Engineering and Testing for EMC and Safety Compliance

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

Test Lab:	Applicant Information:
Rhein Tech Laboratories, Inc. 360 Herndon Parkway Suite 1400 Herndon, VA 20170	Phone: 703-689-0368 Fax: 703-689-2056 Web Site: www.rheintech.com E-Mail: ATCBINFO@rheintech.com	Zebra Technologies Contact: Bob Heon 30 Plan Way Warwick, RI 02886	Phone: 401-739-5800 ext. 352 Fax: 401-732-0145 E-Mail: bheon@zebra.com

FCC ID:	I28MD-BTC2TY	**GRANTEE FRN NUMBER:**	0006-3040-75
PLAT FORM:	Zebra portable printers & other Zebra products with similar physical characteristics	**RTL WORK ORDER NUMBER:**	2003058
MODEL NUMBER / NAME:	CC16735-1 / ZBR-2 (Bluetooth modular radio)	**RTL QUOTE NUMBER:**	QRTL03-747
DATE OF TEST REPORT:	June 2, 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:	DSS – Part 15 Spread Spectrum Transmitter Frequency Hopping
FCC Rule Part(s):	Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Frequency Hopping System
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
2402-2480	0.0008	N/A	N/A

* output power is maximum peak conducted

We, 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: June 2, 2003

Typed/Printed Name: Desmond A. Fraser

Position: President

TABLE OF CONTENTS

FIGURE INDEX

TABLE INDEX

PLOT INDEX

APPENDIX INDEX

PHOTOGRAPH INDEX

1 GENERAL INFORMATION

1.1 SCOPE

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

IC RSS-210 Section 6.2.2(o): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

A direct sequence (DS) system is a spread spectrum (SS) system in which the carrier has been modulated by a high speed spreading code and an information data stream. The high-speed code sequence dominates the "modulating function" and is the direct cause of the wide spreading of the transmitted signal.

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 certification for limited modular transmitter approval, based on the guidelines in FCC Publication DA 00-1407, for Zebra Technologies Corp. Model # CC16735-1, Model Name: ZBR-2, a modular Bluetooth radio, under FCC ID: I28MD-BTC2TY. The applicant requests modular approval to allow the use of this radio in Zebra printers and other products similar in style to those presented in this report, including housing type and materials, and not limited to the printers in this report. This Zebra radio has a proprietary interface that is only found on Zebra Technologies printers and other products. Appendix A of this report, a cover letter exhibit, includes a letter from the client justifying the modular approval request. The IF, LO and up to the 2nd LO were investigated and tested.

1.4 MODIFICATIONS

No modifications were made or performed during testing for compliance with any standard in this application.

2 TEST INFORMATION

2.1 TEST JUSTIFICATION

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. 2402 MHz, 2440 MHz and 2480 MHz were tested and investigated from 9 kHz to 24 GHz. Data for all three channels is presented in this report.

Six antennas were tested with the Bluetooth module and all were found to be compliant. The Bluetooth module and one of the antenna options are intended to be used in various Zebra hosts, such as portable printers and other devices with similar physical characteristics. The antennas are all internal dipole antennas, and the single antenna used in the final application will be internal to the host. The antenna transmits, receives, and is connected to the Bluetooth module antenna port.

2.2 EXERCISING THE EUT

The EUT was provided with software to continuously transmit on one channel or in the hopping mode 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)	Power Output	Pass
FCC 15.247(c)	Antenna Conducted Spurious Emissions	Pass
FCC 15.247(d)	Power Spectral Density	N/A

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.

The EUT, Model ZBR-2, is a Bluetooth radio module made by Zebra Technologies and designed for use in Zebra Technologies portable printers and other Zebra products. This device has a proprietary interface that is only found on Zebra Technologies printers.

TABLE 2-2: EQUIPMENT UNDER TEST (EUT)

Part	Manufacturer	Model	Serial Number	FCC Identifier	Cable Description	RTL Barcode
CC16735-1 BLUETOOTH MODULE	ZEBRA	BLUETOOTH MODULE, ZBR-2	#1	SAMPLE	N/A	015132
CC16735-1 BLUETOOTH MODULE	ZEBRA	BLUETOOTH MODULE, ZBR-2	#4	SAMPLE	N/A	015133
CQ15352 (ANTENNA # 1)	ZEBRA	CAMEO 3	06-0035	SAMPLE	N/A	015119
CQ15731 (ANTENNA # 2)	ZEBRA	CAMEO 2	03-0001	SAMPLE	N/A	015121
CC16203-2 (ANTENNA # 3)	ZEBRA	QL-220	020 B	SAMPLE	N/A	015123
CQ16142 (ANTENNA # 4)	ZEBRA	CAMEO 3 SC	05-0351	SAMPLE	N/A	015125
CQ16203-1 (ANTENNA # 5)	ZEBRA	QL-320	02-0555	SAMPLE	N/A	015127
CQ15813 (ANTENNA # 6)	ZEBRA	ZPR POD	06-0033	SAMPLE	N/A	015129

TABLE 2-3: SUPPORT EQUIPMENT

Part	Manufacturer	Model	Serial Number	FCC Identifier	Cable Description	RTL Barcode
INTERFACE	ZEBRA	BLUETOOTH INTERFACE	FIXTURE #4	SAMPLE	N/A	015130
CABLE	ZEBRA	PROGRAMMING CABLE	N/A	N/A	1 M SHIELDED	015131
CABLE	ZEBRA	BLUETOOTH	SMA	SAMPLE	SHIELDED	015134
BLUE TOOTH TEST SET	ZEBRA	MT8850A	6K00000279	N/A	UNSHIELDED	015196

2.5 CONFIGURATION OF TESTED SYSTEM

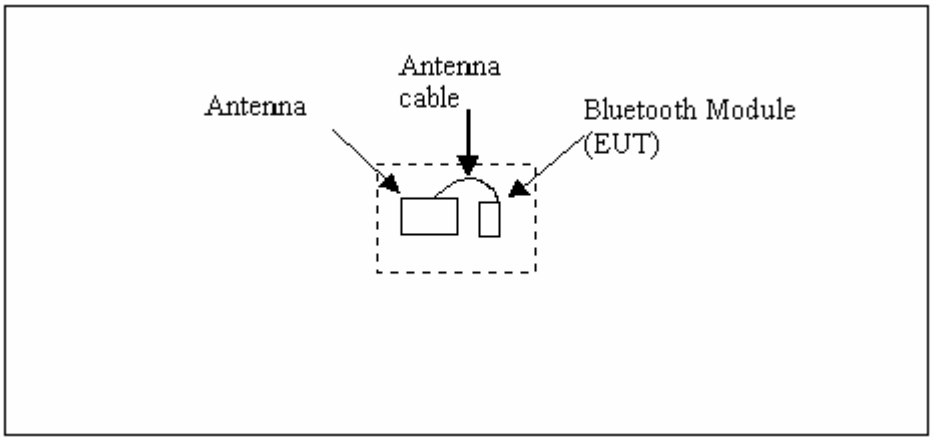


FIGURE 1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

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 FCC's "Radiated Measurement at a Band Edge" guidance document. The data taken in this report represents the worst case at 2 Mbps. The data rate at 1 Mbps was also investigated and found to be in compliance.

3.2 BAND EDGE TEST EQUIPMENT

TABLE 3-1: BAND EDGE TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900772	EMCO	3161-02	Horn Antenna	9804-1044	3/15/04
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/2/03

3.3 COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA

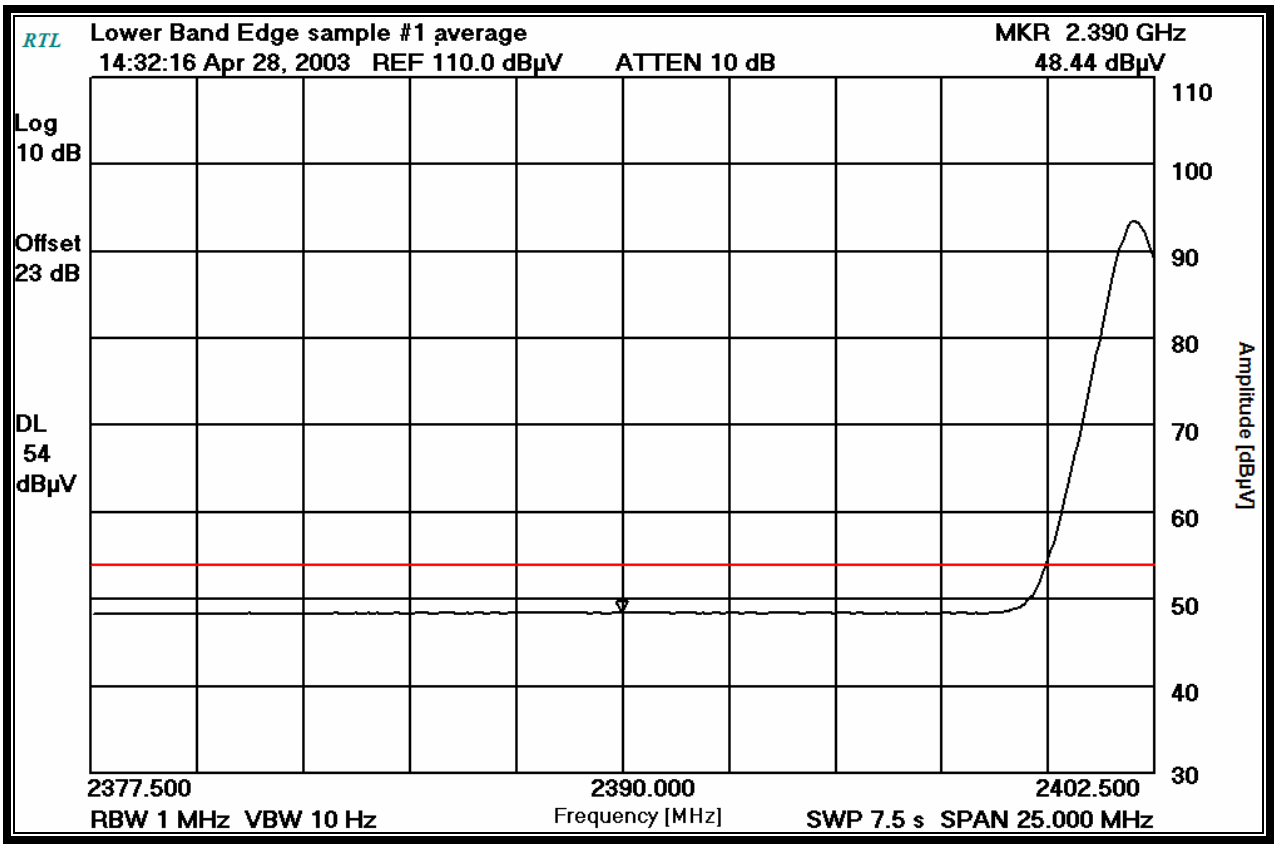
TABLE 3-2: COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA

Antenna Sample	Channel Set to	Frequency Tested (MHz)	Detector	Corrected Field Strength Level (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)
Cameo 3	2	2402	Average	48.44	54.0	-5.6
Cameo 3	80	2480	Average	48.54	54.0	-5.5
Cameo 2	2	2402	Average	48.42	54.0	-5.6
Cameo 2	80	2480	Average	48.42	54.0	-5.6
QL-220	2	2402	Average	48.38	54.0	-5.6
QL-220	80	2480	Average	48.21	54.0	-5.8
Cameo 3 SC	2	2402	Average	48.34	54.0	-5.7
Cameo 3 SC	80	2480	Average	48.56	54.0	-5.4
QL-320	2	2402	Average	48.47	54.0	-5.5
QL-320	80	2480	Average	48.52	54.0	-5.5
ZPR Pod	2	2402	Average	48.42	54.0	-5.6
ZPR Pod	80	2480	Average	48.28	54.0	-5.7

3.4 RESTRICTED BAND EDGE PLOTS

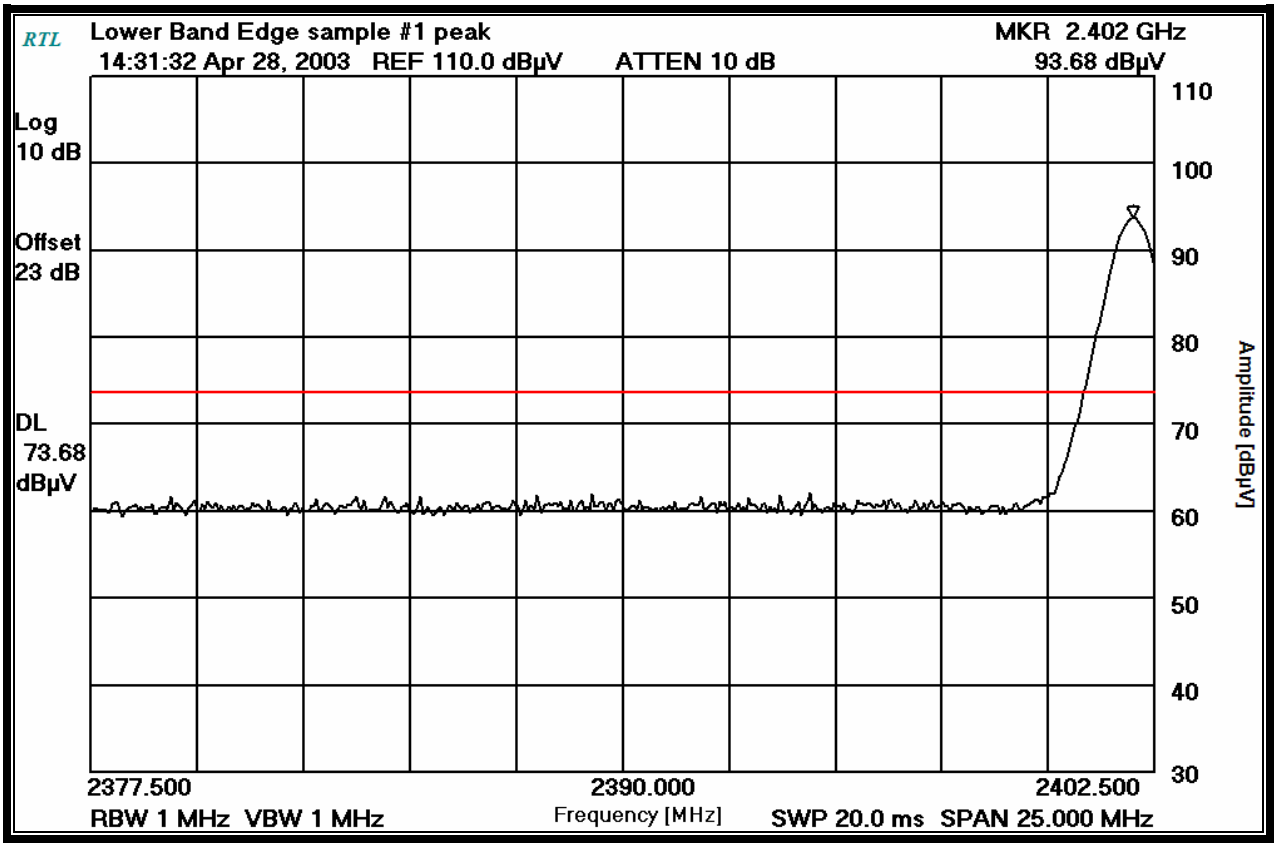
Channel Number:	2
Frequency MHz):	2402
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	7.5

PLOT 3-1: LOWER BAND EDGE: AVERAGE MEASUREMENT CAMEO 3



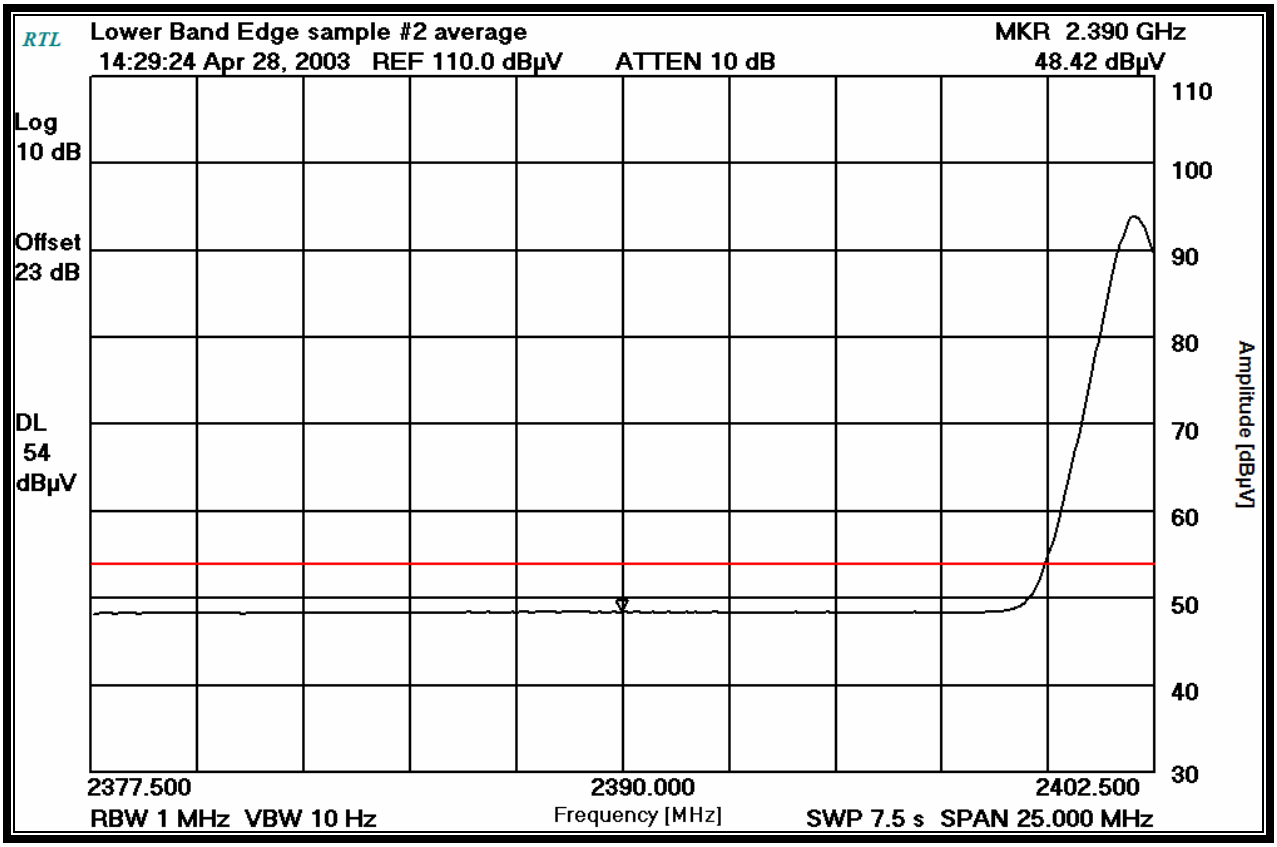
Channel Number:	2
Frequency (MHz):	2402
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20

