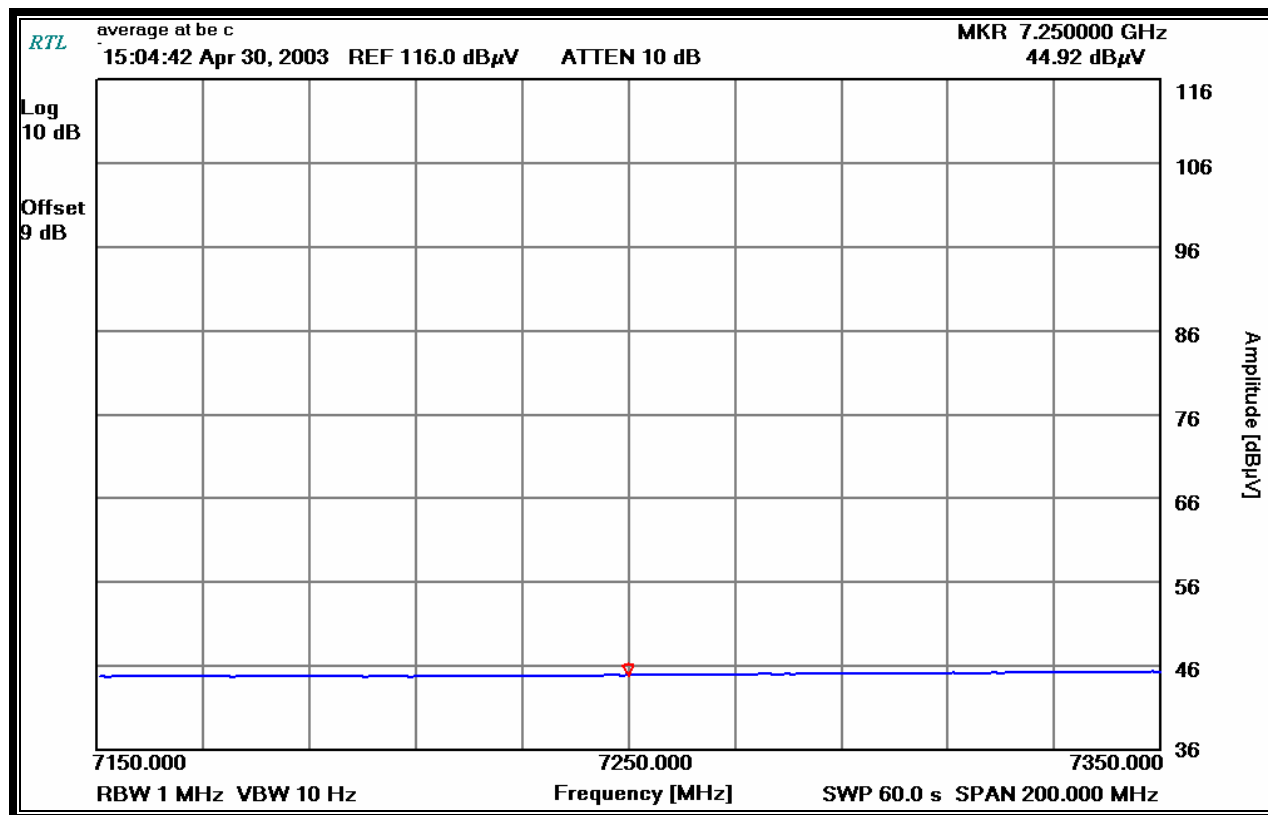
Rachid Sehb  
EMC Test Engineer

  
Signature

April 30, 2003  
Date of Test

Operating Frequency (MHz): 5841  
RBW/VBW: 1 MHz/10 Hz  
Distance (m): 3

**PLOT 3-3: UPPER BAND EDGE WITH FLAT PANEL ANTENNA**



**TEST PERSONNEL:**

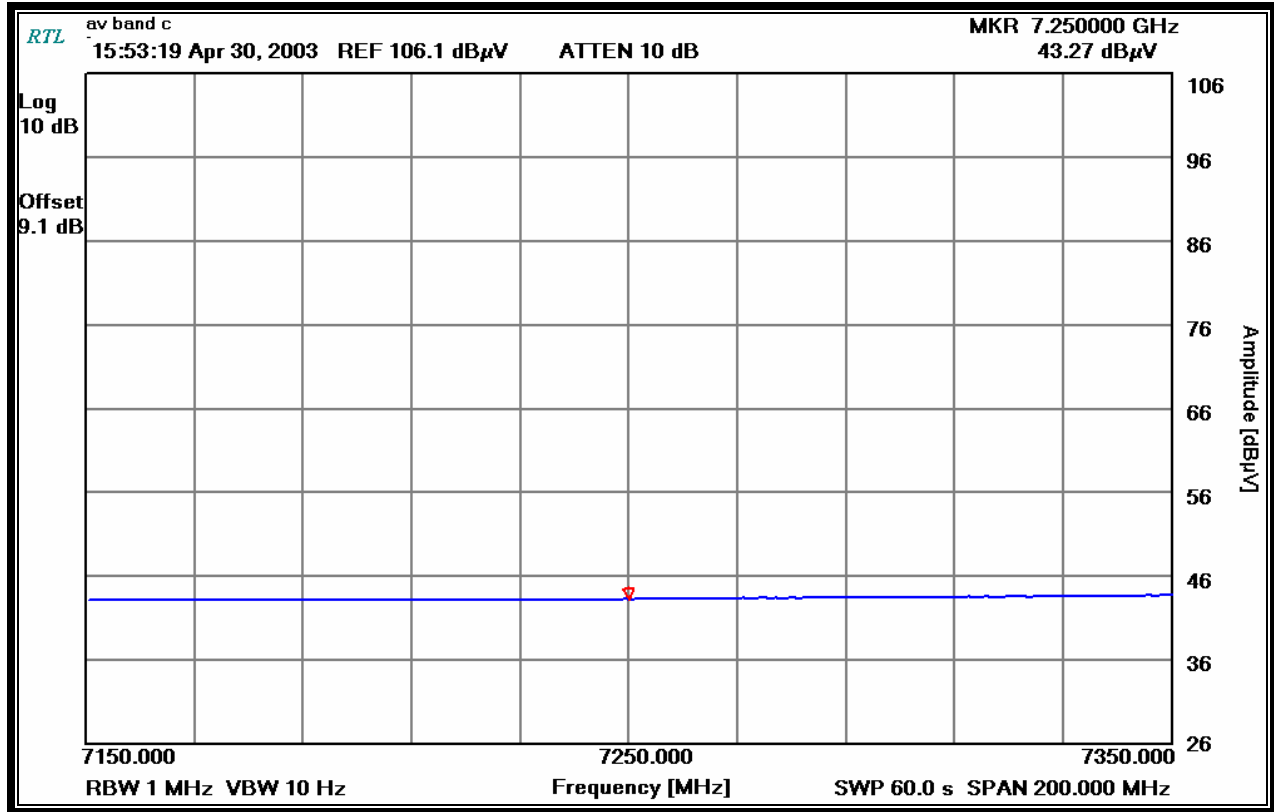
Rachid Sehb  
EMC Test Engineer

*See*  
Signature

April 30, 2003  
Date of Test

Operating Frequency (MHz): 5841  
 RBW/VBW: 1 MHz/10 Hz  
 Distance (m): 3

**PLOT 3-4: UPPER BAND EDGE WITH PARABOLIC ANTENNA**



**TEST PERSONNEL:**

Rachid Sehb  
 EMC Test Engineer

*See*  
 Signature

April 30, 2003  
 Date of Test

## **4 CONDUCTED LIMITS – FCC §15.207; IC RSS-210 §6.6 AND 7.4**

### **4.1 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 Solar 100 kHz 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.*

## 4.2 CONDUCTED EMISSION TEST

The conducted test was performed with the EUT in 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 for worst case conducted emissions in the various data rate modes.

**TABLE 4-1: CONDUCTED SPURIOUS EMISSIONS TEST EQUIPMENT**

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DATE
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	07/15/2003
901084	AFJ international	LS16	16A LISN	16010020082	11/04/2003

### 4.3 CONDUCTED EMISSIONS TEST DATA

**TABLE 4-2: NEUTRAL SIDE TRANSMITTING AT 5734 MHZ AND 16-QAM 25,392 KBPS**


Temperature: 57°F					Humidity: 87%			
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)
0.226	Qp	50.0	1.5	51.5	62.6	-11.1	52.6	-1.1
0.226	Av	38.0	1.5	39.5	62.6	-23.1	52.6	-13.1
0.322	Av	44.2	1.0	45.2	59.7	-14.5	49.7	-4.5
0.322	Qp	45.2	1.0	46.2	59.7	-13.5	49.7	-3.5
0.356	Qp	46.4	1.0	47.4	58.8	-11.4	48.8	-1.4
0.356	Av	26.1	1.0	27.1	58.8	-31.7	48.8	-21.7
0.410	Qp	44.2	1.0	45.2	57.6	-12.4	47.6	-2.4
0.410	Av	38.8	1.0	39.8	57.6	-17.8	47.6	-7.8
0.451	Qp	43.7	0.9	44.6	56.9	-12.3	46.9	-2.3
0.451	Av	42.7	0.9	43.6	56.9	-13.3	46.9	-3.3
1.014	Qp	45.2	0.9	46.1	56.0	-9.9	46.0	0.1
1.014	Av	40.7	0.9	41.6	56.0	-14.4	46.0	-4.4

