Engineering and Testing for EMC and Safety Compliance

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

Test Lab:	Applicant:
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FCC ID:	ONJ-3ECJ68B3E	**GRANTEE FRN:**	0007245384
PLAT FORM:	N/A	**RTL WORK ORDER #:**	2003129
MODEL(S):	ORION 5810i	**RTL QUOTE #:**	QRTL03-929
DATE OF TEST REPORT:	August 11 , 2003		

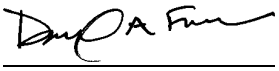
American National Standard Institute:	ANSI C63.4: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
FCC Classification:	DTS – Part 15 Digital Transmission System
FCC Rule Part(s):	Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz
Industry Canada Standard:	RSS-210: Low Power License-Exempt Radio Communication Devices (All Frequency Bands)
Digital Interface Information	Digital Interface was found to be compliant
Receiver Information	Receiver was found to be compliant

Frequency Range (MHz)	Output Power* (W)	Frequency Tolerance	Emission Designator
5735 – 5840	0.275	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:  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 15.247: 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. One antenna was 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 5810i, Model Number: 651-04299-02.1, FCC ID: ONJ-3ECJ68B3E . 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.

The worst-case data is presented in this report. The unit was tested for the maximum power output. The conducted testing was performed with the only modulation type available on this unit. 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: 5735 MHz, 5804 MHz and 5840 MHz. The EUT was tested with one antenna: Gabriel Electronics parabolic antenna, model number SSP2-52B.

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	Pass
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
Indoor RF Unit (L)	Tellumat (Pty) Ltd	ORION 5810i	5810-007	ONJ-3ECJ68B3E	Shielded CAT 5 Cable, Unshielded DC Power Cable	15328
Indoor RF Unit (H)	Tellumat (Pty) Ltd	ORION 5810i	5810-006	ONJ-3ECJ68B3E	Shielded CAT 5 Cable, Unshielded DC Power Cable	15327
Parabolic Antenna	Gabriel Electronics	SSP2-52B	T92457	N/A	RTL Asset 901238	15025

TABLE 2-3: AUXILIARY EQUIPMENT

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
Indoor Digital Unit	Tellumat (Pty) Ltd	ORION 10	OR10-0029	N/A - Verification	Shielded CAT 5 Cable, Unshielded DC Power Cable	15329

2.5 CONFIGURATION OF TESTED SYSTEM

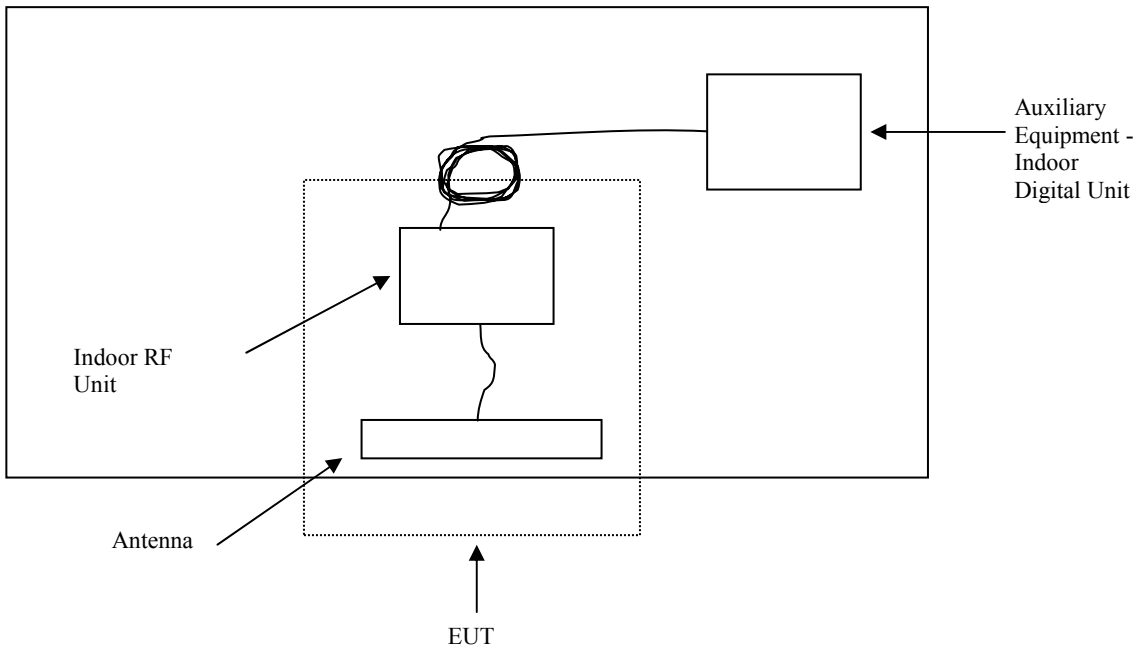


FIGURE 1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

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. The single antenna presented in this report was tested. 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 only modulation available with this unit.