PLOT 3-2: LOWER BAND EDGE: PEAK MEASUREMENT CAMEO 3



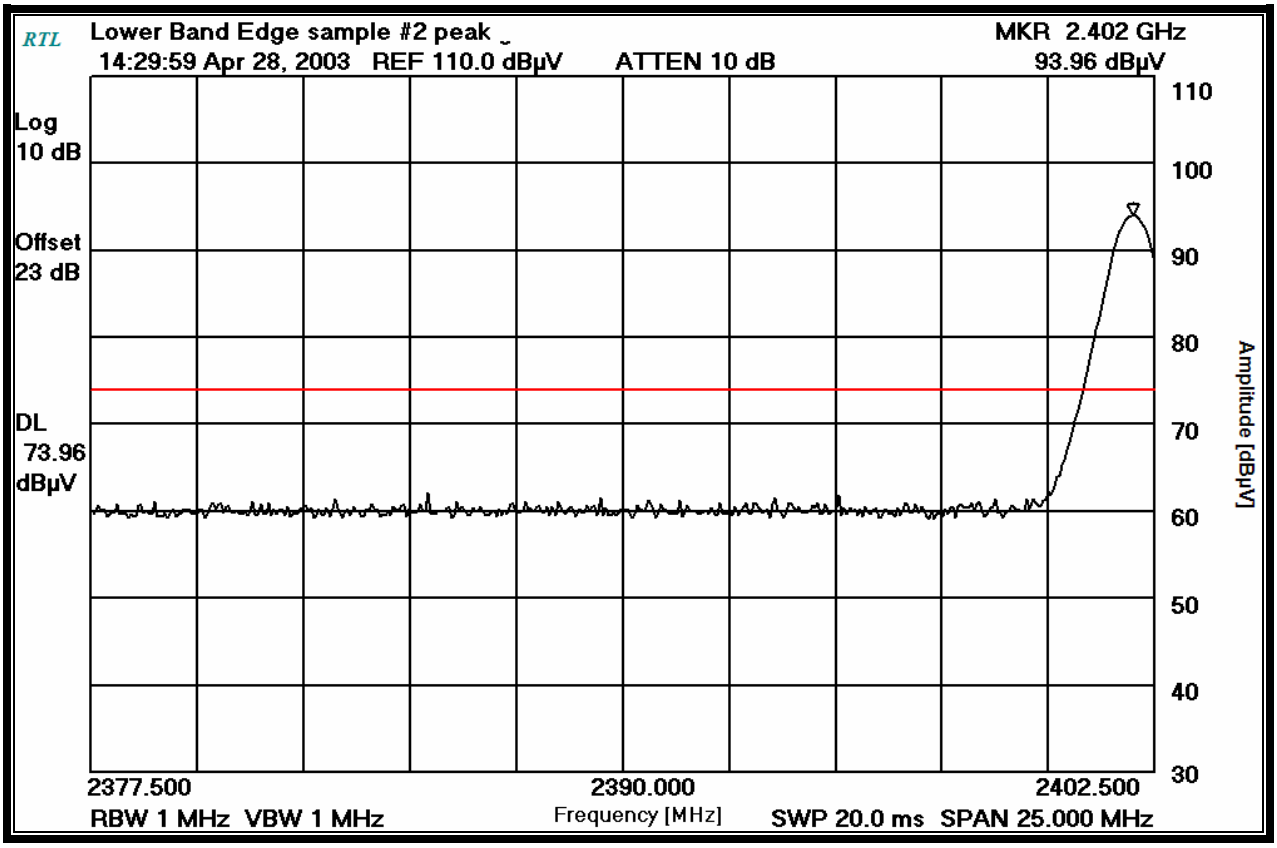
Channel Number:	2
Frequency (MHz):	2402
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	7.5

PLOT 3-3: LOWER BAND EDGE: AVERAGE MEASUREMENT CAMEO 2



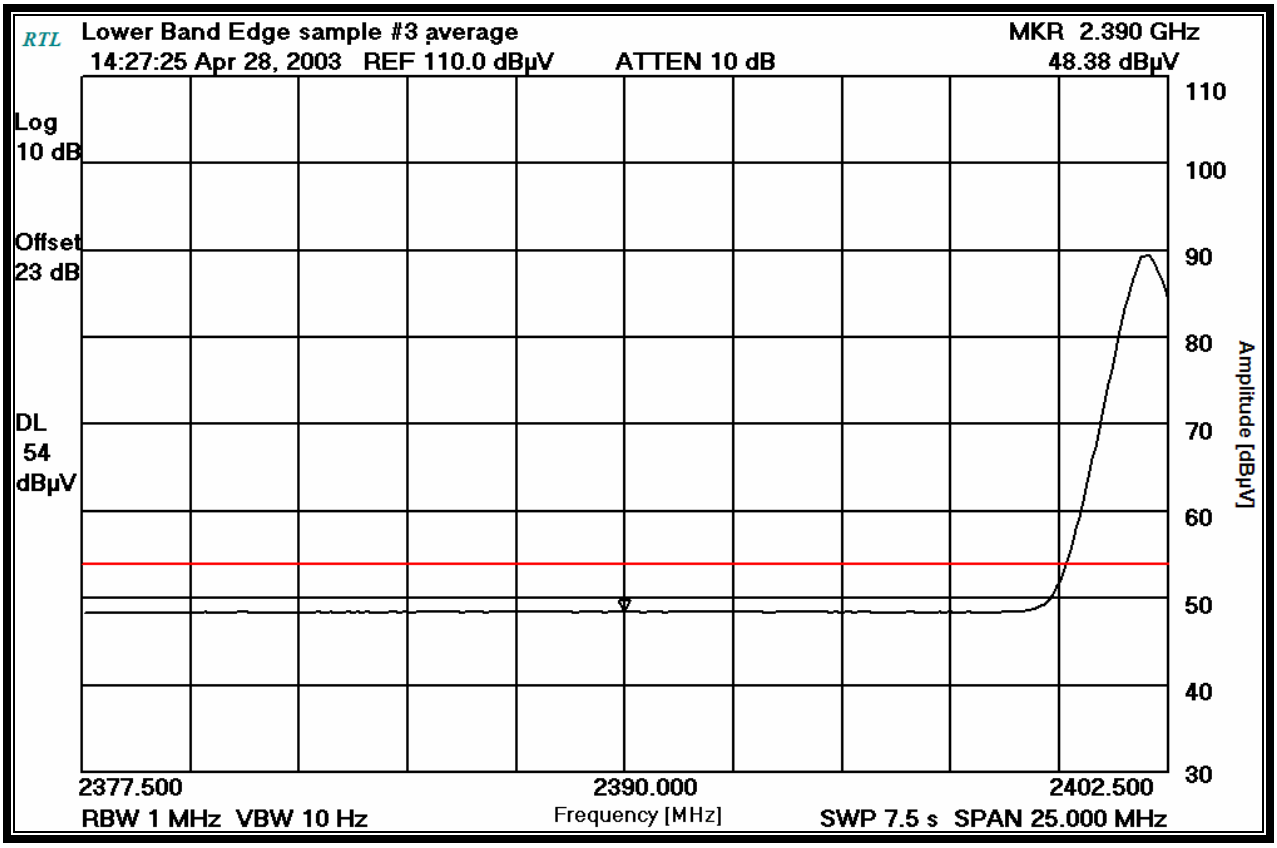
Channel Number:	2
Frequency (MHz):	2402
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20