**TABLE 4-3: PHASE SIDE TRANSMITTING AT 5734 MHZ AND 16-QAM 25,392 KBPS**

Temperature: 57°F					Humidity: 87%			
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)
0.488	Qp	44.1	1.0	45.1	57.6	-12.5	47.6	-2.5
0.488	Av	38.9	1.0	39.9	57.6	-17.7	47.6	-7.7
0.545	Qp	36.3	0.7	37	56	-19	46	-9.0
0.545	Av	26.3	0.7	27	56	-29	46	-19
4.520	Qp	40.1	1.6	41.7	56	-17.3	46	-7.3
4.520	Av	31.1	1.6	32.7	56	-23.3	46	-13.3
6.510	Qp	35.8	1.9	37.7	60	-22.3	50	-12.3
6.510	Av	34.8	1.9	36.7	60	-23.3	50	-13.3
12.530	Qp	31.3	2.5	33.8	60	-26.2	50	-16.2
12.530	Av	25.8	2.5	28.3	60	-31.7	50	-21.7
15.185	Qp	32.6	2.7	35.3	60	-24.7	50	-14.7
15.185	Av	24.3	2.7	27	60	-33	50	-23

#### TEST PERSONNEL:

Franck Schuppius  
Test Technician/Engineer

  
Signature

06/18/03  
Date Of Test



## 5 RADIATED EMISSION LIMITS RECEIVER/DIGITAL INTERFACE – FCC §15.109; IC RSS-210 §7.3

### 5.1 RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST PROCEDURE

Radiated Spurious Emissions applies to harmonics and spurious emissions from oscillators, LO's, and IF's that fall in the restricted and non-restricted bands. The restricted bands are listed in Part 15.205. The maximum permitted average field strength for the restricted band is listed in Part 15.209. The oscillators, IF, LO and up to the 2<sup>nd</sup> LO were investigated.

Emissions from the digital portion of the EUT were tested and found to comply with the Class A requirements of FCC Part 15.109.

### 5.2 RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS TEST EQUIPMENT

**TABLE 5-1: RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS TEST EQUIPMENT**

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
900889	Hewlett Packard	85685A	RF Preselector for HP 8566B or 8568B (20 Hz-2 GHz)	3146A01309	3/5/04
900905	Rhein Tech Labs	PR-1040	Amplifier	900905	7/10/03
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	5/12/04
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	5/12/04
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	5/22/03

### 5.3 RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST DATA

**TABLE 5-2: RECEIVER/DIGITAL INTERFACE RADIATED EMISSIONS**

Temperature: 50°F					Humidity: 73%				
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)
51.195	Qp	V	10	1.0	54.3	-22.0	32.3	49.5	-17.2
57.335	Qp	V	50	1.0	56.8	-23.0	33.8	49.5	-15.7
57.339	Qp	V	1	1.0	59.8	-23.0	36.8	49.5	-12.7
104.430	Qp	H	1	1.0	53.3	-18.0	35.3	54.0	-18.7
104.446	Qp	V	0	1.0	55.6	-17.1	38.5	54.0	-15.5
108.534	Qp	H	1	1.0	54.1	-17.3	36.8	54.0	-17.2
108.535	Qp	V	85	1.0	57.0	-16.4	40.6	54.0	-13.4
108.546	Qp	V	180	1.0	51.7	-16.4	35.3	54.0	-18.7
131.065	Qp	V	270	1.0	53.7	-16.2	37.5	54.0	-16.5
131.071	Qp	V	10	1.0	51.0	-16.2	34.8	54.0	-19.2
172.017	Qp	V	45	1.0	43.3	-18.3	25.0	54.0	-29
300.000	Qp	H	95	1.0	49.1	-14.8	34.3	56.9	-22.6
380.000	Qp	H	1	1.0	51.6	-12.6	39.0	56.9	-17.9
740.006	Qp	H	85	1.0	44.3	-6.2	38.1	56.9	-18.8

Note: Quasi-peak adapter settings: RBW/VBW 120 kHz/120 kHz; 3m EUT-to-antenna distance

#### TEST PERSONNEL:

Rachid Sehb  
EMC Test Engineer

  
Signature

May 13, 2003  
Date of Test

## 6 RADIATED EMISSION LIMITS; SPURIOUS AND HARMONICS – FCC §15.247; IC RSS-210 §6.3

### 6.1 RADIATED SPURIOUS EMISSION LIMITS TEST PROCEDURE

Radiated spurious emissions apply to harmonics and spurious emissions that fall in the restricted and non-restricted bands. The restricted bands are listed in Part 15.205. The maximum permitted average field strength for the restricted band is listed in Part 15.209.

### 6.2 RADIATED SPURIOUS TEST EQUIPMENT

**TABLE 6-1: RADIATED SPURIOUS EMISSIONS TEST EQUIPMENT**

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
900323	EMCO	3160-7	Horn Antennas (8.2 - 12.4 GHz)	9605-1054	6/10/04
900356	EMCO	3160-08	Horn Antennas (12.4 – 18 GHz)	9607-1044	6/10/04
900321	EMCO	3161-03	Horn Antenna (4.0-8.2 GHz)	9508-1020	4/10/04
901053	Schaffner & Chase	CBL6112B	Bilog Antenna (20 MHz - 2 GHz)	2648	5/24/03
900905	Rhein Tech Laboratories, Inc.	PR-1040	Pre Amplifier 40dB (10 MHz – 2 GHz)	1006	7/10/03
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	7/30/04
900814	Electrometrics	RGA-60	Horn Antenna	2310	2/17/04
900889	Hewlett Packard	85685A	RF Preselector for HP 8566B or 8568B (20 Hz-2 GHz)	3146A01309	11/21/03
900905	Rhein Tech Labs	PR-1040	Amplifier	900905	7/10/03
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	5/12/04
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	5/12/04
900932	Hewlett Packard	8449B	Microwave Preamplifier, (1 to 26.5 GHz)	3008A00505	7/15/03
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	5/12/04

### 6.3 RADIATED EMISSIONS HARMONICS/SPURIOUS TEST DATA

**TABLE 6-2: RADIATED EMISSIONS HARMONICS/SPURIOUS 5734 MHz – PARABOLIC ANTENNA**

Operating Frequency (MHz): 5734  
Measured Power at the Antenna Port (dBm): 23.9  
Distance (m): 3

Emission Frequency (MHz)	Peak Test Detector (dBuV)	Average Test Detector (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11,464	37.2	22.8	16.7	39.5	54	-14.5
17,201	36.7	23.7	19	42.7	54	-11.3

Note: Peak test: RBW/VBW 1MHz/1MHz; Average test: RBW/VBW 1MHz/10Hz

**TABLE 6-3: RADIATED EMISSIONS HARMONICS/SPURIOUS 5804 MHz – PARABOLIC ANTENNA**

Operating Frequency (MHz): 5804  
Measured Power at the Antenna Port (dBm): 23.4  
Distance (m): 3

Emission Frequency (MHz)	Peak Test Detector (dBuV)	Average Test Detector (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11,620	37.3	22.8	16.7	39.5	54	-14.5
17,474	33.4	21	17.7	38.7	54	-15.3

Note: Peak test: RBW/VBW 1MHz/1MHz; Average test: RBW/VBW 1MHz/10Hz

**TABLE 6-4: RADIATED EMISSIONS HARMONICS/SPURIOUS 5841 MHz – PARABOLIC ANTENNA**

Operating Frequency (MHz): 5841  
Measured Power at the Antenna Port (dBm): 22.9  
Distance (m): 3

Emission Frequency (MHz)	Peak Test Detector (dBuV)	Average Test Detector (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11,680	37.2	22.9	16.7	39.6	54	-14.4
17,523	37.2	24.1	17.7	41.8	54	-12.2

Note: Peak test: RBW/VBW 1MHz/1MHz; Average test: RBW/VBW 1MHz/10Hz

**TABLE 6-5: RADIATED EMISSIONS HARMONICS/SPURIOUS 5734 MHz – FLAT PANEL ANTENNA**

**Operating Frequency (MHz):** 5734  
**Measured Power at the Antenna Port (dBm):** 23.9  
**Distance (m):** 3

Emission Frequency (MHz)	Peak Test Detector (dBuV)	Average Test Detector (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11,464	37.2	22.8	16.7	39.5	54	-14.5
17,201	36.7	23.7	19	42.7	54	-11.3

Note: Peak test: RBW/VBW 1MHz/1MHz; Average test: RBW/VBW 1MHz/10Hz

**TABLE 6-6: RADIATED EMISSIONS HARMONICS/SPURIOUS 5804 MHz – FLAT PANEL ANTENNA**

**Operating Frequency (MHz):** 5804  
**Measured Power at the Antenna Port (dBm):** 23.4  
**Distance (m):** 3

Emission Frequency (MHz)	Peak Test Detector (dBuV)	Average Test Detector (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11,620	37.3	22.8	16.7	39.5	54	-14.5
17,474	33.4	21	17.7	38.7	54	-15.3

Note: Peak test: RBW/VBW 1MHz/1MHz; Average test: RBW/VBW 1MHz/10Hz

**TABLE 6-7: RADIATED EMISSIONS HARMONICS/SPURIOUS 5841 MHz – FLAT PANEL ANTENNA**

**Operating Frequency (MHz):** 5841  
**Measured Power at the Antenna Port (dBm):** 22.9  
**Distance (m):** 3

Emission Frequency (MHz)	Peak Test Detector (dBuV)	Average Test Detector (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11,680	37.2	22.9	16.7	39.6	54	-14.4
17,523	37.2	24.1	17.7	41.8	54	-12.2

Note: Peak test: RBW/VBW 1MHz/1MHz; Average test: RBW/VBW 1MHz/10Hz

Rhein Tech Laboratories  
360 Herndon Parkway  
Suite 1400  
Herndon, VA 20170  
<http://www.rheintech.com>

Client: Tellumat (Pty) Ltd.  
FCC: Part 15.247  
Industry Canada: RSS-210  
FCC ID: ONJ-3ECJ68A4D  
Model Name: ORION 5850

**TEST PERSONNEL:**

---

Rachid Sehb  
EMC Test Engineer



Signature

May 13, 2003  
Date of Test

## 7 MODULATED BANDWIDTH - §15.247(A)(2)

### 7.1 MODULATED BANDWIDTH TEST PROCEDURE – MINIMUM 6 DB BANDWIDTH

The minimum 6 dB bandwidths per FCC 15.247 (a)(2) were measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz. The minimum 6 dB bandwidths for the widest and narrowest modulation bandwidth are presented, respectively, in Table 7-2 and 7-3.