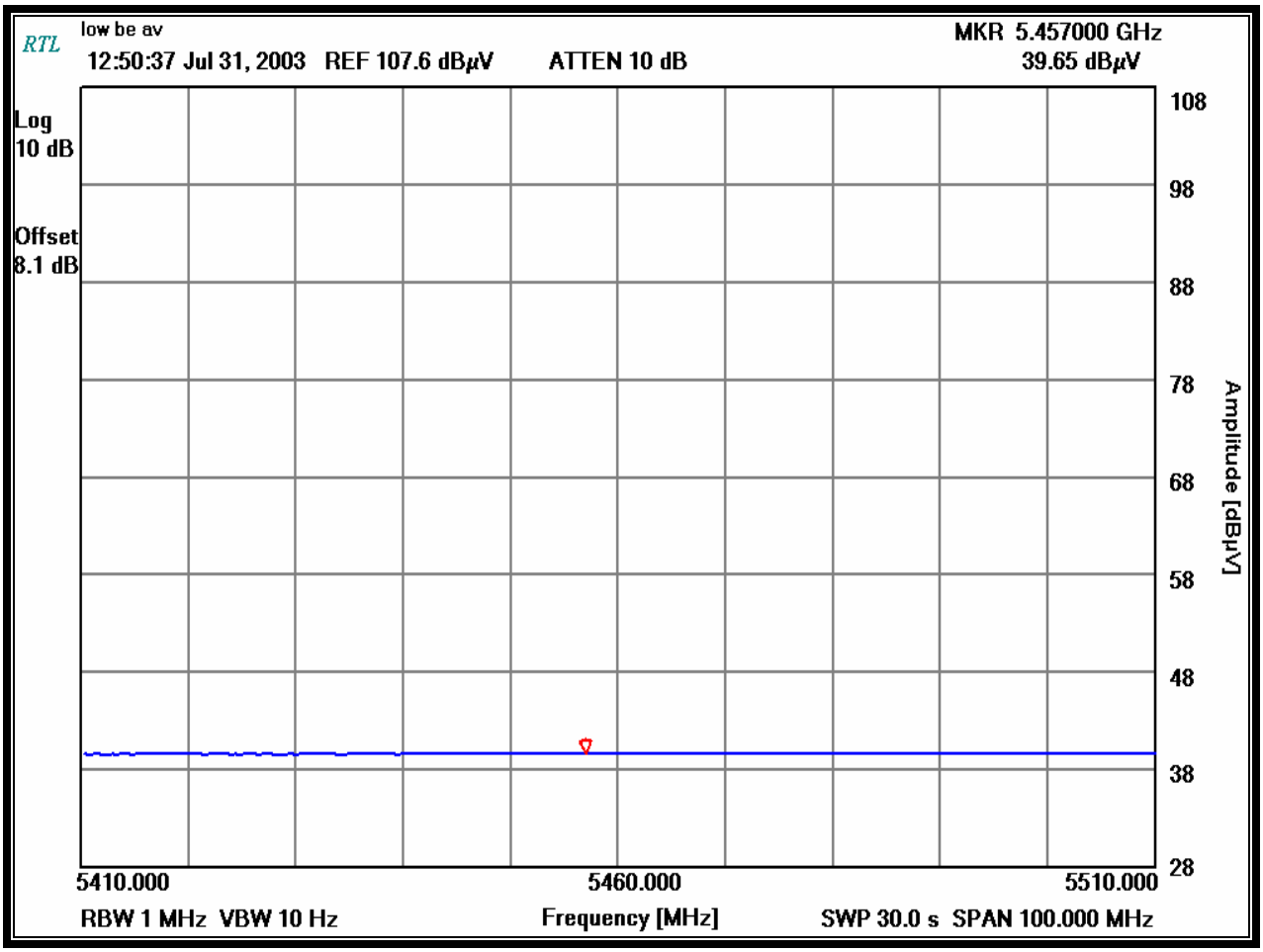
3.2 BAND EDGE TEST EQUIPMENT

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	7/15/04

Operating Frequency (MHz): 5735
RBW/VBW: 1 MHz/10 Hz
Distance (m): 3

PLOT 3-1: LOWER BAND EDGE WITH PARABOLIC ANTENNA

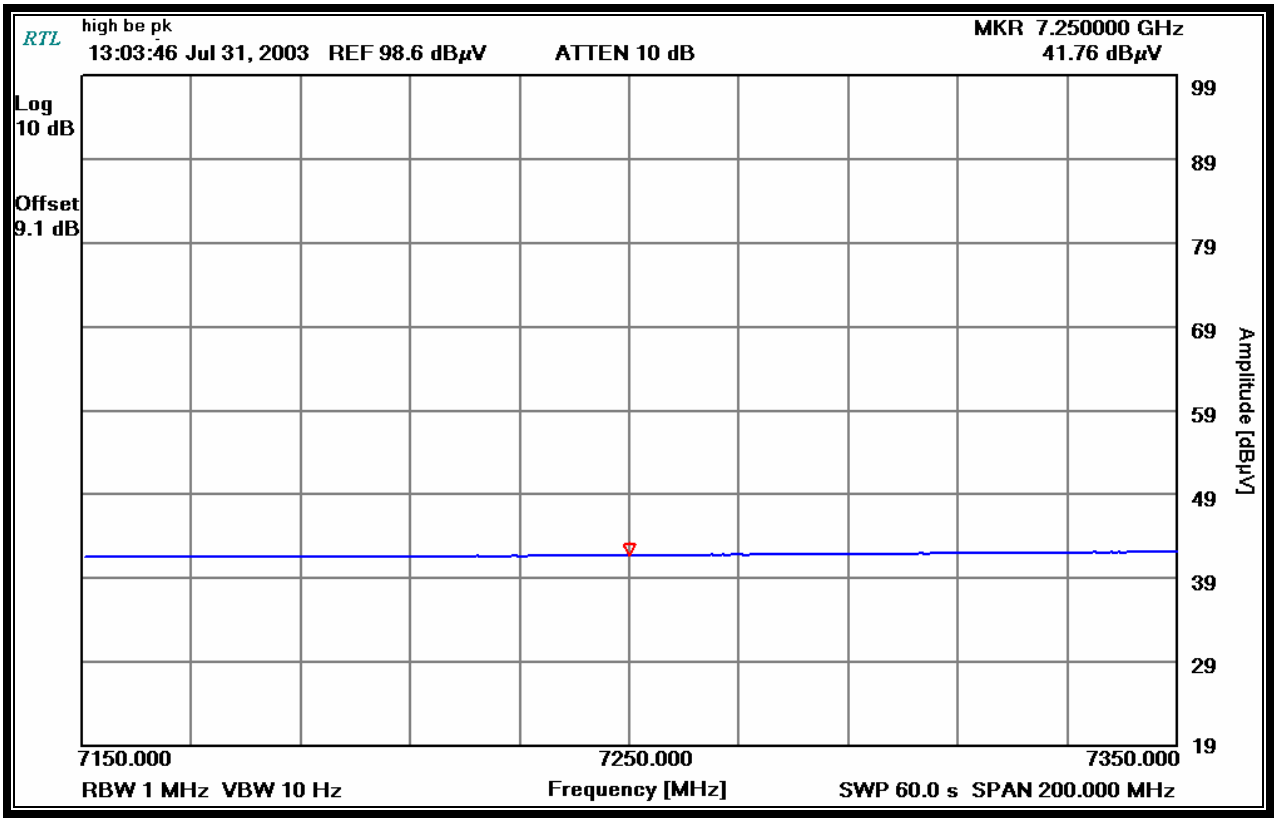


TEST PERSONNEL:

Rachid Sehb		July 31, 2003
EMC Test Engineer	Signature	Date of Test

Operating Frequency (MHz): 5840
RBW/VBW: 1 MHz/10 Hz
Distance (m): 3

PLOT 3-2: UPPER BAND EDGE WITH PARABOLIC ANTENNA



TEST PERSONNEL:

Rachid Sehb		July 31, 2003
EMC Test Engineer	Signature	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 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 constantly transmitting data, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and PHASE SIDE. Receive mode was also investigated for conducted emissions.