PLOT 3-4: LOWER BAND EDGE: PEAK MEASUREMENT CAMEO 2



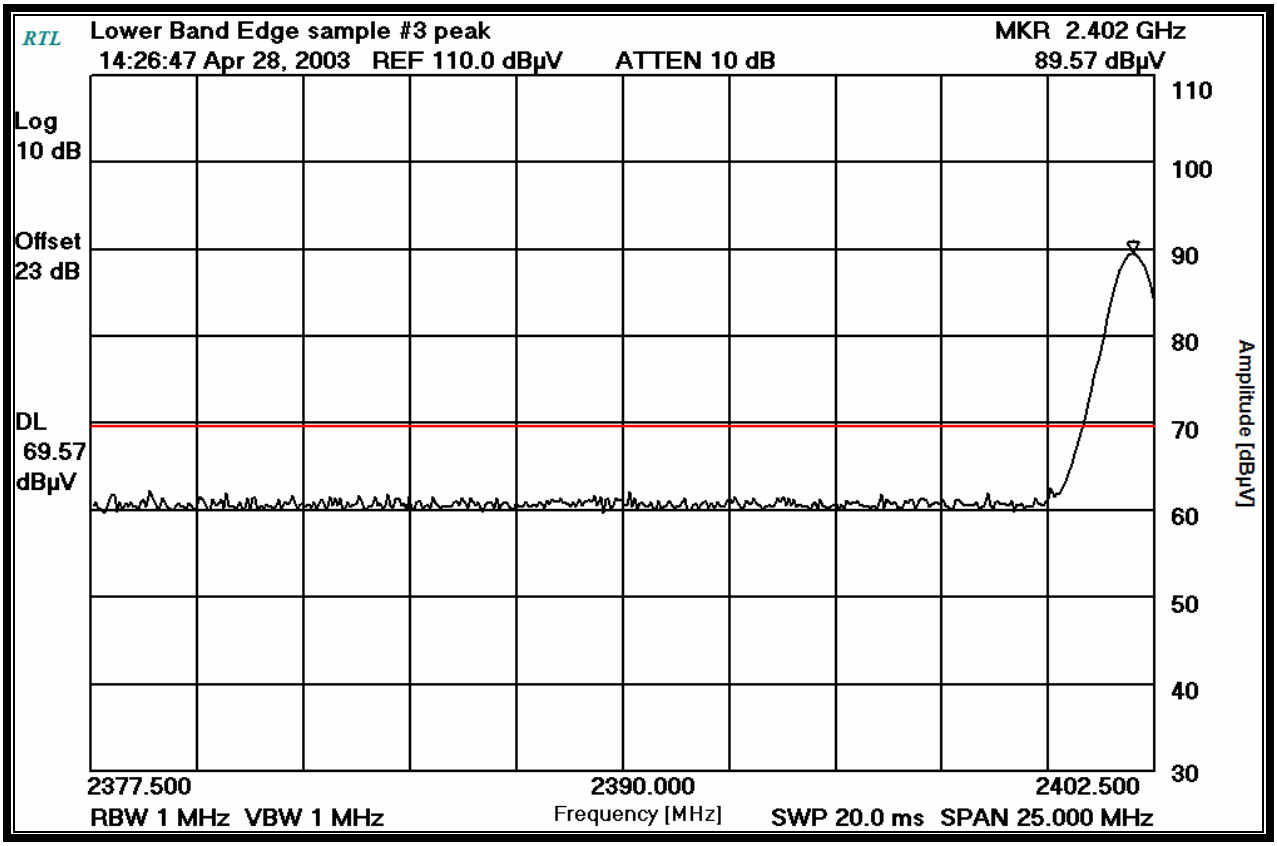
Channel Number:	2
Frequency (MHz):	2402
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	7.5

PLOT 3-5: LOWER BAND EDGE: AVERAGE MEASUREMENT QL-220



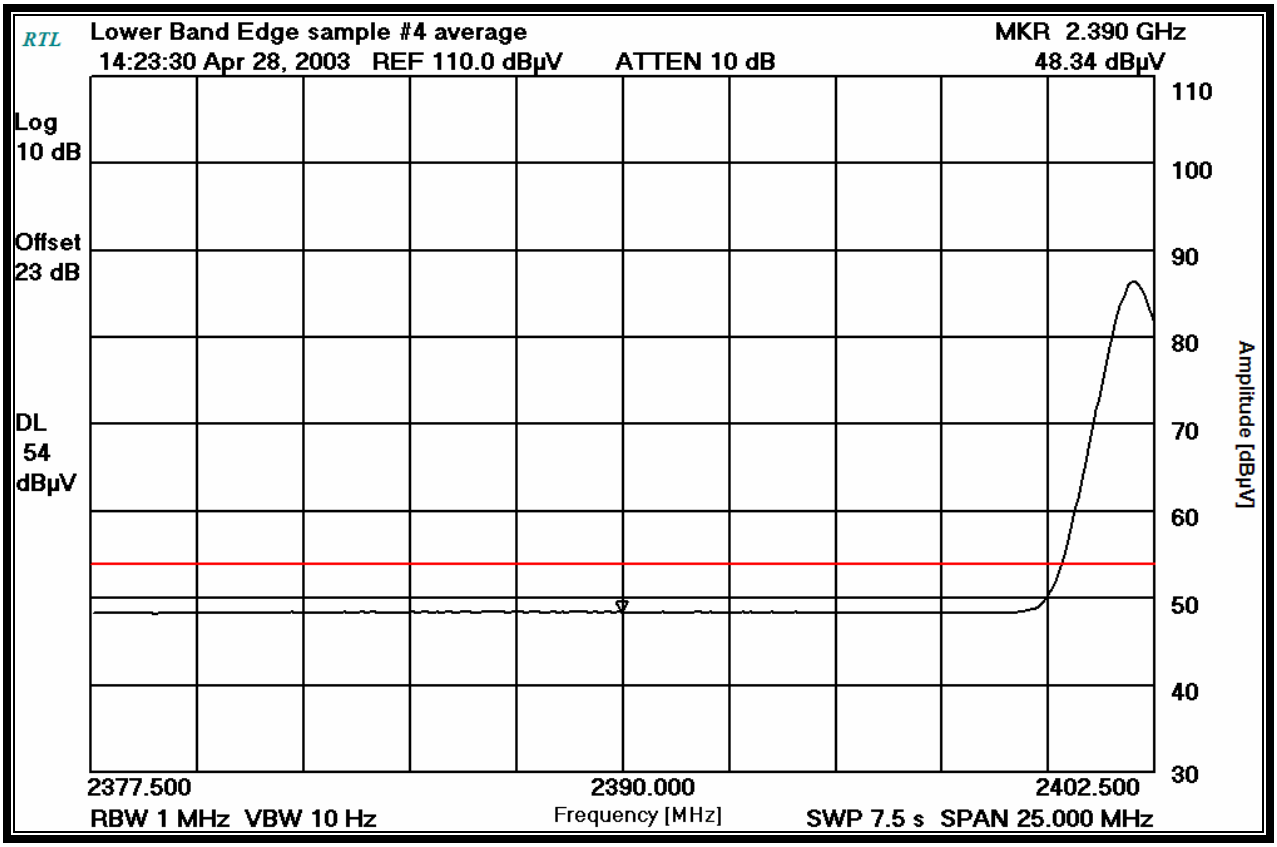
Channel Number:	2
Frequency (MHz):	2402
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20

PLOT 3-6: LOWER BAND EDGE: PEAK MEASUREMENT QL-220



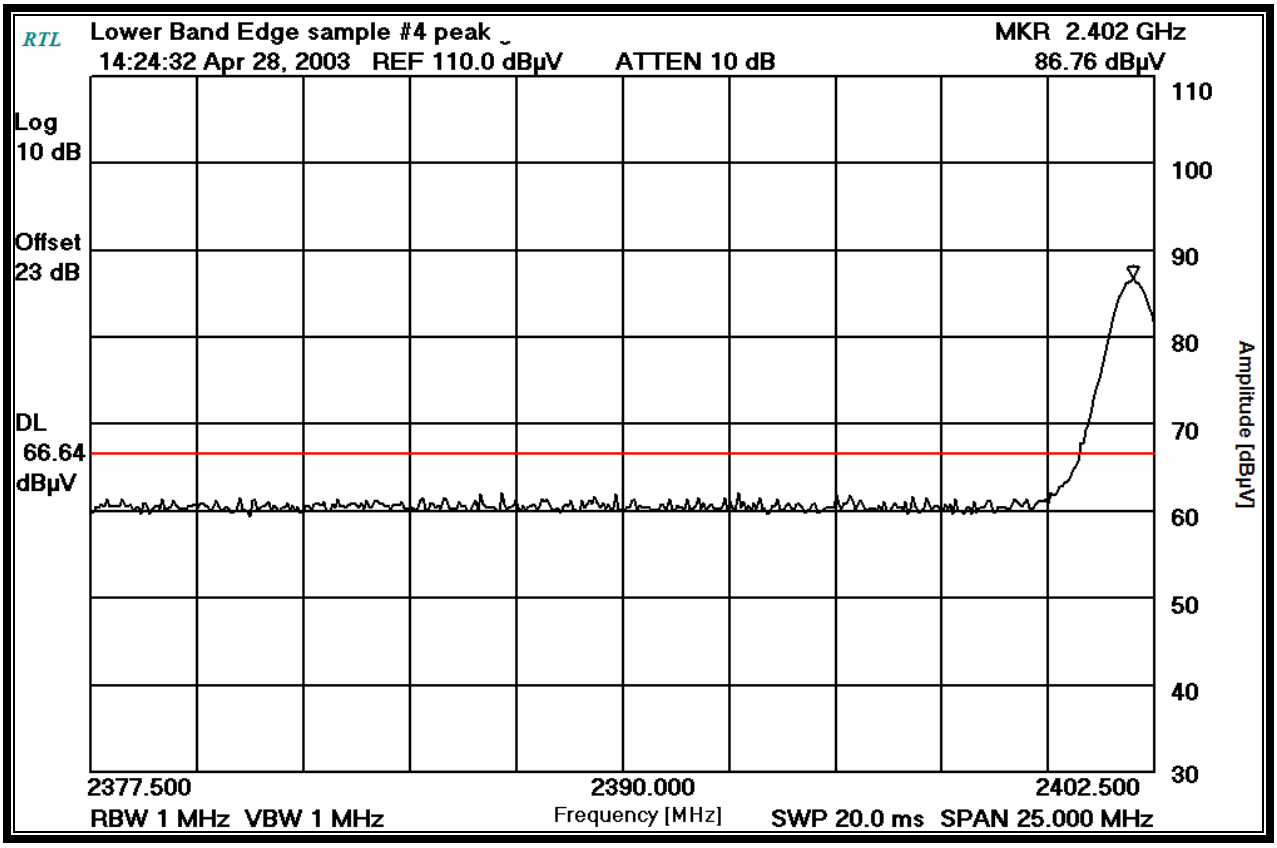
Channel Number:	2
Frequency (MHz):	2402
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	7.5