### 7.2 BANDWIDTH TEST EQUIPMENT

**TABLE 7-1: BANDWIDTH TEST EQUIPMENT**

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
900931	Hewlett Packard	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771	5/12/2004

### 7.3 BANDWIDTH TEST DATA

**TABLE 7-2: MINIMUM 6 dB BANDWIDTH TEST DATA FOR 16-QAM 25,392 KBPS**

FREQUENCY (MHz)	6 dB BANDWIDTH (MHz)
5734	7.05
5804	7.05
5841	7.20

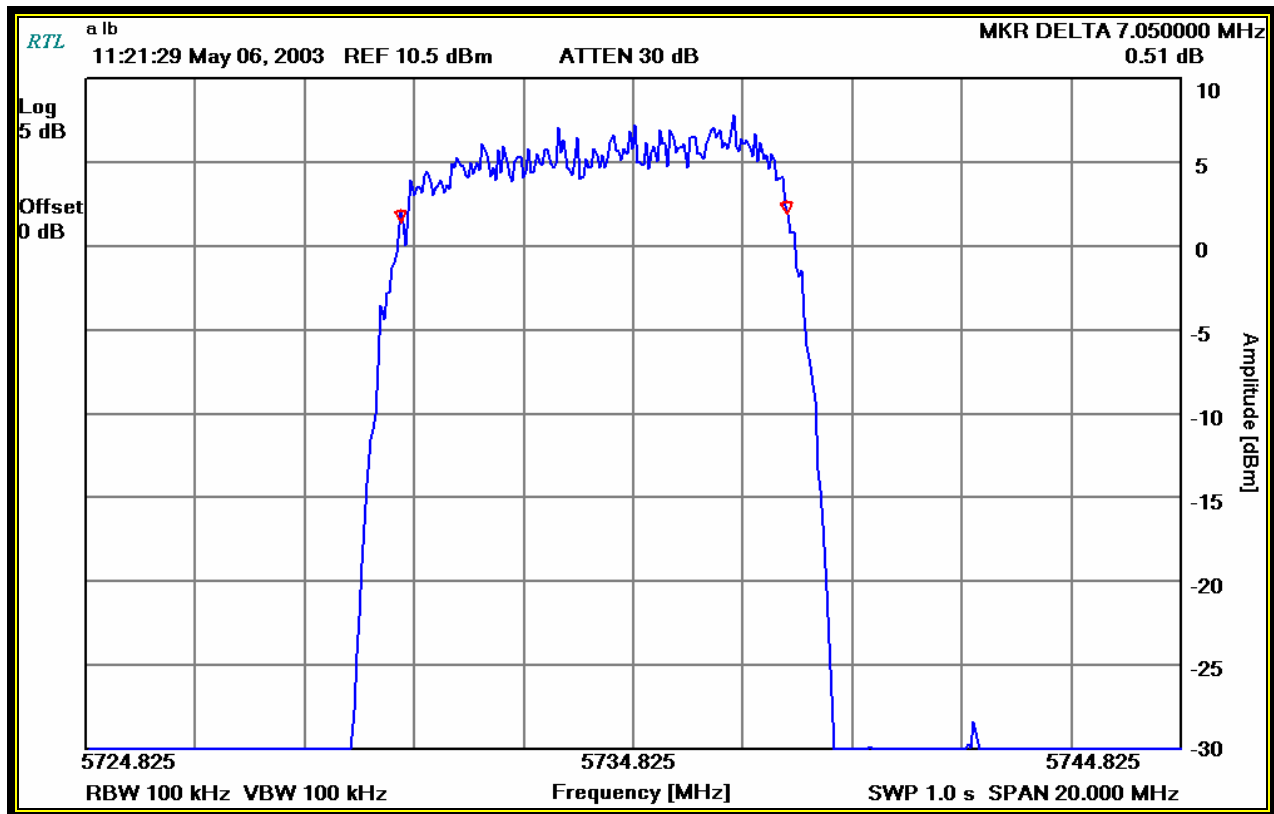
#### TEST PERSONNEL:

Rachid Sehb		May 6, 2003
EMC Test Engineer	Signature	Date of Test

## 7.4 MODULATED BANDWIDTH PLOTS

Frequency (MHz): 5734  
 Resolution Bandwidth (kHz): 100  
 Video Bandwidth (kHz): 100  
 Sweep Time (s): 1

**PLOT 7-1: MODULATED BANDWIDTH 5734 MHz**



### TEST PERSONNEL:

Rachid Sehb  
 EMC Test Engineer

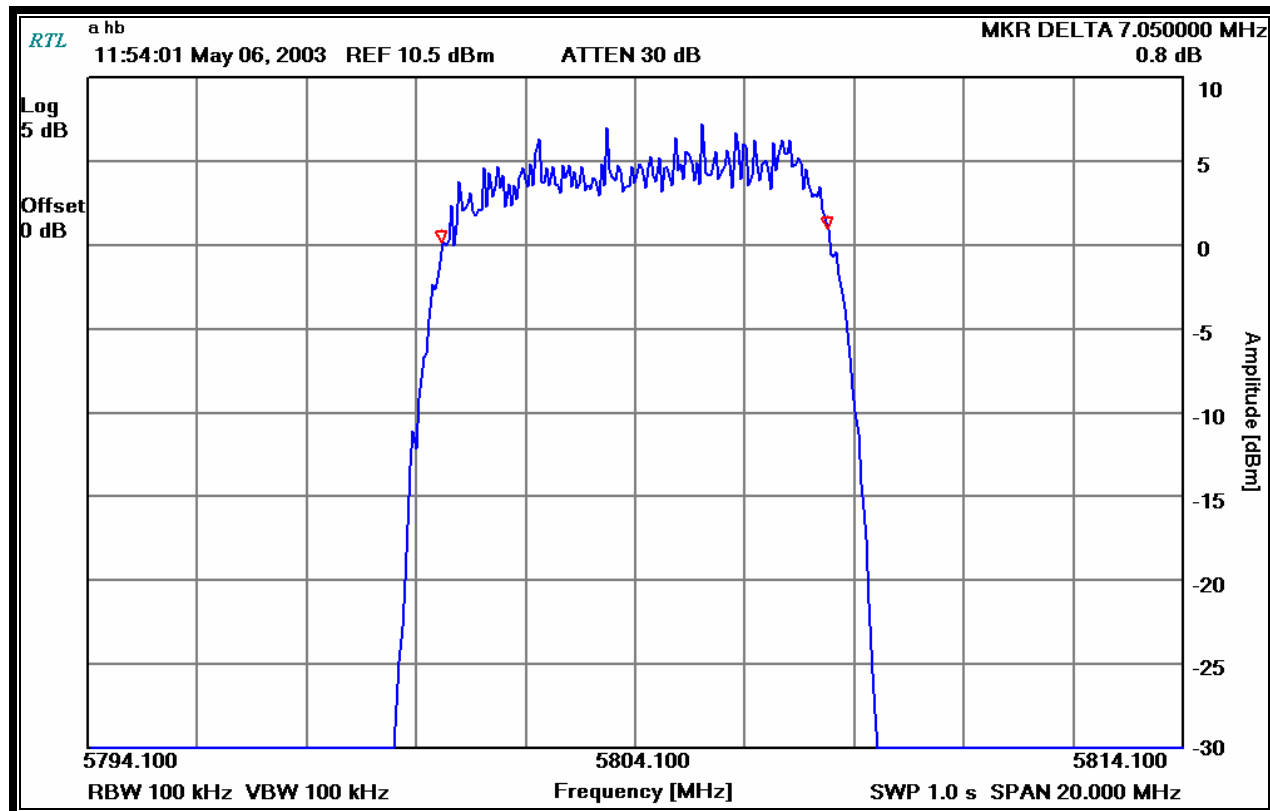
*See*  
 Signature

May 6, 2003  
 Date of Test



Frequency (MHz): 5804  
 Resolution Bandwidth (kHz): 100  
 Video Bandwidth (kHz): 100  
 Sweep Time (s): 1