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 5735 MHZ

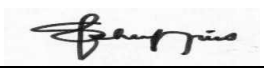
Temperature: 57°F Humidity: 87%								
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	CISPR B QP Limit (dBuV)	CISPR B QP Margin (dBuV)	CISPR B AV Limit (dBuV)	CISPR B AV Margin (dBuV)
0.153	Qp	54.3	2.0	56.3	65.8	-9.5	55.8	N/A
0.153	Av	23.0	2.0	25.0	65.8	-40.8	55.8	-30.8
0.212	Qp	47.9	1.5	49.4	63.1	-13.7	53.1	N/A
0.212	Av	18.2	1.5	19.7	63.1	-43.4	53.1	-33.4
0.282	Pk	46.8	1.0	47.8	60.8	-13.0	50.8	-3.0
0.345	Pk	43.6	0.8	44.4	59.1	-14.7	49.1	-4.7
0.674	Qp	41.7	0.7	42.4	56.0	-13.6	46.0	-3.6
0.789	Qp	42.7	0.7	43.4	56.0	-12.6	46.0	N/A
0.789	Av	41.9	0.7	42.6	56.0	-13.4	46.0	-3.4
1.126	Qp	43.3	0.8	44.1	56.0	-11.9	46.0	N/A
1.126	Av	42.3	0.8	43.1	56.0	-12.9	46.0	-2.9
5.090	Pk	36.0	1.6	37.6	60.0	-22.4	50.0	-12.4
25.410	Pk	24.4	3.4	27.8	60.0	-32.2	50.0	-22.2

TABLE 4-3: PHASE SIDE TRANSMITTING AT 5735 MHZ

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)
0.159	Qp	40.3	1.9	42.2	65.5	-23.3	55.5	N/A
0.159	Av	26.2	1.9	28.1	65.5	-37.4	55.5	-27.4
0.342	Pk	45.3	0.8	46.1	59.2	-13.1	49.2	-3.1
0.673	Qp	43.0	0.7	43.7	56.0	-12.3	46.0	N/A
0.673	Av	39.3	0.7	40.0	56.0	-16.0	46.0	-6.0
0.787	Qp	43.4	0.6	44.0	56.0	-12.0	46.0	N/A
0.787	Av	43.1	0.6	43.7	56.0	-12.3	46.0	-2.3
1.346	Qp	42.6	0.9	43.5	56.0	-12.5	46.0	N/A
1.346	Av	42.0	0.9	42.9	56.0	-13.1	46.0	-3.1
10.000	Pk	38.0	1.3	39.3	60.0	-20.7	50.0	-10.7
10.200	Pk	31.4	1.5	32.9	60.0	-27.1	50.0	-17.1
25.540	Pk	27.0	3.4	30.4	60.0	-29.6	50.0	-19.6
26.155	Pk	26.6	3.4	30.0	60.0	-30.0	50.0	-20.0

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

TEST PERSONNEL:

Franck Schuppius		08/01/03
Test Technician/Engineer	Signature	Date Of Test

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

5.1 FIELD STRENGTH CALCULATION

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:

$$FI(dBuV/m) = SAR(dBuV) + SCF(dB/m)$$

FI = Field Intensity
SAR = Spectrum Analyzer Reading
SCF = Site Correction Factor

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

$$SCF(dB/m) = -PG(dB) + AF(dB/m) + CL(dB)$$

SCF = Site Correction Factor
PG = Pre-amplifier Gain
AF = Antenna Factor
CL = Cable Loss

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

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

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:

$$49.3 \text{ dBuV} - 11.5 \text{ dB/m} = 37.8 \text{ dBuV/m}$$

$$10^{37.8/20} = 10^{1.89} = 77.6 \text{ uV/m}$$

5.2 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 2nd 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.

5.3 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	9/10/03
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	7/3/04

5.4 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)**
59.770	Qp	V	90	1.0	60.0	-21.6	38.4	40.0	-1.6
72.160	Qp	V	45	1.0	62.4	-24.0	38.4	40.0	-1.6
89.000	Qp	V	90	1.0	53.5	-19.3	34.2	43.5	-9.3
104.500	Qp	V	145	1.0	48.3	-16.8	31.5	43.5	-12.0
116.500	Qp	V	45	1.0	50.8	-15.7	35.1	43.5	-8.4
127.000	Qp	V	45	1.0	48.6	-15.8	32.8	43.5	-10.7
140.000	Qp	V	180	1.0	57.2	-16.4	40.8	43.5	-2.7
148.300	Qp	V	90	1.0	54.1	-17.0	37.1	43.5	-6.4
159.960	Qp	V	45	1.0	48.1	-17.9	30.2	43.5	-13.3
250.000	Qp	V	145	1.0	45.7	-15.8	29.9	46.0	-16.1
300.200	Qp	V	45	1.0	42.2	-14.6	27.6	46.0	-18.4
322.148	Qp	V	145	1.0	45.2	-14.2	31.0	46.0	-15.0
340.000	Qp	V	90	1.0	44.2	-13.5	30.7	46.0	-15.3
432.054	Qp	V	90	1.0	43.9	-10.5	33.4	46.0	-12.6

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

TEST PERSONNEL:

Rachid Sehb		August 1, 2003
EMC Test Engineer	Signature	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	7/3/04
900905	Rhein Tech Laboratories, Inc.	PR-1040	Pre Amplifier 40dB (10 MHz – 2 GHz)	1006	9/10/03
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
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	4/22/04
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

Operating Frequency (MHz): 5735
Measured Power at the Antenna Port (dBm): 24.4
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)
11,464	38.2	22.7	16.7	39.4	54	-14.6
17,201	36.5	23.8	19.0	42.8	54	-11.2

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): 22.7
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	37.0	22.5	16.7	39.2	54	-14.8
17,474	34.4	21.5	17.7	39.2	54	-14.8

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): 5840
Measured Power at the Antenna Port (dBm): 23.8
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	37.0	23.0	16.7	39.7	54	-14.3
17,523	37.1	24.5	17.7	42.2	54	-11.8

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

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 are presented in Table 7-2.