PLOT 3-7: LOWER BAND EDGE: AVERAGE MEASUREMENT CAMEO 3 SC



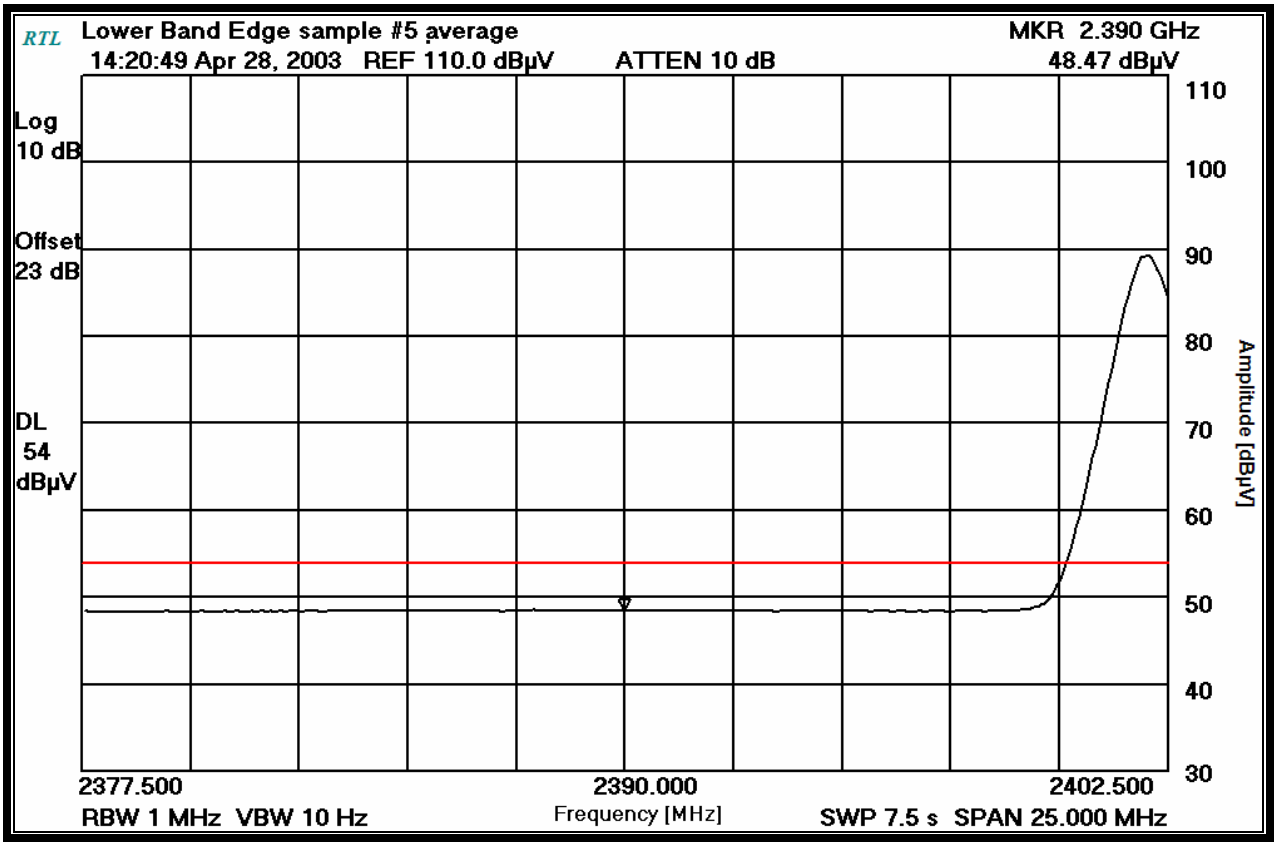
Channel Number:	2
Frequency (MHz):	2402
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20

PLOT 3-8: LOWER BAND EDGE: PEAK MEASUREMENT CAMEO 3 SC



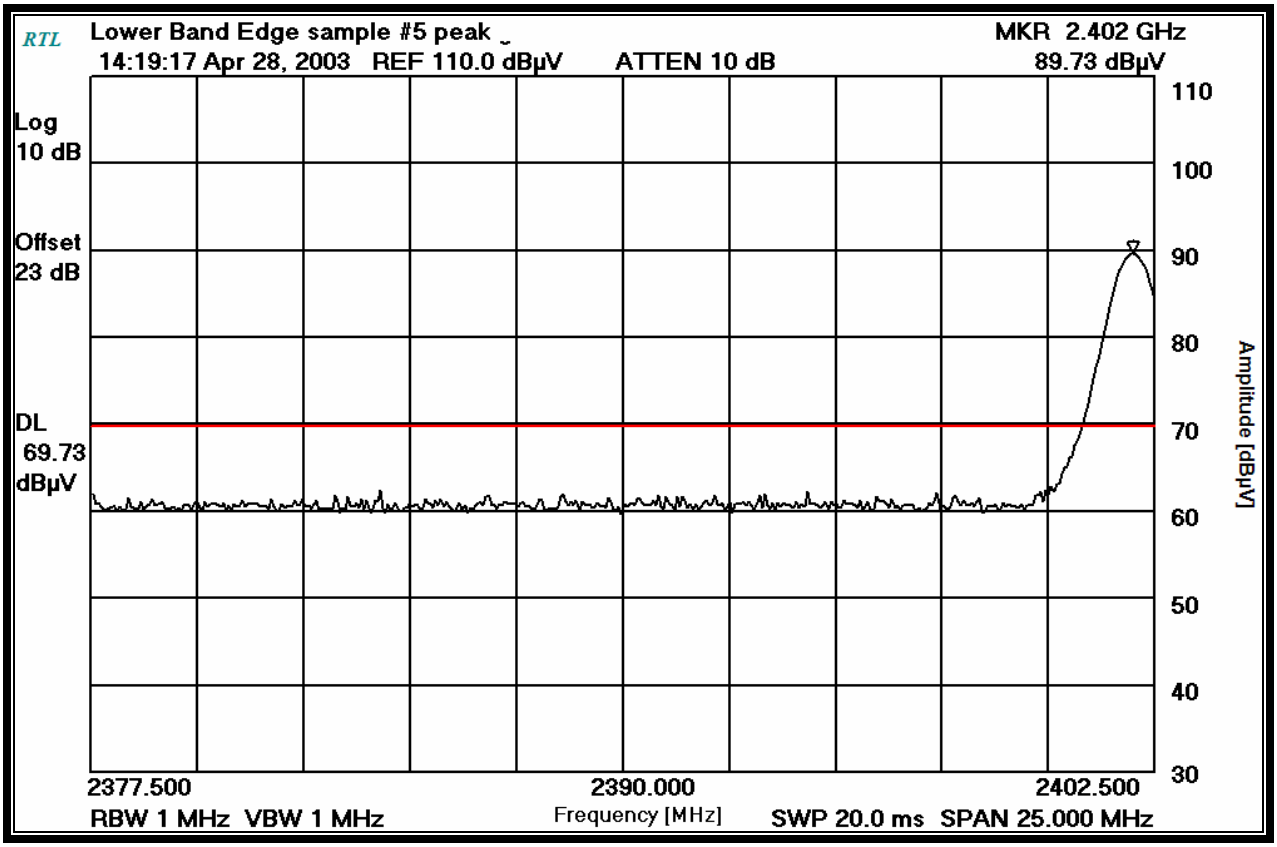
Channel Number:	2
Frequency (MHz):	2402
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	7.5