**PLOT 7-2: MODULATED BANDWIDTH 5804 MHz**



**TEST PERSONNEL:**

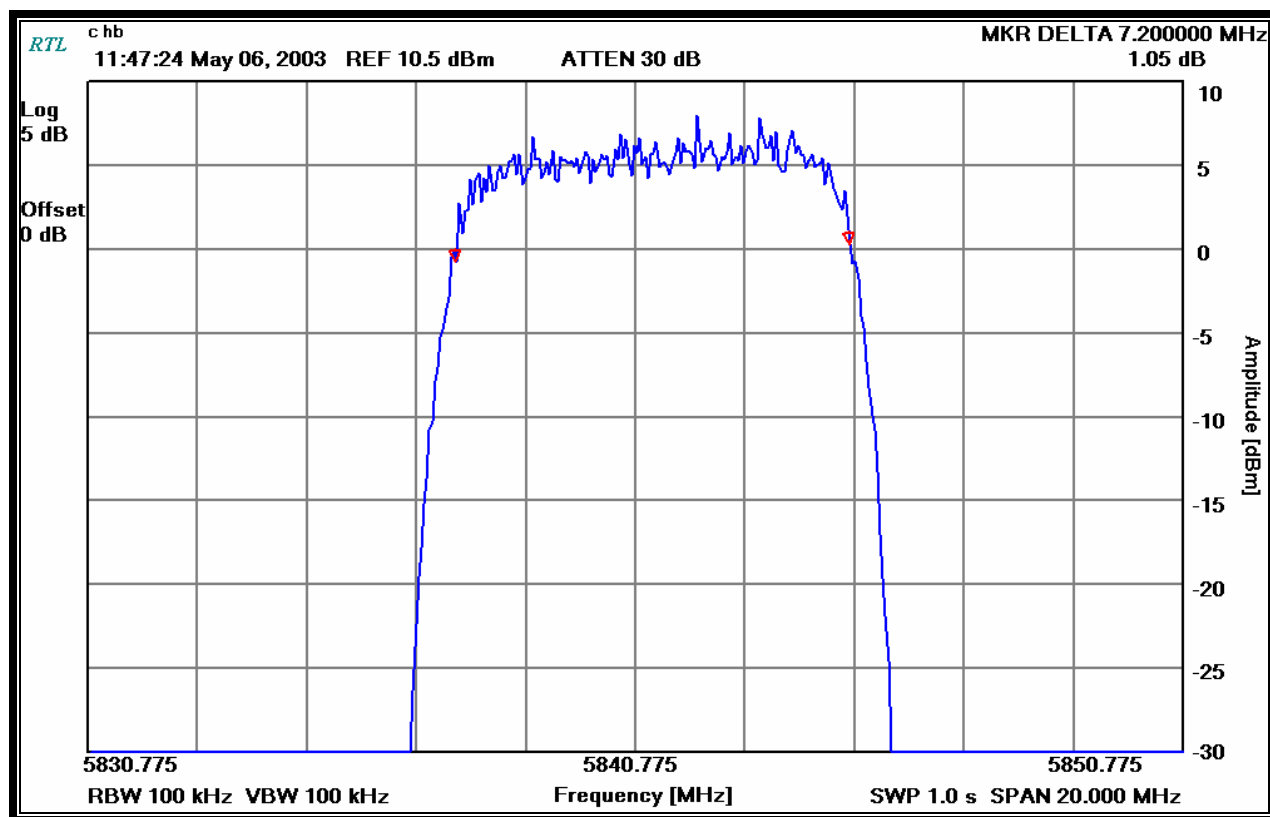
Rachid Sehb  
 EMC Test Engineer

  
 Signature

May 6, 2003  
 Date of Test

Frequency (MHz): 5841  
Resolution Bandwidth (kHz): 100  
Video Bandwidth (kHz): 100  
Sweep Time (s): 1

**PLOT 7-3: MODULATED BANDWIDTH 5841 MHz**



**TEST PERSONNEL:**

Rachid Sehb  
EMC Test Engineer

*See*  
Signature

May 6, 2003  
Date of Test

## 7.5 BANDWIDTH TEST DATA

**TABLE 7-3: MINIMUM 6 dB BANDWIDTH TEST DATA FOR 16-QAM 8464 KBPS**

FREQUENCY (MHz)	6 dB BANDWIDTH (MHz)
5731	2.35
5801	2.35
5844	2.399

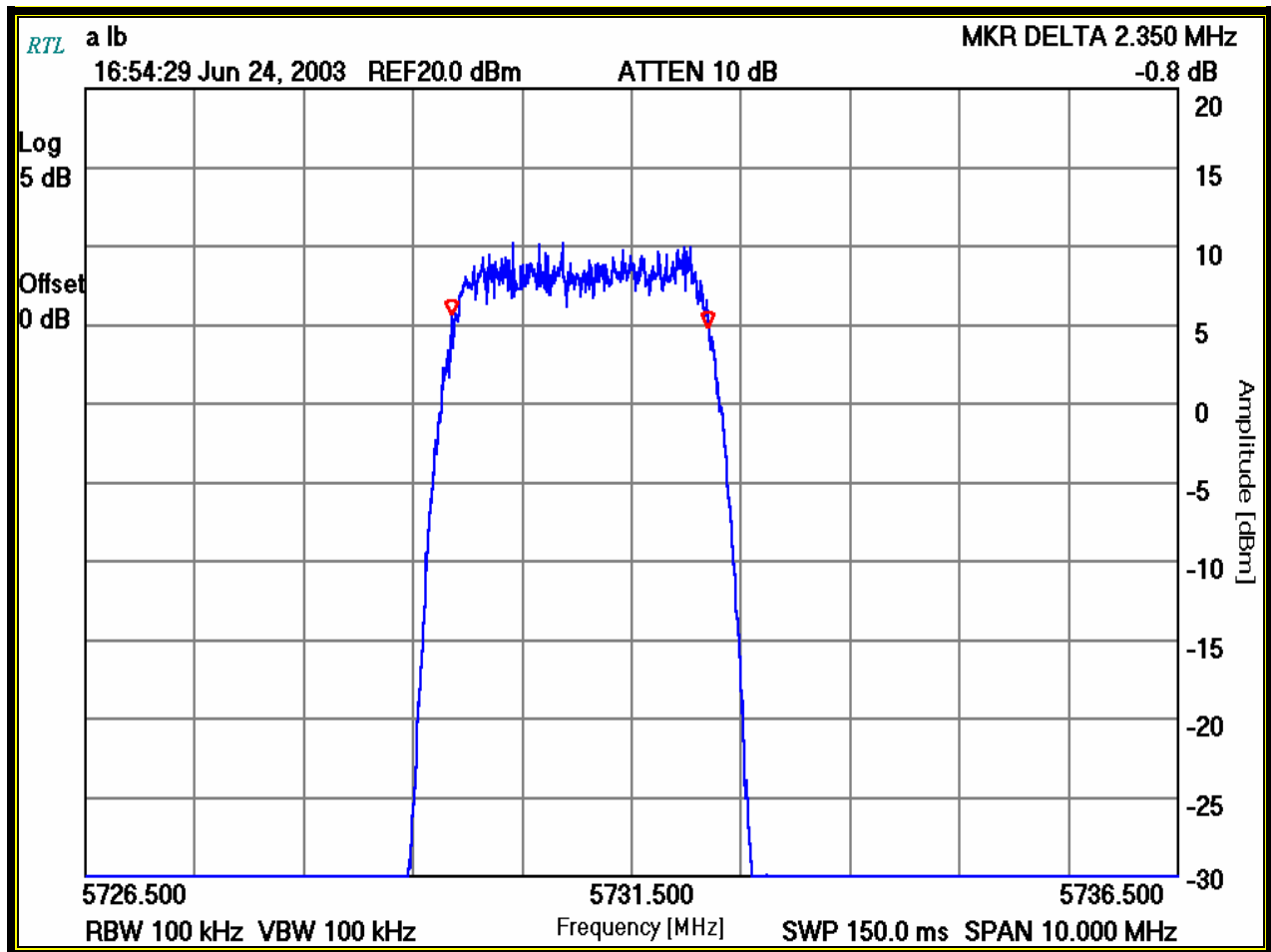
### TEST PERSONNEL:

Rachid Sehb		May 6, 2003
EMC Test Engineer	Signature	Date of Test

## 7.6 MODULATED BANDWIDTH PLOTS

Frequency (MHz): 5731  
 Resolution Bandwidth (kHz): 100  
 Video Bandwidth (kHz): 100  
 Sweep Time (s): 0.15