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

FREQUENCY (MHz)	6 dB BANDWIDTH (MHz)
5735	12.3
5804	12.5
5840	12.9

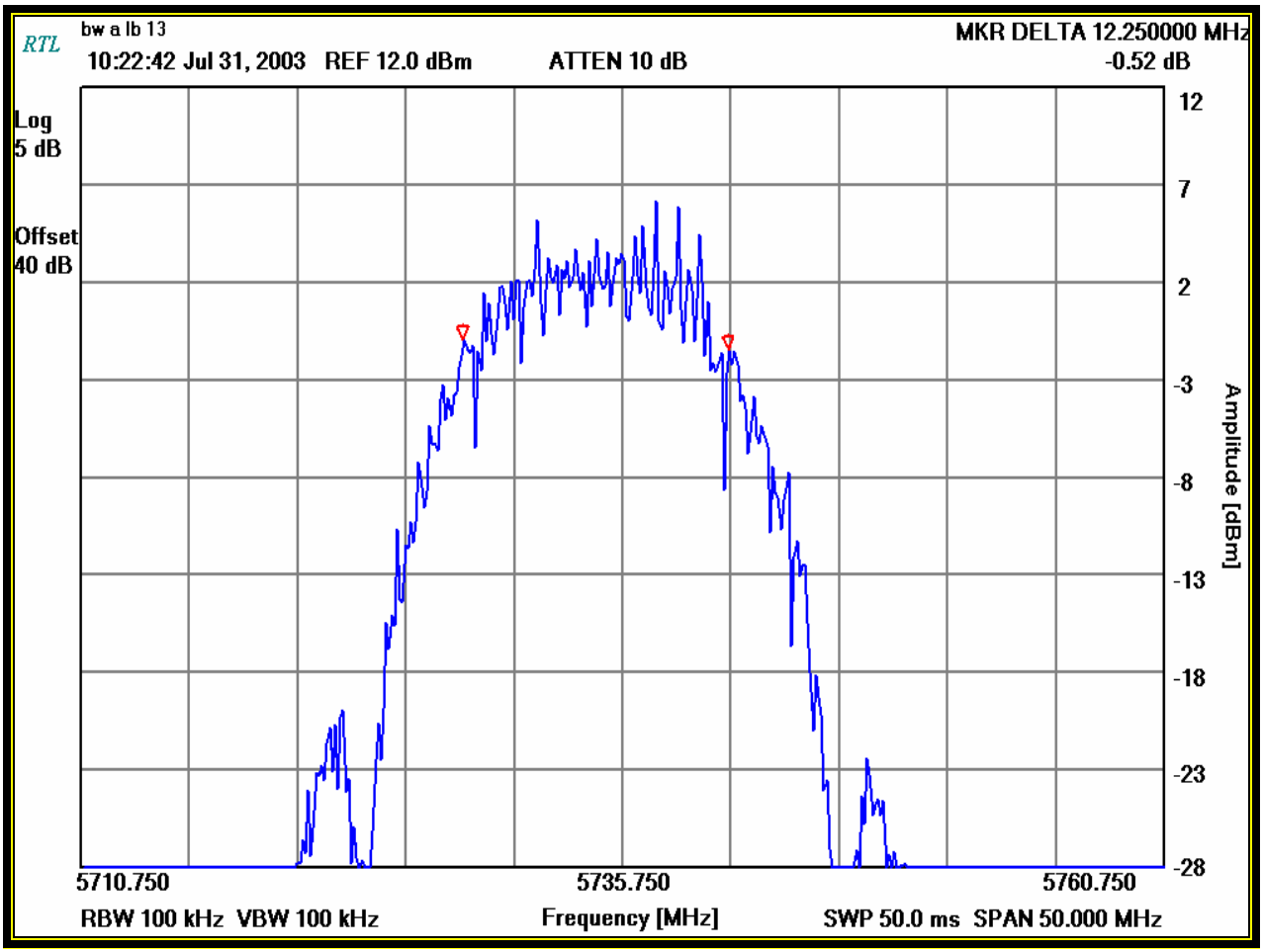
TEST PERSONNEL:

Rachid Sehb		July 31, 2003
EMC Test Engineer	Signature	Date of Test

7.4 MODULATED BANDWIDTH PLOTS

Frequency (MHz):	5735
Resolution Bandwidth (kHz):	100
Video Bandwidth (kHz):	100
Sweep Time (ms):	50