PLOT 3-9: LOWER BAND EDGE: AVERAGE MEASUREMENT QL-320



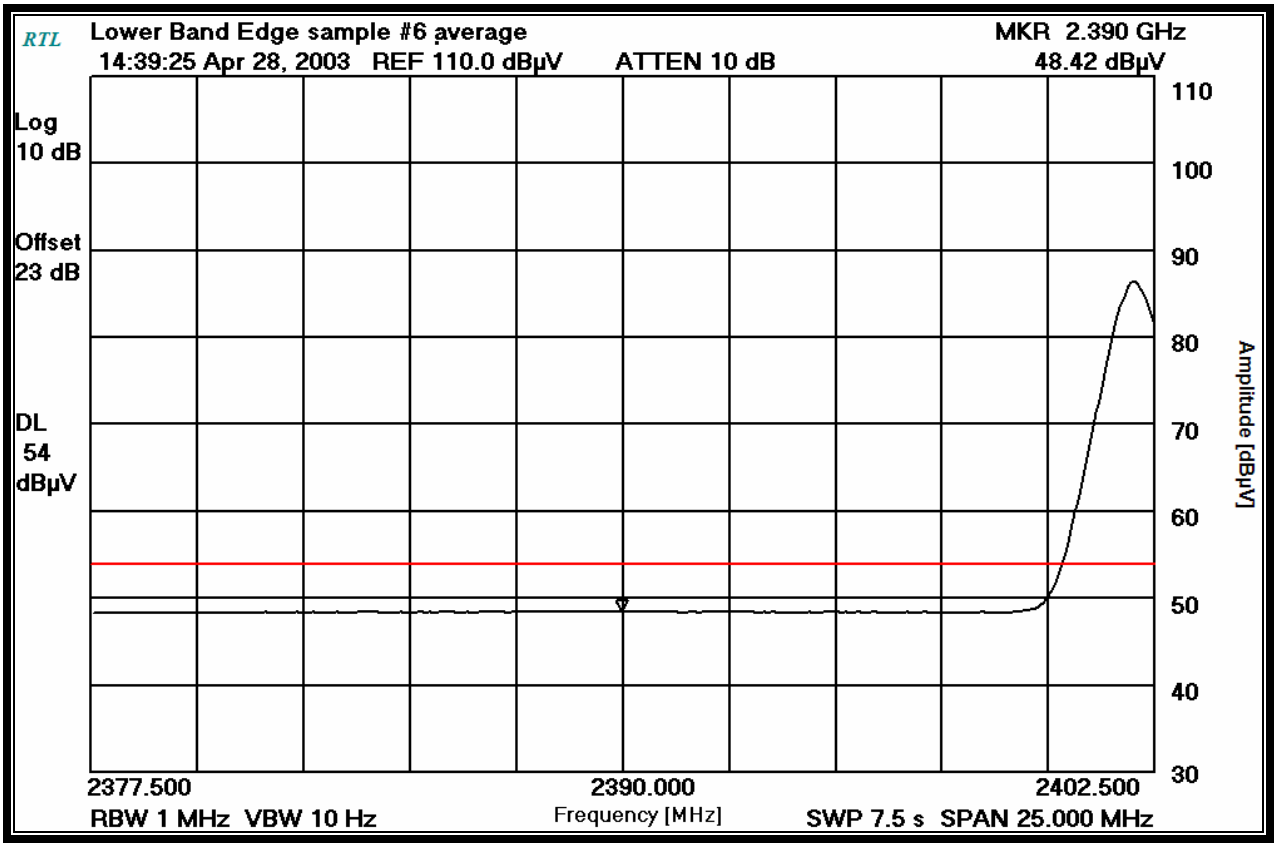
Channel Number:	2
Frequency (MHz):	2402
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20

PLOT 3-10: LOWER BAND EDGE: PEAK MEASUREMENT QL-320



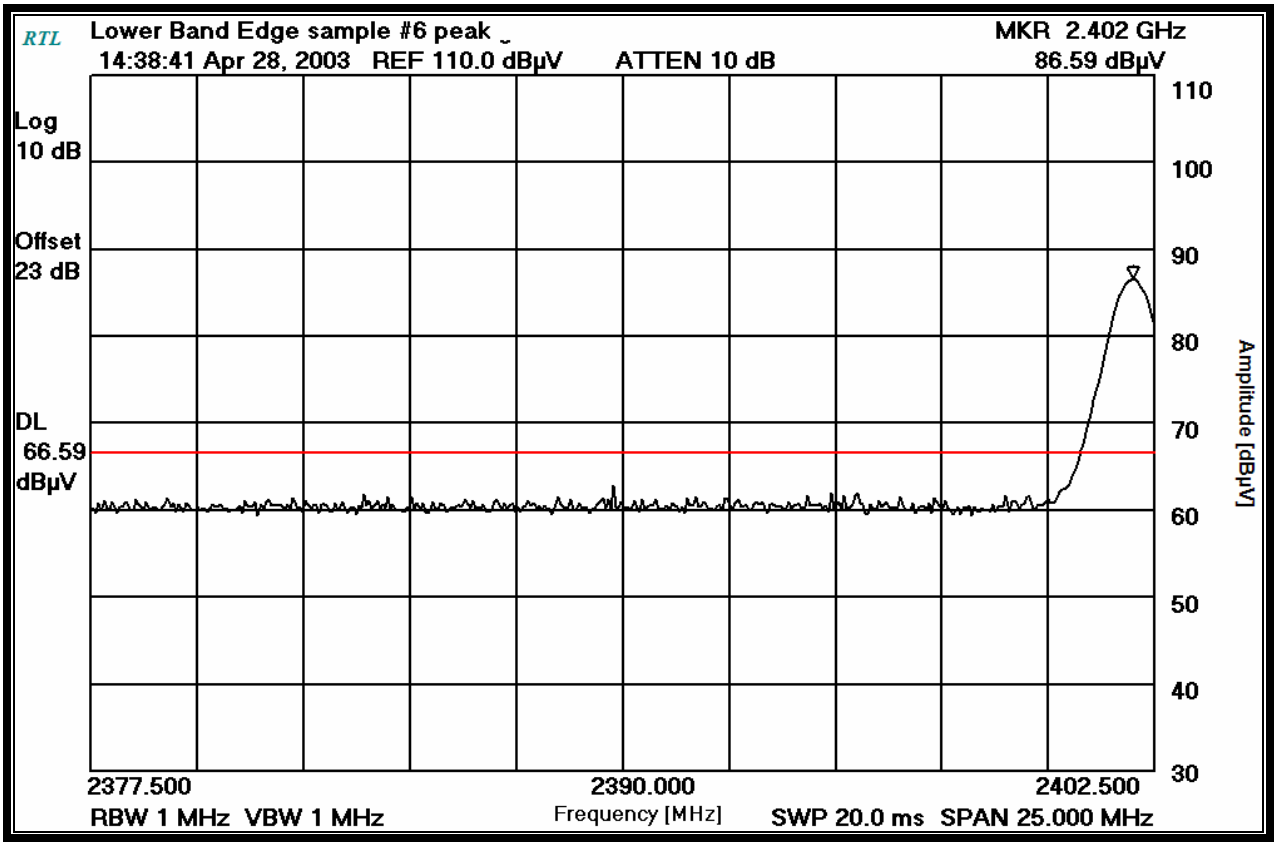
Channel Number:	2
Frequency (MHz):	2402
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	7.5

PLOT 3-11: LOWER BAND EDGE: AVERAGE MEASUREMENT ZPR POD



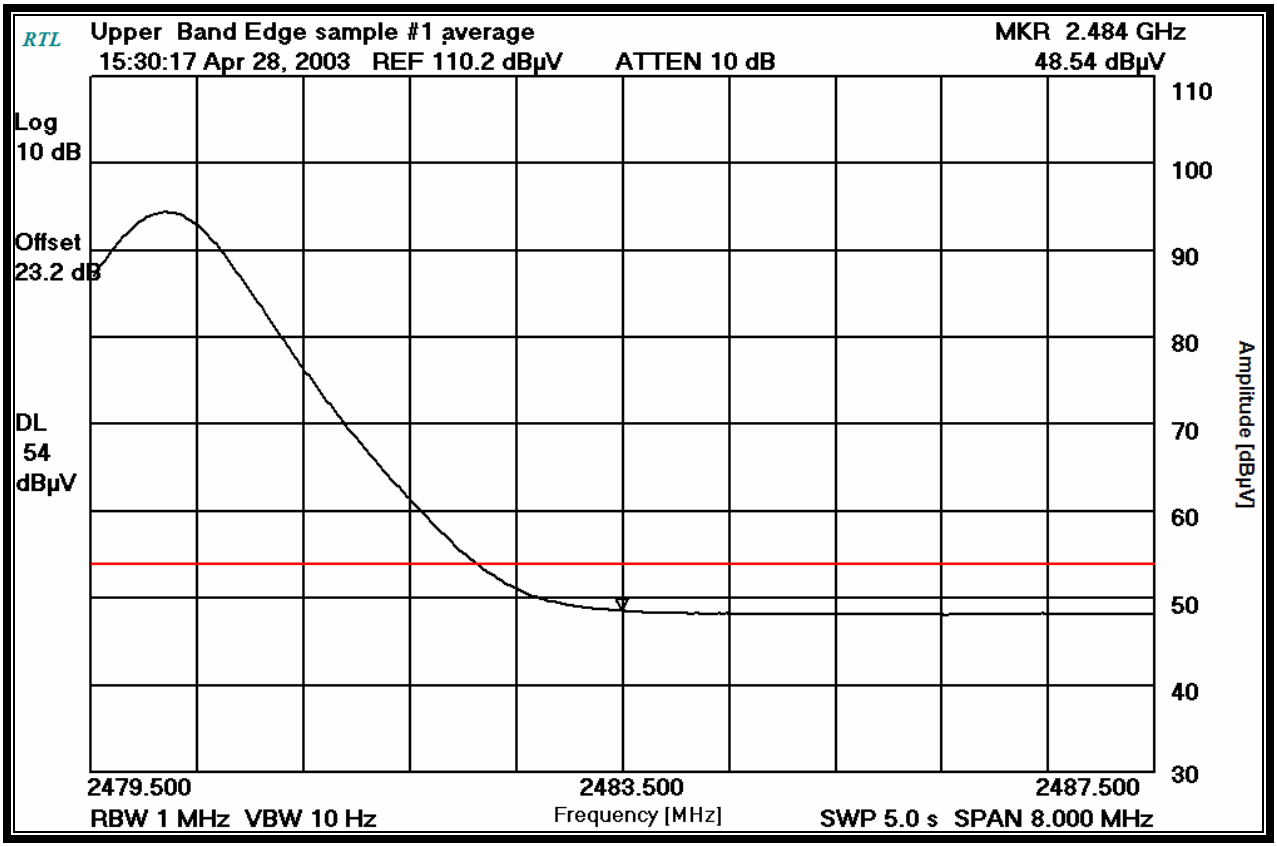
Channel Number:	2
Frequency (MHz):	2402
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20