**PLOT 7-4: MODULATED BANDWIDTH 5731 MHz**



### TEST PERSONNEL:

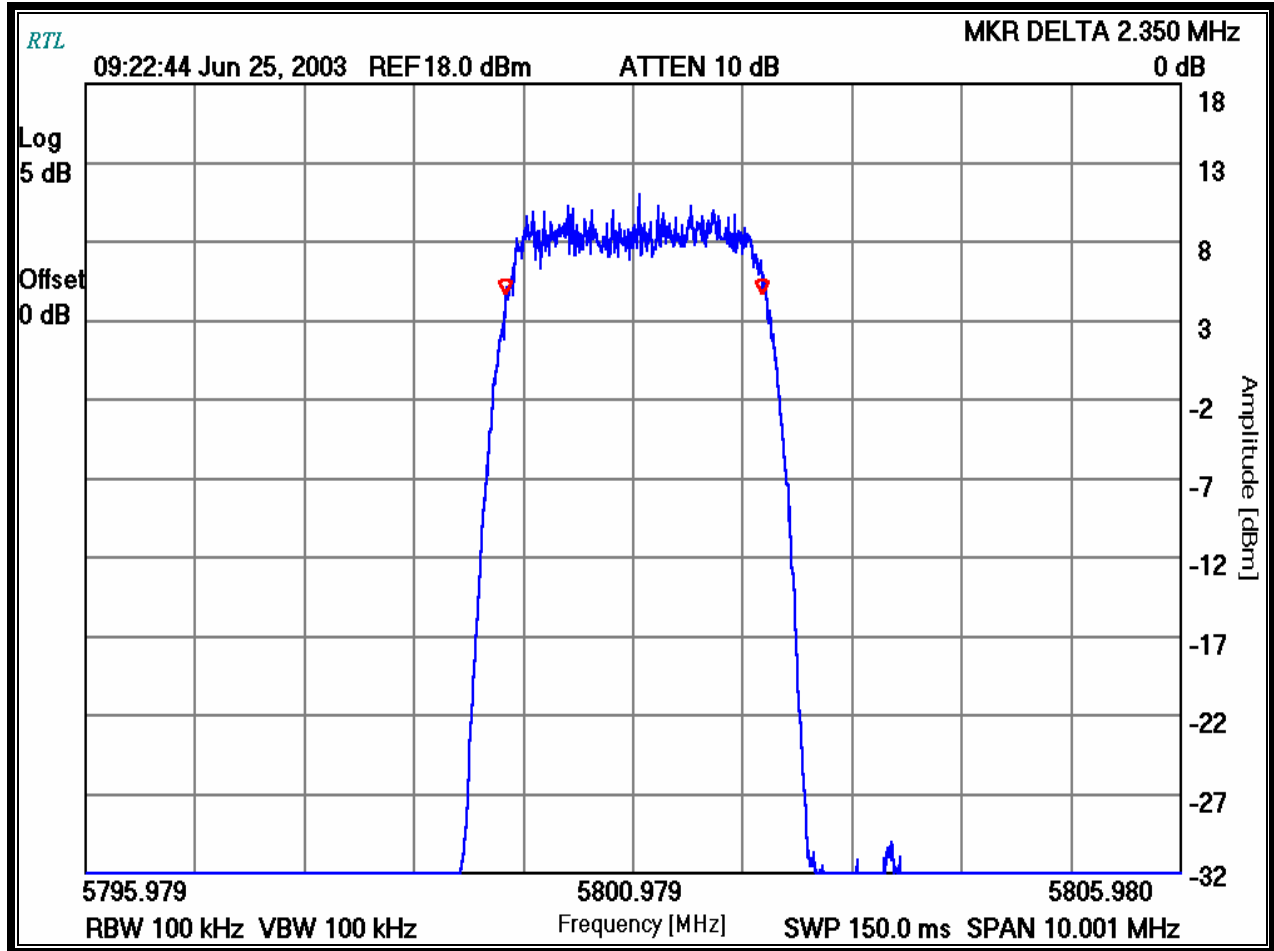
Rachid Sehb  
 EMC Test Engineer

  
 Signature

May 6, 2003  
 Date of Test

Frequency (MHz): 5801  
 Resolution Bandwidth (kHz): 100  
 Video Bandwidth (kHz): 100  
 Sweep Time (s): 0.150

**PLOT 7-5: MODULATED BANDWIDTH 5801 MHz**



**TEST PERSONNEL:**

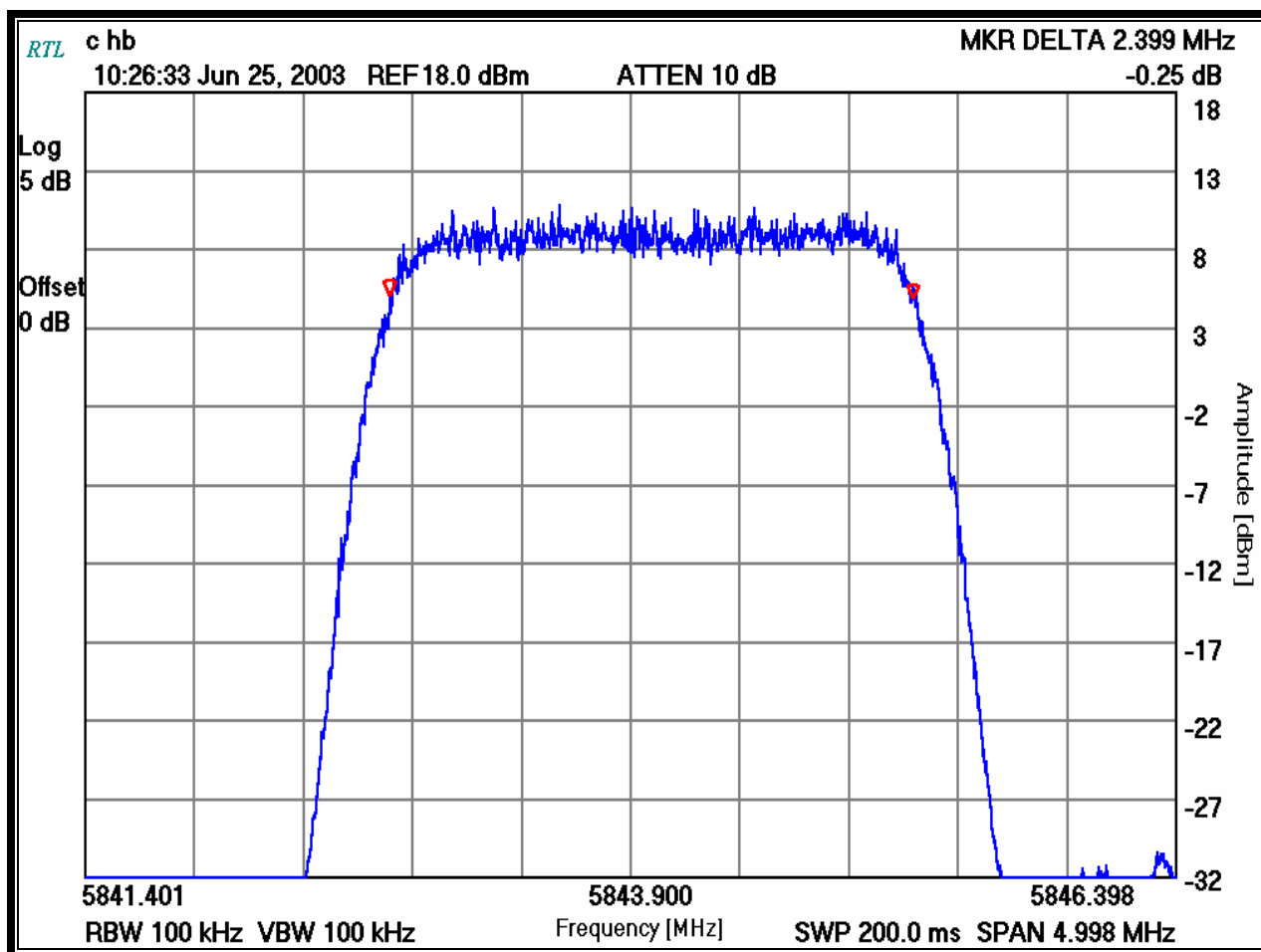
Rachid Sehb  
 EMC Test Engineer

*Sehb*  
 Signature

May 6, 2003  
 Date of Test

Frequency (MHz): 5844  
Resolution Bandwidth (kHz): 100  
Video Bandwidth (kHz): 100  
Sweep Time (s): 0.20

**PLOT 7-6: MODULATED BANDWIDTH 5844 MHz**



**TEST PERSONNEL:**

Rachid Sehb  
EMC Test Engineer

  
Signature

May 6, 2003  
Date of Test

## 8 PEAK OUTPUT POWER - FCC §15.247(B)(3), (B)(4)(II); IC RSS-210 §6.2.2(O)(B)

### 8.1 POWER OUTPUT TEST PROCEDURE

A conducted power measurement of the EUT was taken using an Agilent 4416A EPM-P Series Power Meter with a E9323A Peak and Average Power Sensor.\*

\*This measurement was verified using the conducted power substitution method.

### 8.2 POWER OUTPUT TEST EQUIPMENT

**TABLE 8-1: POWER OUTPUT TEST EQUIPMENT**

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
901186	Agilent Technologies	E9323A (50 MHz-6 GHz)	Peak & Avg. Power Sensor	US40410380	6/25/03
901184	Agilent Technologies	E4416A	EPM-P Power Meter, Single Channel	GB41050573	7/5/03

### 8.3 POWER OUTPUT TEST DATA

**TABLE 8-2: POWER OUTPUT TEST DATA**

FREQUENCY (MHZ)	PEAK POWER CONDUCTED OUTPUT (dBm) 16-QAM 8464 kbps	PEAK POWER CONDUCTED OUTPUT (dBm) 16-QAM 16928 kbps	PEAK POWER CONDUCTED OUTPUT (dBm) 16-QAM 25392 kbps
5731/5734	22.9	23.5	23.9
5801/5804	22.8	23.1	23.4
5844/5841	22.6	22.8	22.9

#### TEST PERSONNEL:

Rachid Sehb  
EMC Test Engineer

  
Signature

April 27, 2003  
Date Of Test

## **9 ANTENNA CONDUCTED SPURIOUS EMISSIONS - §15.247(C); IC RSS-210 §6.2.2(O)(E1)**

### **9.1 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST PROCEDURES**

Antenna spurious emissions per FCC 15.247(c) were measured from the EUT antenna port using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz. The modulated carrier was identified at 5731 and 5734 MHz for the low frequencies of operation, 5801 and 5804 MHz for the mid frequencies of operation and 5841 and 5844 MHz for the high frequencies of operation. The antenna spurious emissions for the widest and narrowest modulation bandwidth are presented in Table 9-2 to 9-7.

No other harmonics or spurs were found within 20 dB of the carrier level from 9 kHz to 40 GHz. See the following tables for results.