PLOT 7-1: MODULATED BANDWIDTH 5735 MHz

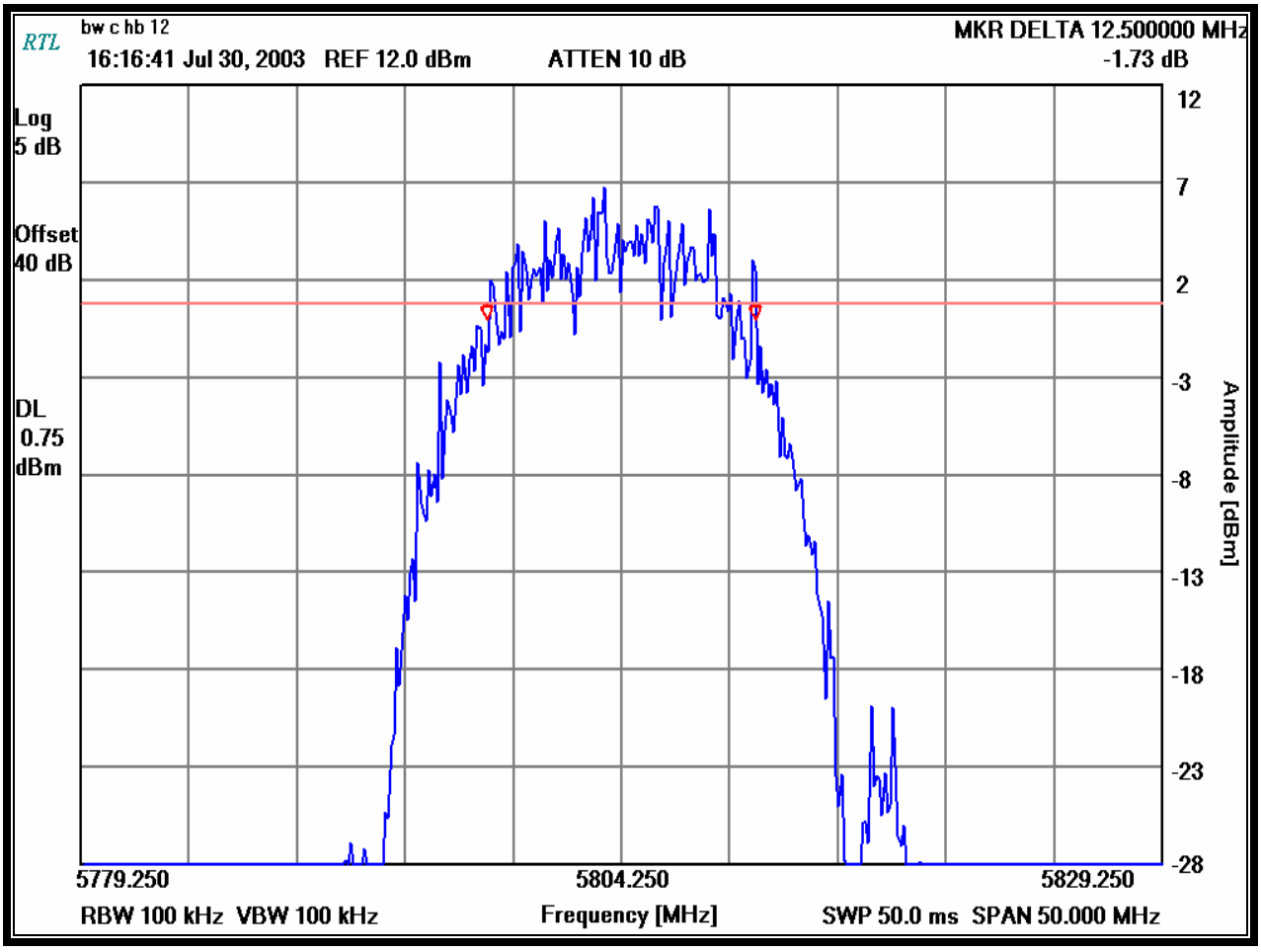


TEST PERSONNEL:

Rachid Sehb		July 31, 2003
EMC Test Engineer	Signature	Date of Test

Frequency (MHz):	5804
Resolution Bandwidth (kHz):	100
Video Bandwidth (kHz):	100
Sweep Time (ms):	50