PLOT 3-12: LOWER BAND EDGE: PEAK MEASUREMENT ZPR POD



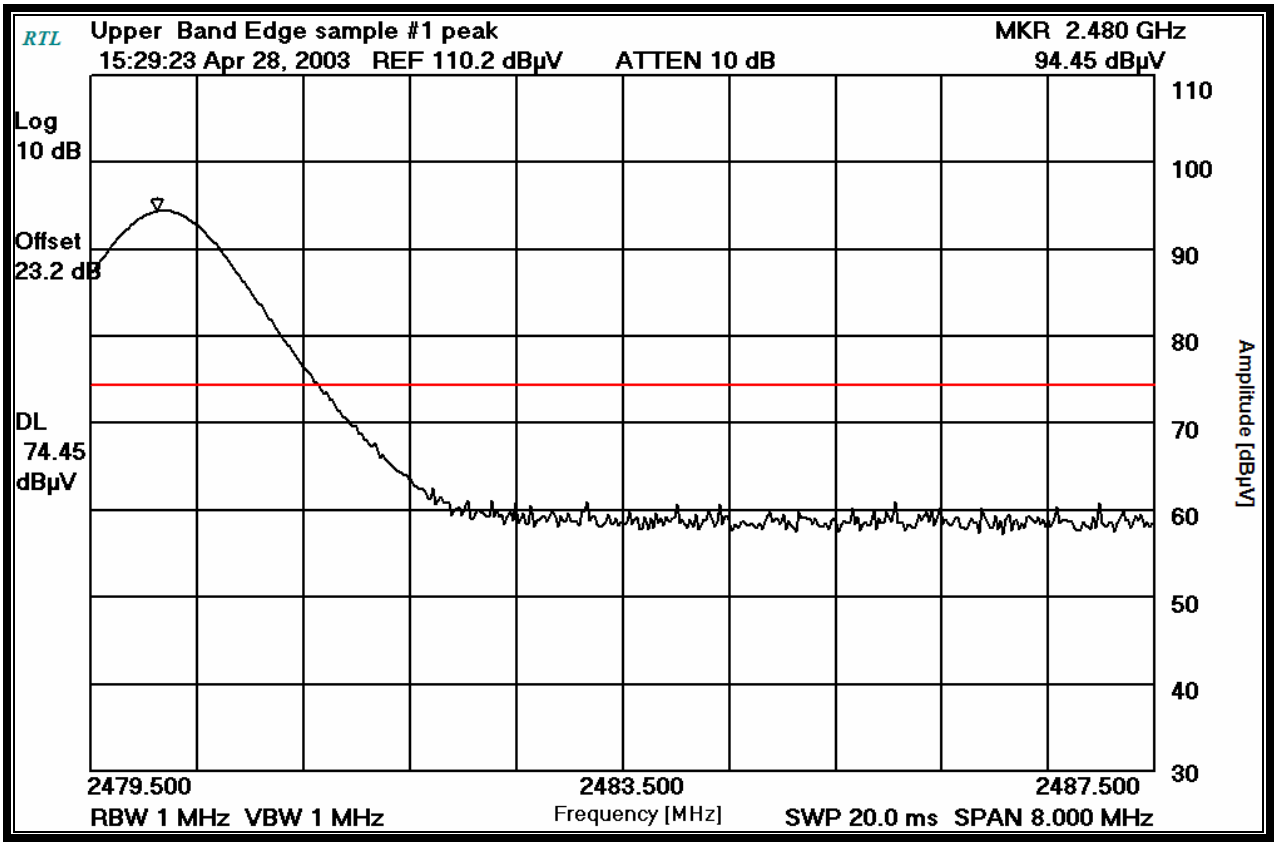
Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	7.5

PLOT 3-13: UPPER BAND EDGE: AVERAGE MEASUREMENT CAMEO 3



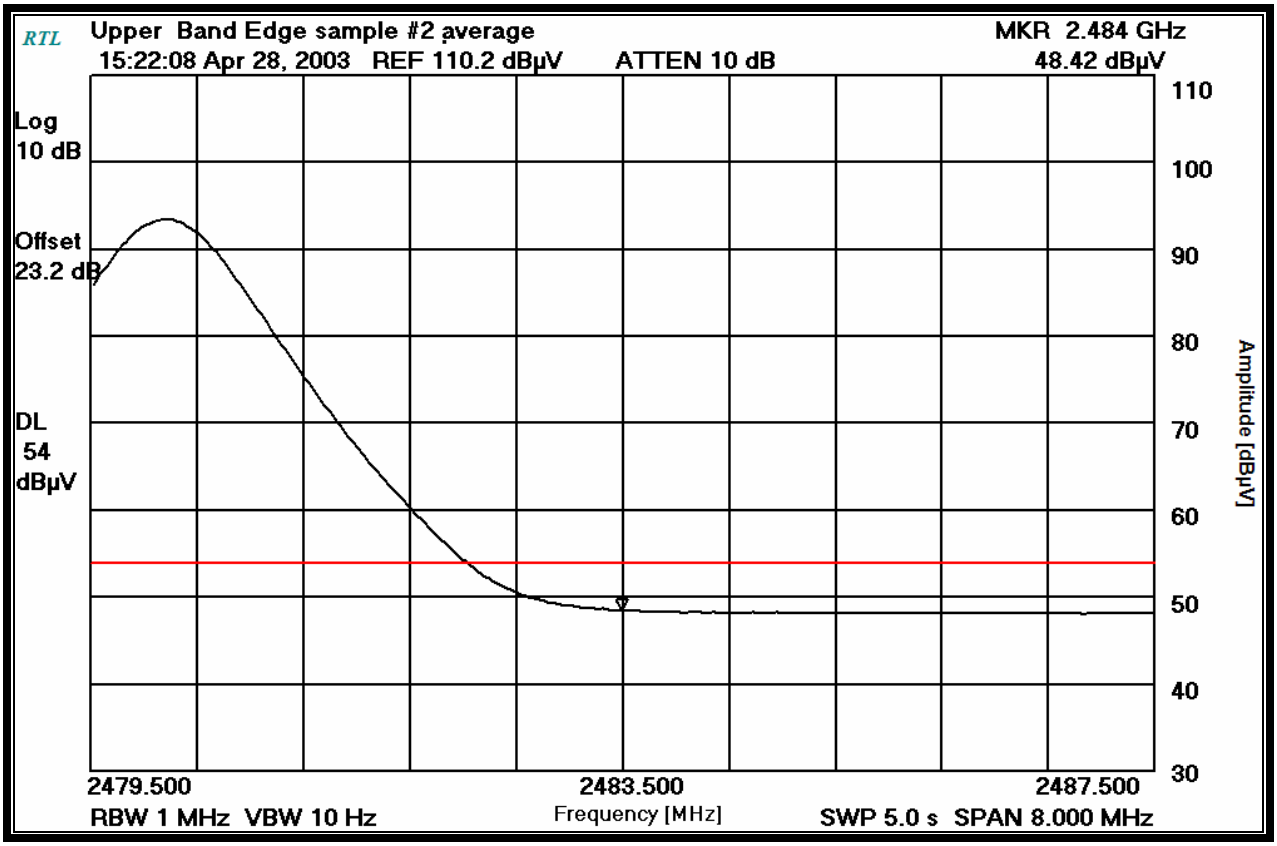
Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20