### **9.2 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST EQUIPMENT**

**TABLE 9-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST EQUIPMENT**

<b>RTL ASSET #</b>	<b>MANUFACTURER</b>	<b>MODEL</b>	<b>PART TYPE</b>	<b>SERIAL NUMBER</b>	<b>CALIBRATION DUE DATE</b>
901020	Hewlett Packard	8564E	Spectrum Analyzer (30 Hz – 40 GHz)	3943A01719	7/2/03



### 9.3 ANTENNA CONDUCTED SPURIOUS EMISSIONS DATA FOR 16-QAM 25,392 KBPS

**TABLE 9-2: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5734 MHz**

Operating Frequency (MHz): 5734  
Peak measurement at the Antenna Port (dBm): 3.0  
Limit (dBc): 20

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
11466.6	-78.9	81.9	20	-61.9
17195.6	-79.3	82.3	20	-62.3

**TABLE 9-3: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5804 MHz**

Operating Frequency (MHz): 5804  
Peak measurement at the Antenna Port (dBm): 5.2  
Limit (dBc): 20

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
11608.0	-82.3	87.5	20	-67.5

**TABLE 9-4: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5841 MHz**

Operating Frequency (MHz): 5841  
Peak measurement at the Antenna Port (dBm): 9.6  
Limit (dBc): 20

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
11682.1	-77.1	86.7	20	-66.7
17541.1	-44.1	53.7	20	-33.7

**TEST PERSONNEL:**

Rachid Sehb  
EMC Test Engineer

  
Signature

May 1, 2003  
Date Of Test

## 9.4 ANTENNA CONDUCTED SPURIOUS EMISSIONS DATA FOR 16-QAM 8464 KBPS

**TABLE 9-5: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5731 MHz**

Operating Frequency (MHz): 5731  
Peak measurement at the Antenna Port (dBm): 9.4  
Limit (dBc): 20

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
3050.17	-53.6	-63.2	20.0	-83.2
6854.05	-49.1	-58.7	20.0	-78.7
11464.24	-48.9	-58.5	20.0	-78.5
17193.54	-49.5	-59.1	20.0	-79.1

**TABLE 9-6: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5801 MHz**

Operating Frequency (MHz): 5801  
Peak measurement at the Antenna Port (dBm): 10.4  
Limit (dBc): 20

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
11604.00	-49.7	-60.2	20.0	-80.2
10872.29	-49.9	-60.4	20.0	-80.4
13728.62	-45.7	-56.2	20.0	-76.2
11604.00	-49.7	-60.2	20.0	-80.2

**TABLE 9-7: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5844 MHz**

Operating Frequency (MHz): 5844  
Peak measurement at the Antenna Port (dBm): 9.6  
Limit (dBc): 20

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
5844.81	9.6			10.4
1720.82	-53.4	-63.0	20.0	-83.0
8667.05	-49.5	-59.1	20.0	-79.1
11510.3	-49.5	-59.1	20.0	-79.1

### TEST PERSONNEL:

Rachid Sehb  
EMC Test Engineer

  
Signature

May 1, 2003  
Date Of Test

## 10 POWER SPECTRAL DENSITY - §15.247(D)

### 10.1 POWER SPECTRAL DENSITY TEST PROCEDURE

The power spectral density per FCC 15.247(d) was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 3kHz, the video bandwidth set at 30kHz, and the sweep time set at 1000 seconds. The test was performed as a conducted test. The spectral lines were resolved for the modulated carriers at 5731 MHz, 5734 MHz, 5801 MHz, 5804 MHz, 5841 MHz and 5844 MHz. The power spectral density for the widest and narrowest modulation bandwidth are presented, respectively, in Table 10-1 and 10-2. These levels are well below the +8dBm limit. See the power spectral density table and plots that follow.

### 10.2 POWER SPECTRAL DENSITY TEST DATA

Operating Frequency (MHz): 5734, 5804, and 5841  
Measured Peak Conducted Power (dBm): 23.9, 23.4 and 22.9  
Power Spectral Density Limit (dBm): +8

TABLE 10-1: POWER SPECTRAL DENSITY

FREQUENCY (MHz)	POWER SPECTRAL DENSITY (dBm) (LIMIT = +8dBm)
5734	-6.8
5804	-8.5
5841	-6.7

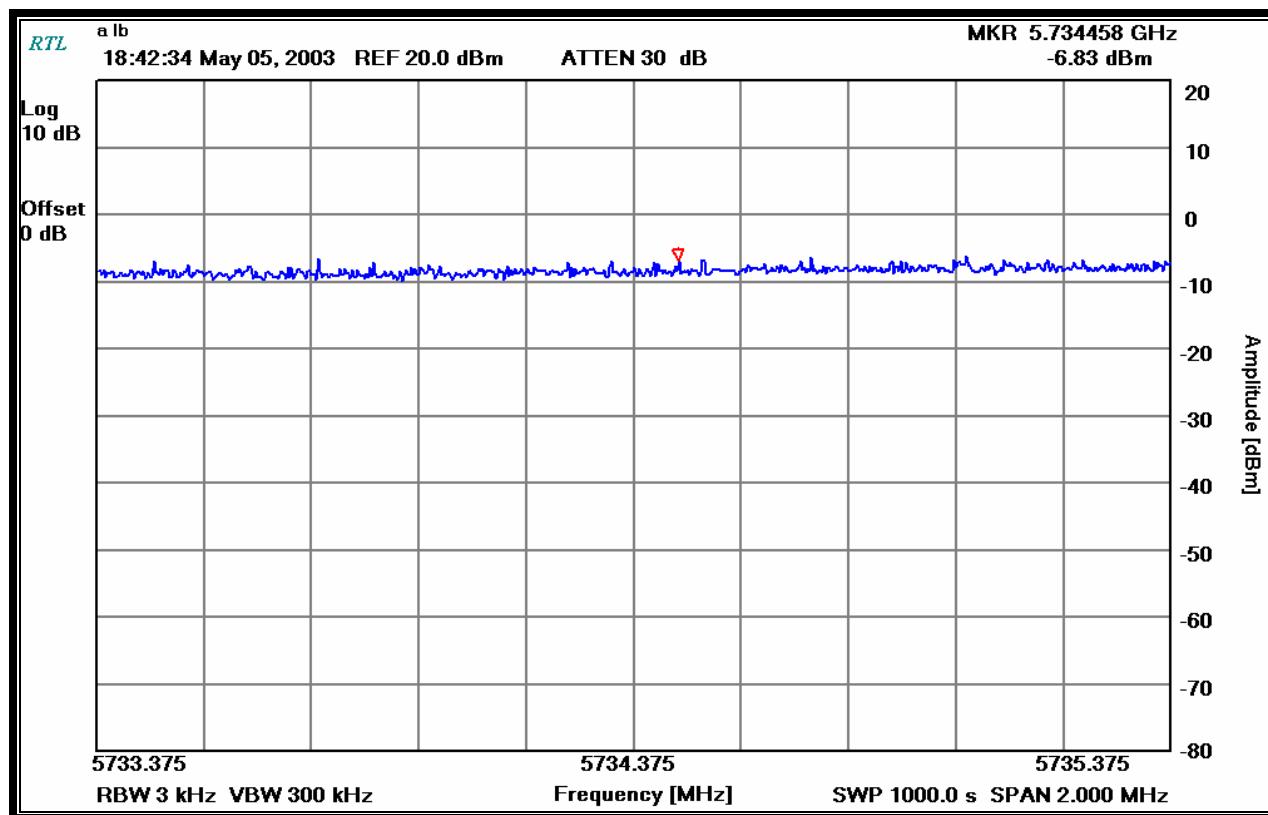
#### TEST PERSONNEL:

Rachid Sehb		May 5, 2003
EMC Test Engineer	Signature	Date Of Test

### 10.3 POWER SPECTRAL DENSITY PLOTS

Operating Frequency (MHz): 5734  
Measured Peak Conducted Power (dBm): 23.9  
Bandwidth Resolution (kHz): 3  
Bandwidth Video (kHz): 300  
Sweep Time (s): 1000

**PLOT 10-1: POWER SPECTRAL DENSITY 5734 MHz**



#### TEST PERSONNEL:

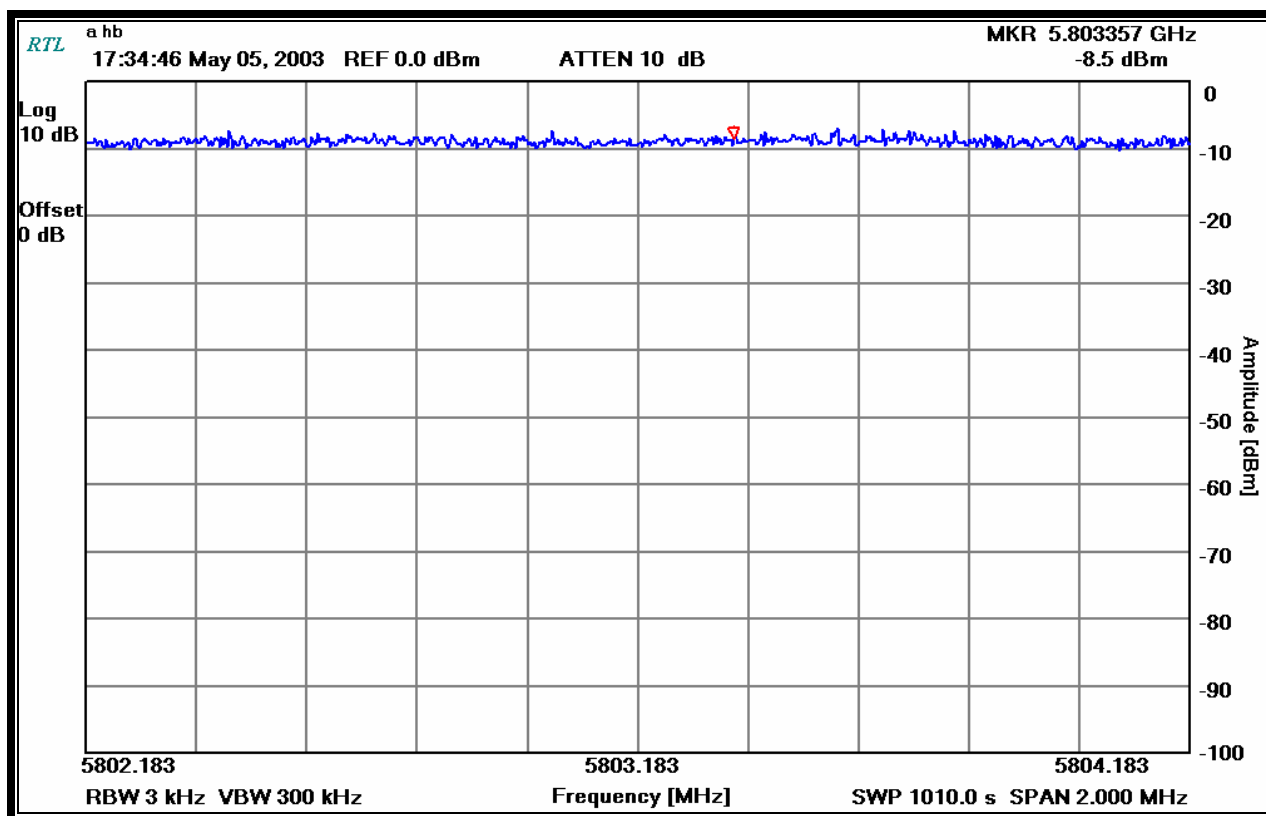
Rachid Sehb  
EMC Test Engineer

*See*  
Signature

May 5, 2003  
Date Of Test

Operating Frequency (MHz): 5804  
Measured Peak Conducted Power (dBm): 23.4  
Bandwidth Resolution (kHz): 3  
Bandwidth Video (kHz): 300  
Sweep Time (s): 1000