PLOT 7-2: MODULATED BANDWIDTH 5804 MHz

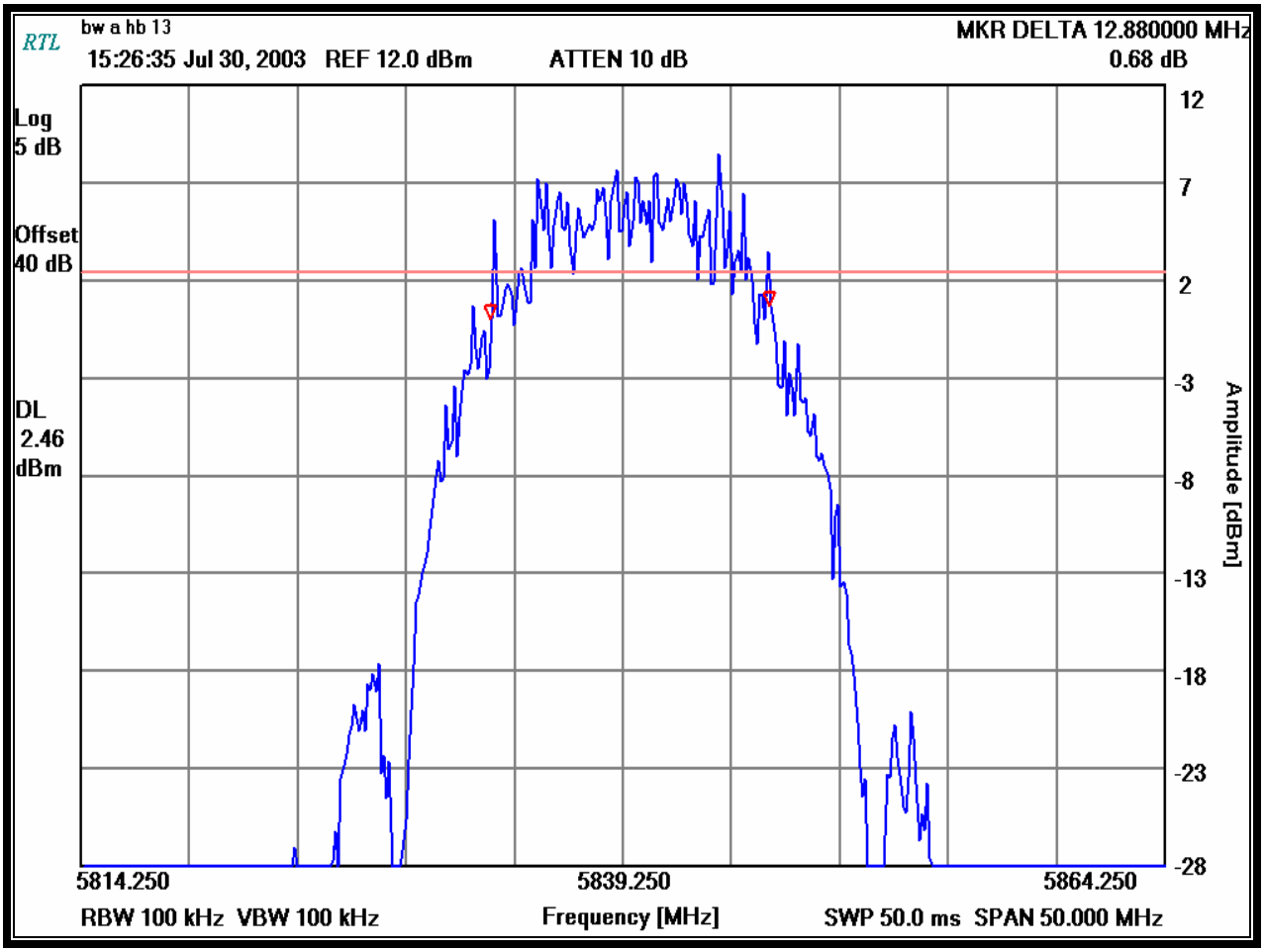


TEST PERSONNEL:

Rachid Sehb		July 30, 2003
EMC Test Engineer	Signature	Date of Test

Frequency (MHz):	5840
Resolution Bandwidth (kHz):	100
Video Bandwidth (kHz):	100
Sweep Time (ms):	50

PLOT 7-3: MODULATED BANDWIDTH 5840 MHz



TEST PERSONNEL:

Rachid Sehb		July 30, 2003
EMC Test Engineer	Signature	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	7/30/04
901184	Agilent Technologies	E4416A	EPM-P Power Meter, Single Channel	GB41050573	7/30/04

8.3 POWER OUTPUT TEST DATA

TABLE 8-2: POWER OUTPUT TEST DATA

FREQUENCY (MHZ)	PEAK POWER CONDUCTED OUTPUT (dBm)
5735	24.4
5804	22.7
5840	23.8

TEST PERSONNEL:

Rachid Sehb		July 29, 2003
EMC Test Engineer	Signature	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 5735 MHz for the low frequencies of operation, 5804 MHz for the mid frequencies of operation and 5840 MHz for the high frequencies of operation. The antenna spurious emissions for the widest and narrowest modulation bandwidth are presented in Tables 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

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
901020	Hewlett Packard	8564E	Spectrum Analyzer (30 Hz – 40 GHz)	3943A01719	7/15/04

9.3 ANTENNA CONDUCTED SPURIOUS EMISSIONS

TABLE 9-2: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5735 MHz

Operating Frequency (MHz): 5735
Peak measurement at the Antenna Port (dBm): 16.4
Limit (dBc): 20

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
5861.52	-53.5	-69.9	20.0	-49.9
7351.87	-52.9	-69.3	20.0	-49.3
10264.04	-52.7	-69.1	20.0	-49.1
11585.39	-51.9	-68.3	20.0	-48.3
16369.50	-52.7	-69.1	20.0	-49.1

TABLE 9-3: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5804 MHz

Operating Frequency (MHz): 5804
Peak measurement at the Antenna Port (dBm): 21.4
Limit (dBc): 20

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
11605.10	-52.7	-74.1	20.0	-54.1
17415.30	-51.2	-72.6	20.0	-52.6

TABLE 9-4: ANTENNA CONDUCTED SPURIOUS EMISSIONS 5840 MHz

Operating Frequency (MHz): 5840
Peak measurement at the Antenna Port (dBm): 22.4
Limit (dBc): 20

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
5567.54	-54.0	-76.5	20.0	-56.5
11671.2	-53.1	-75.6	20.0	-55.6
17511.9	-50.8	-73.3	20.0	-53.3

TEST PERSONNEL:

Rachid Sehb		July 29, 2003
EMC Test Engineer	Signature	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 5735 MHz, 5804 MHz, and 5840 MHz. The power spectral density for the modulation bandwidth are presented, respectively, in Table 10-1. 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): 5735 , 5804, and 5840
Power Spectral Density Limit (dBm): +8