**PLOT 10-2: POWER SPECTRAL DENSITY 5804 MHz**



**TEST PERSONNEL:**

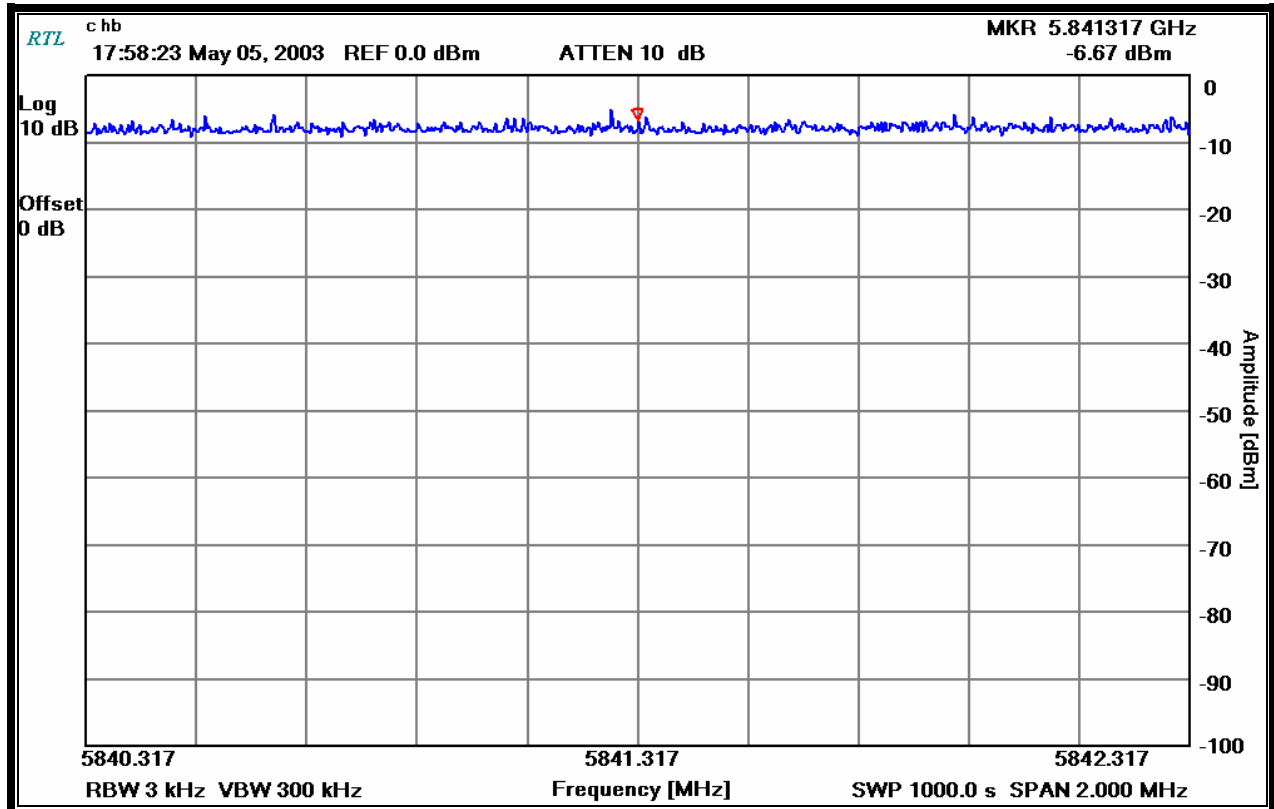
Rachid Sehb  
EMC Test Engineer

  
Signature

May 5, 2003  
Date Of Test

Operating Frequency (MHz): 5841  
Measured Peak Conducted Power (dBm): 22.9  
Bandwidth Resolution (kHz): 3  
Bandwidth Video (kHz): 300  
Sweep Time (s): 1000

**PLOT 10-3: POWER SPECTRAL DENSITY 5841 MHz**



**TEST PERSONNEL:**

Rachid Sehb  
EMC Test Engineer

  
Signature

May 5, 2003  
Date Of Test

Rhein Tech Laboratories  
360 Herndon Parkway  
Suite 1400  
Herndon, VA 20170  
<http://www.rheintech.com>

Client: Tellumat (Pty) Ltd.  
FCC: Part 15.247  
Industry Canada: RSS-210  
FCC ID: ONJ-3ECJ68A4D  
Model Name: ORION 5850

**Operating Frequency (MHz):** 5731, 5801, and 5844  
**Measured Peak Conducted Power (dBm):** 22.9, 22.8 and 22.6  
**Power Spectral Density Limit (dBm):** +8

**TABLE 10-2: POWER SPECTRAL DENSITY**

<b>FREQUENCY (MHz)</b>	<b>POWER SPECTRAL DENSITY (dBm) (LIMIT = +8dBm)</b>
5731	-3.8
5801	-1.9
5844	-1.7

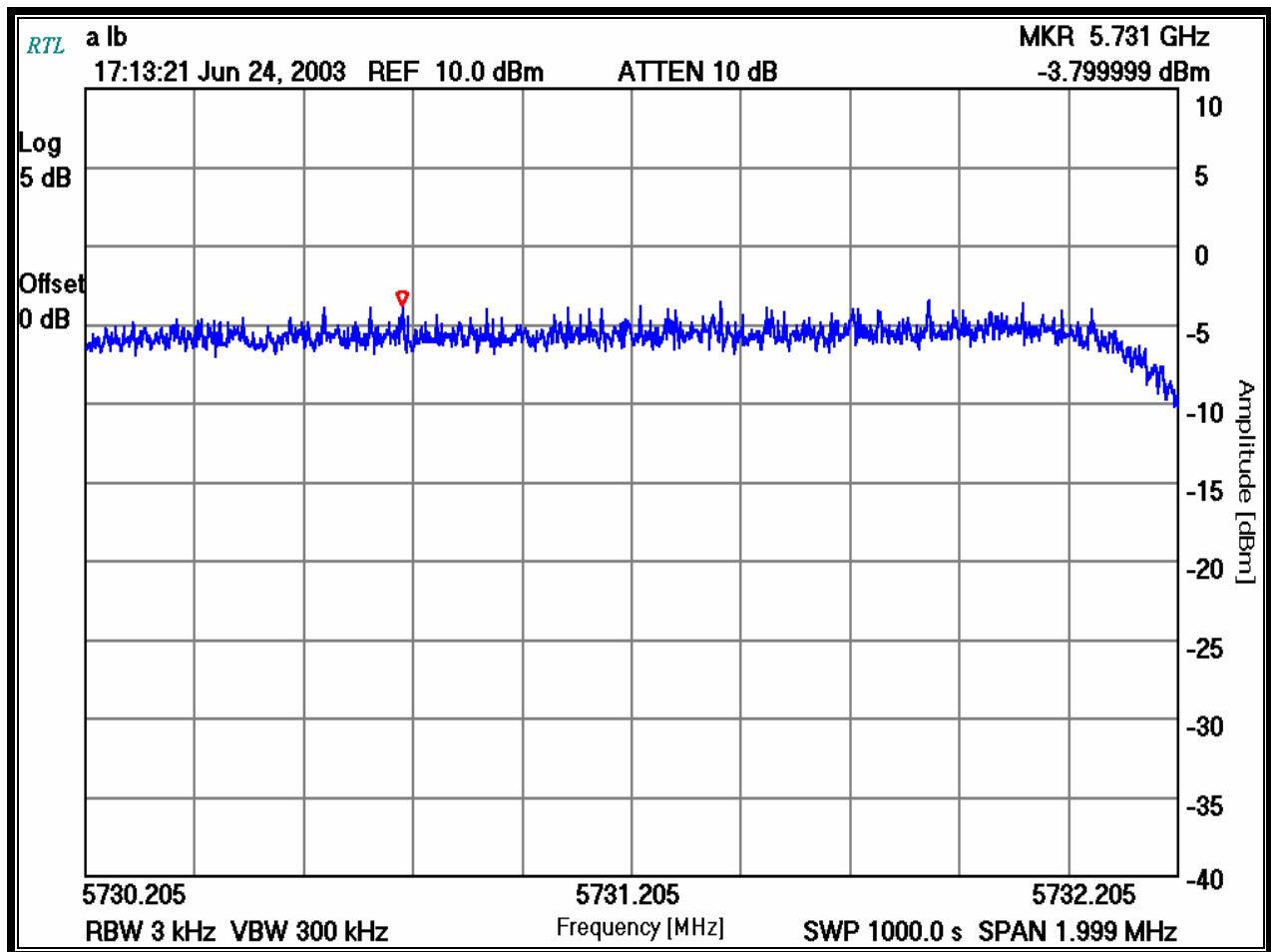
**TEST PERSONNEL:**

Rachid Sehb		June 24 and 25, 2003
EMC Test Engineer	Signature	Date Of Test

## 10.4 POWER SPECTRAL DENSITY PLOTS

Operating Frequency (MHz): 5731  
 Measured Peak Conducted Power (dBm): 22.9  
 Bandwidth Resolution (kHz): 3  
 Bandwidth Video (kHz): 300  
 Sweep Time (s): 1000

**PLOT 10-4: POWER SPECTRAL DENSITY 5731 MHz**



### TEST PERSONNEL:

Rachid Sehb  
 EMC Test Engineer

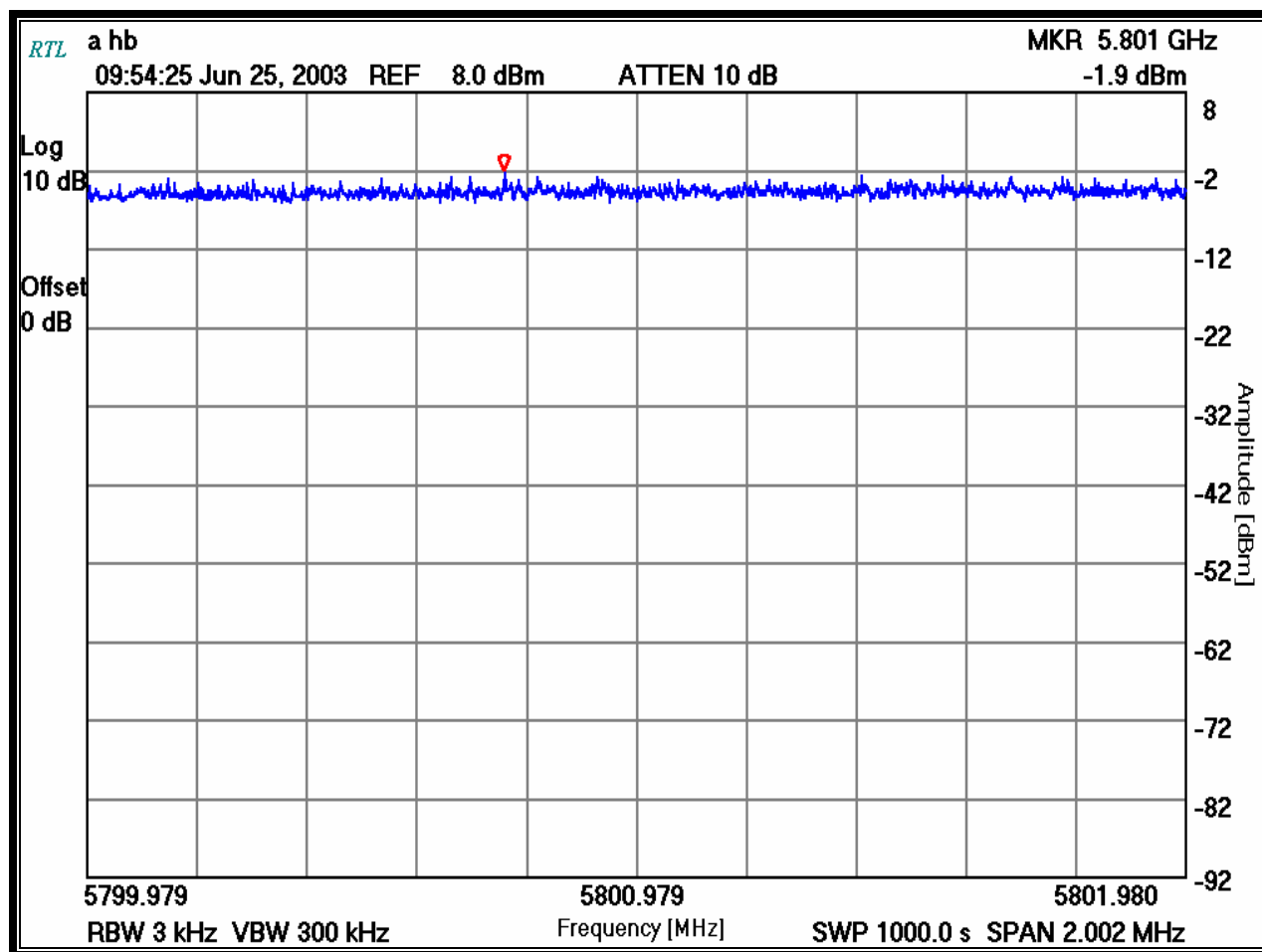
*See*  
 Signature

June 24, 2003  
 Date Of Test



Operating Frequency (MHz): 5801  
Measured Peak Conducted Power (dBm): 22.8  
Bandwidth Resolution (kHz): 3  
Bandwidth Video (kHz): 300  
Sweep Time (s): 1000

**PLOT 10-5: POWER SPECTRAL DENSITY 5801 MHz**



**TEST PERSONNEL:**

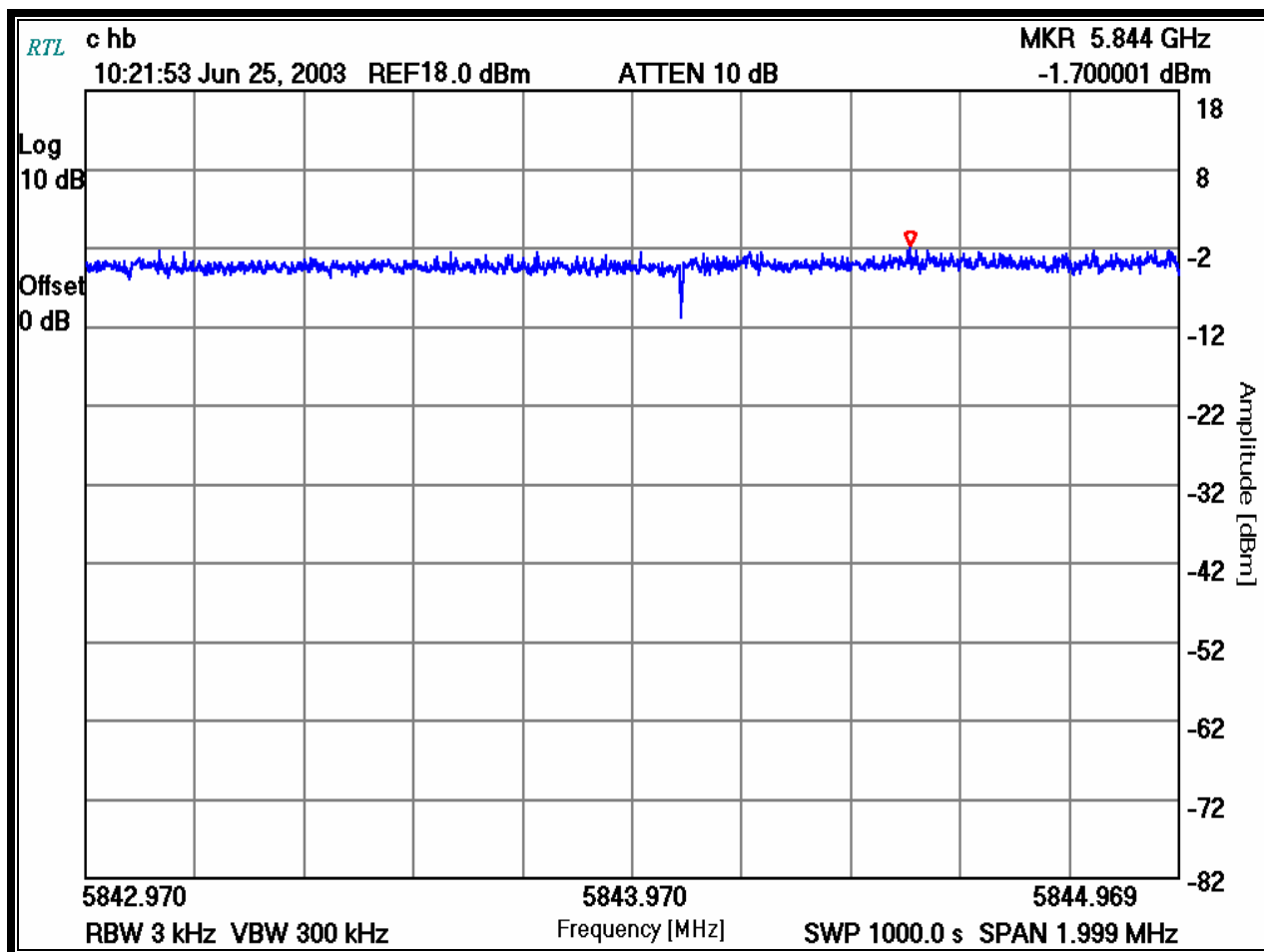
Rachid Sehb  
EMC Test Engineer

  
Signature

June 25, 2003  
Date Of Test

Operating Frequency (MHz): 5844  
Measured Peak Conducted Power (dBm): 22.6  
Bandwidth Resolution (kHz): 3  
Bandwidth Video (kHz): 300  
Sweep Time (s): 1000

**PLOT 10-6: POWER SPECTRAL DENSITY 5844 MHz**



**TEST PERSONNEL:**

Rachid Sehb  
EMC Test Engineer

*See*  
Signature

June 25, 2003  
Date Of Test

**10.5 TEST EQUIPMENT USED FOR TESTING**

**TABLE 10-3: TEST EQUIPMENT USED FOR TESTING (POWER SPECTRAL DENSITY)**

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
900931	Hewlett Packard	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771	5/12/04

Rhein Tech Laboratories  
360 Herndon Parkway  
Suite 1400  
Herndon, VA 20170  
<http://www.rheintech.com>

Client: Tellumat (Pty) Ltd.  
FCC: Part 15.247  
Industry Canada: RSS-210  
FCC ID: ONJ-3ECJ68A4D  
Model Name: ORION 5850

## 11 CONCLUSION

The data in this measurement report shows that the Tellumat (Pty) Ltd, Model Name: ORION 5850, Model Number: 651-04253-01, FCC ID: ONJ-3ECJ68A4D, when used with the Gabriel Electronics SSP2-52B antenna or the Harris Corporation MT-20004 antenna, complies with all the requirements of Parts 2 and 15 of the FCC Rules and Industry Canada RSS-210.