TABLE 10-1: POWER SPECTRAL DENSITY

FREQUENCY (MHz)	POWER SPECTRAL DENSITY (dBm) (LIMIT = +8dBm)
5735	-0.17
5804	1.83
5840	2.80

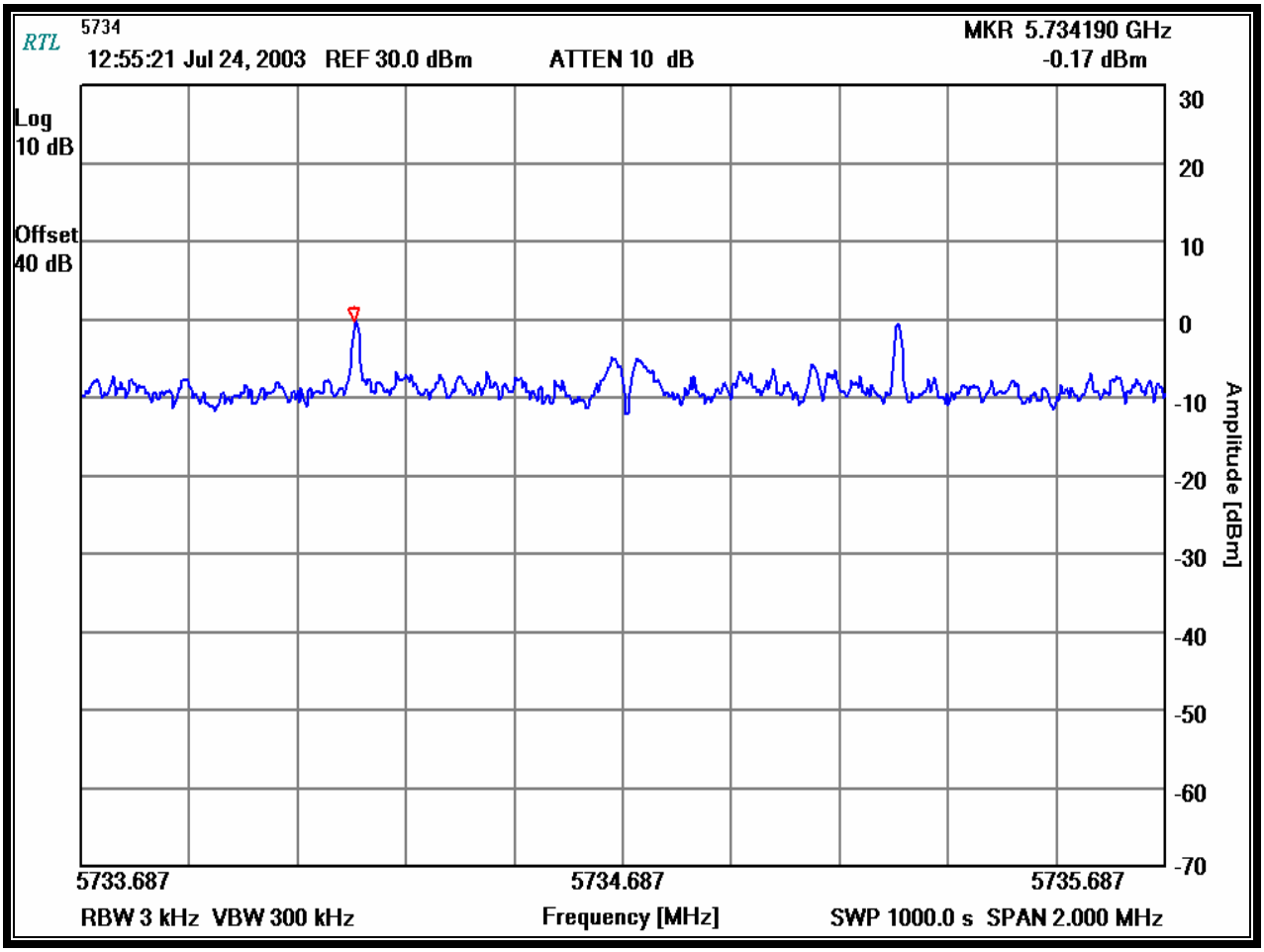
TEST PERSONNEL:

Rachid Sehb		July 24, 2003
EMC Test Engineer	Signature	Date Of Test

10.3 POWER SPECTRAL DENSITY PLOTS

Operating Frequency (MHz):	5735
Measured Peak Conducted Power (dBm):	24.4
Bandwidth Resolution (kHz):	3
Bandwidth Video (kHz):	300
Sweep Time (s):	1000

PLOT 10-1: POWER SPECTRAL DENSITY 5735 MHz

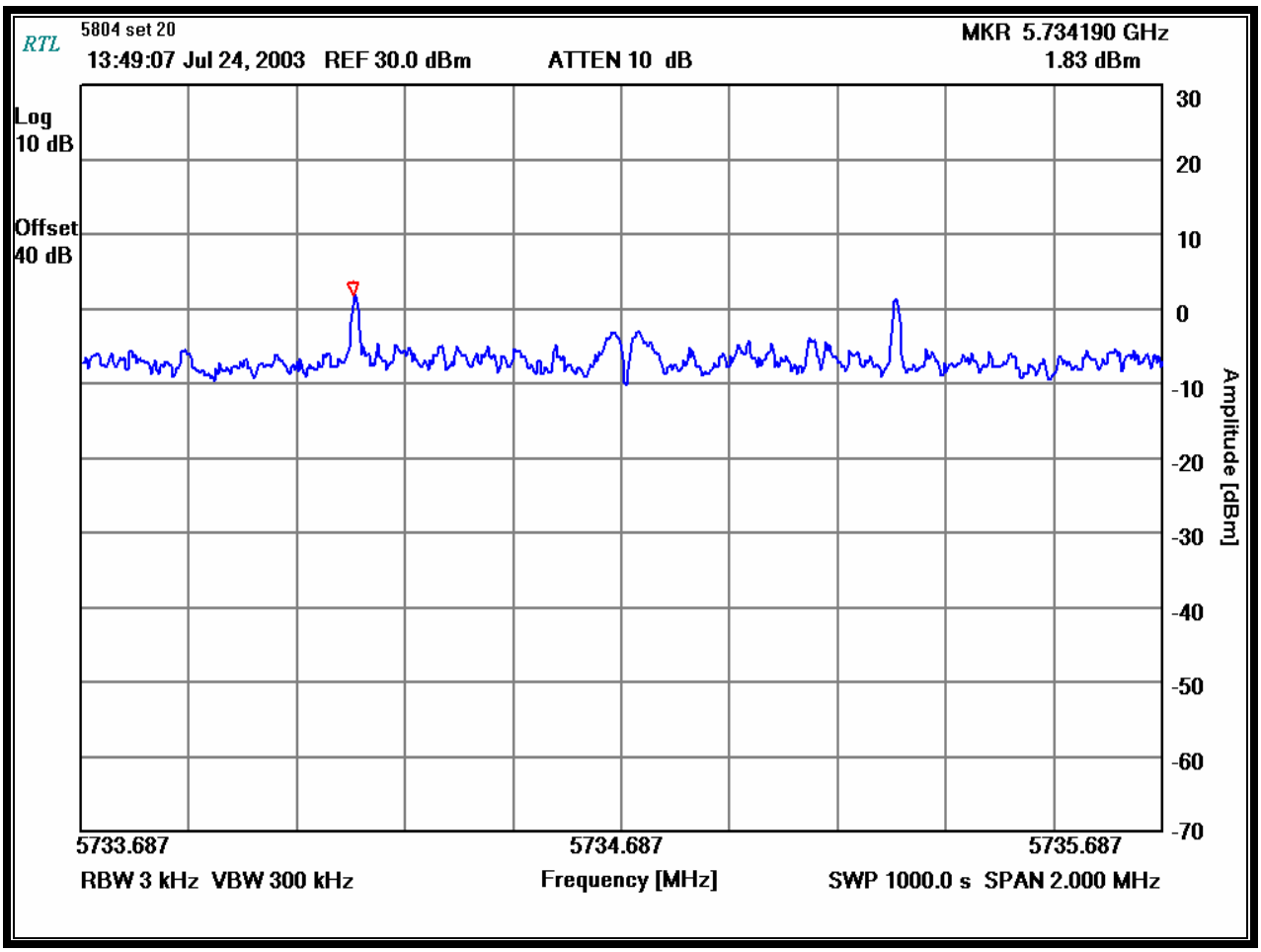


TEST PERSONNEL:

Rachid Sehb		July 24, 2003
EMC Test Engineer	Signature	Date Of Test

Operating Frequency (MHz):	5804
Measured Peak Conducted Power (dBm):	22.7
Bandwidth Resolution (kHz):	3
Bandwidth Video (kHz):	300
Sweep Time (s):	1000

PLOT 10-2: POWER SPECTRAL DENSITY 5804 MHz

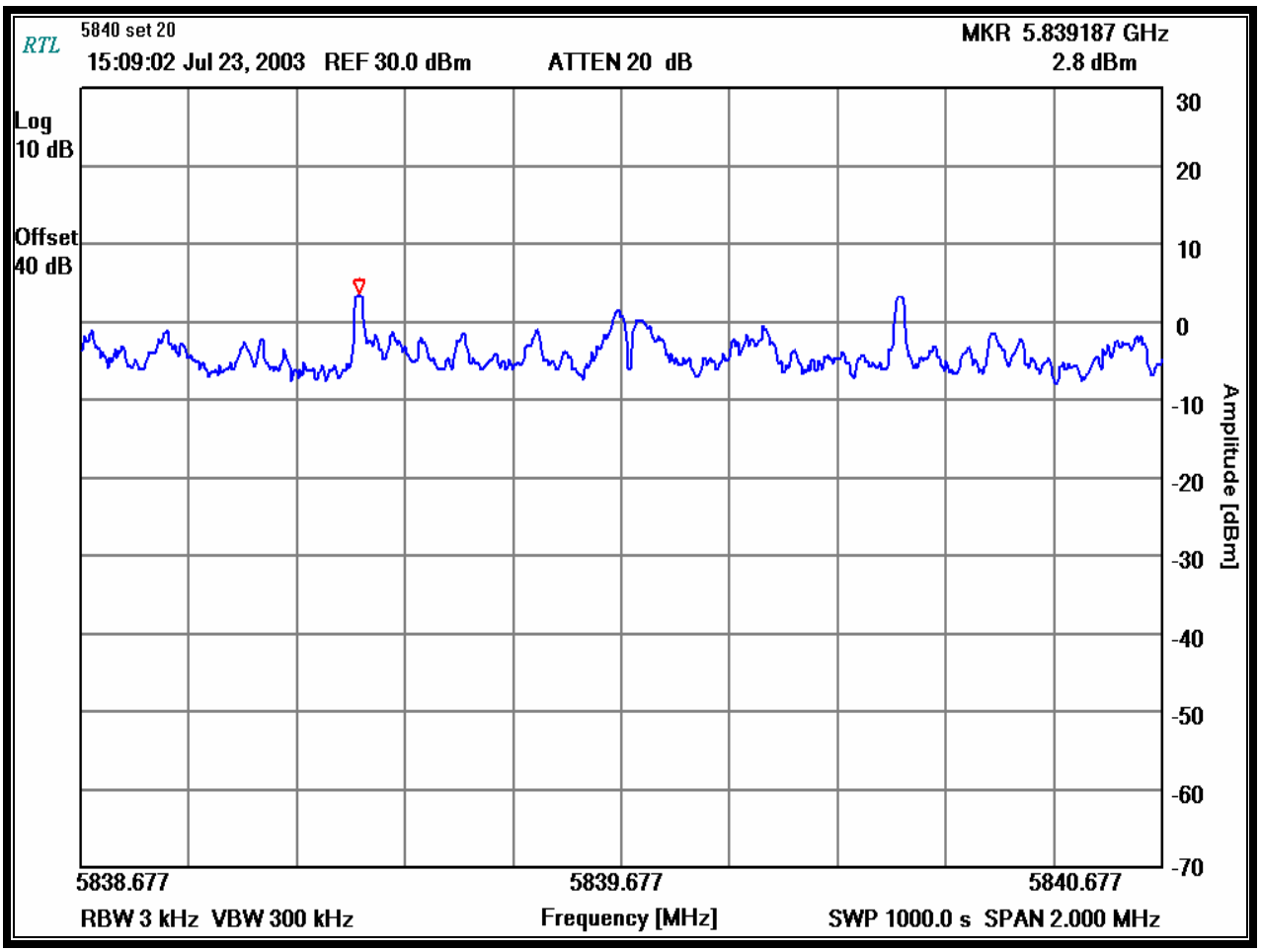


TEST PERSONNEL:

Rachid Sehb		July 24, 2003
EMC Test Engineer	Signature	Date Of Test

Operating Frequency (MHz):	5840
Measured Peak Conducted Power (dBm):	23.8
Bandwidth Resolution (kHz):	3
Bandwidth Video (kHz):	300
Sweep Time (s):	1000

PLOT 10-3: POWER SPECTRAL DENSITY 5840 MHz



TEST PERSONNEL:

Rachid Sehb		July 23, 2003
EMC Test Engineer	Signature	Date Of Test

10.4 TEST EQUIPMENT USED FOR TESTING

TABLE 10-2: TEST EQUIPMENT USED FOR TESTING (POWER SPECTRAL DENSITY)

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
901020	Hewlett Packard	8564E	Spectrum Analyzer (30 Hz – 40 GHz)	3943A01719	7/15/04

11 CONCLUSION

The data in this measurement report shows that the Tellumat (Pty) Ltd, Model Name: ORION 5810i, Model Number: 651-04299-02.1-, FCC ID: ONJ-3ECJ68B3E, when used with the Gabriel Electronics SSP2-52B antenna, complies with all the requirements of Parts 2 and 15 of the FCC Rules and Industry Canada RSS-210.