PLOT 3-14: UPPER BAND EDGE: PEAK MEASUREMENT CAMEO 3



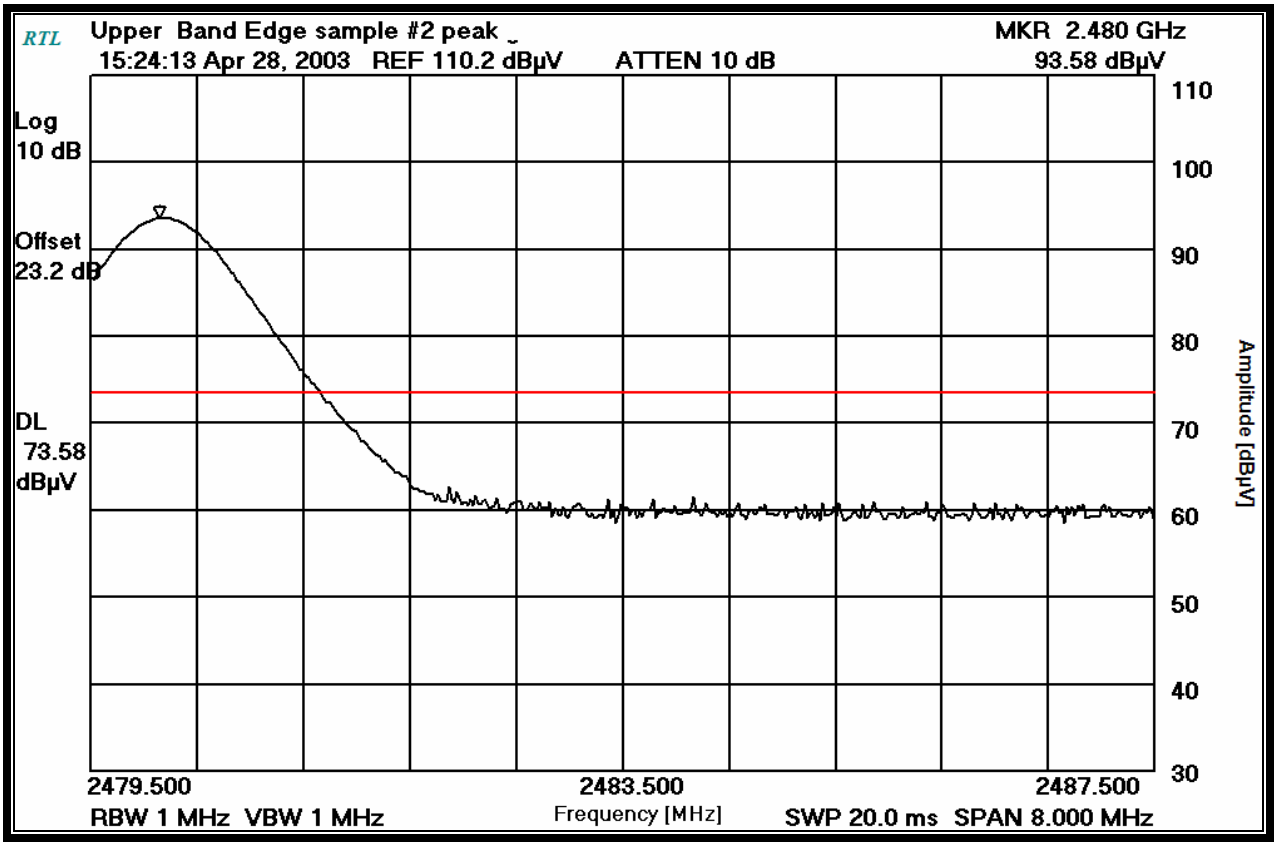
Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	7.5

PLOT 3-15: UPPER BAND EDGE: AVERAGE MEASUREMENT CAMEO 2



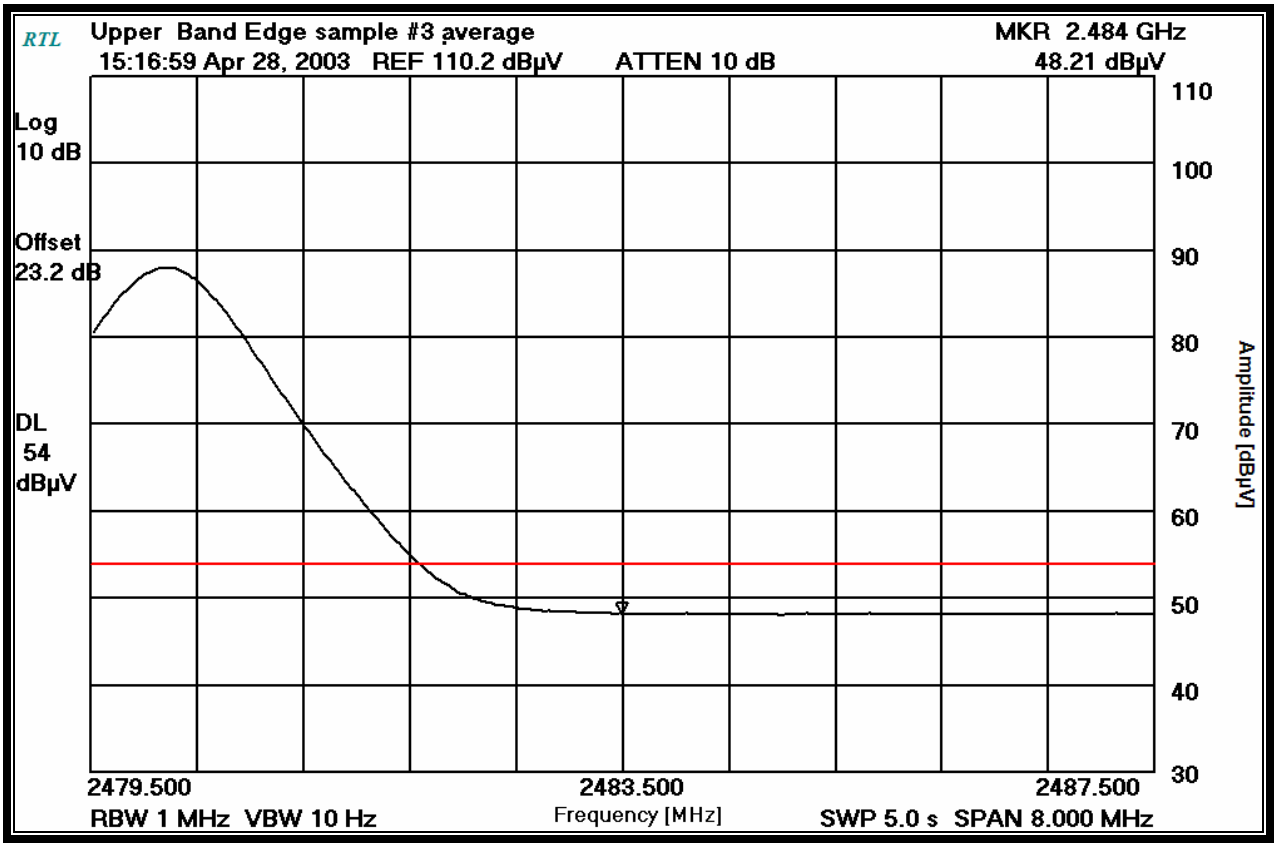
Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20

PLOT 3-16: UPPER BAND EDGE: PEAK MEASUREMENT CAMEO 2



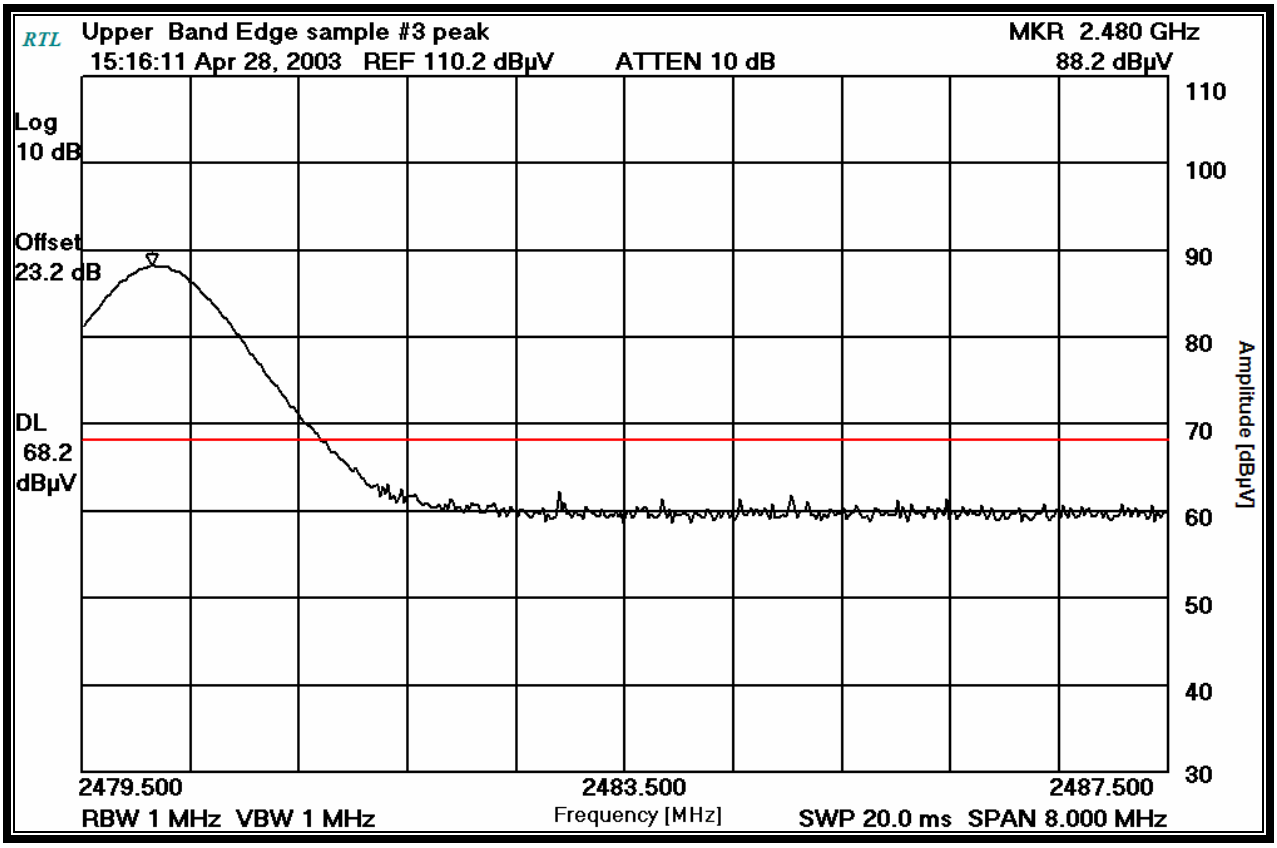
Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	7.5

PLOT 3-17: UPPER BAND EDGE: AVERAGE MEASUREMENT QL-220



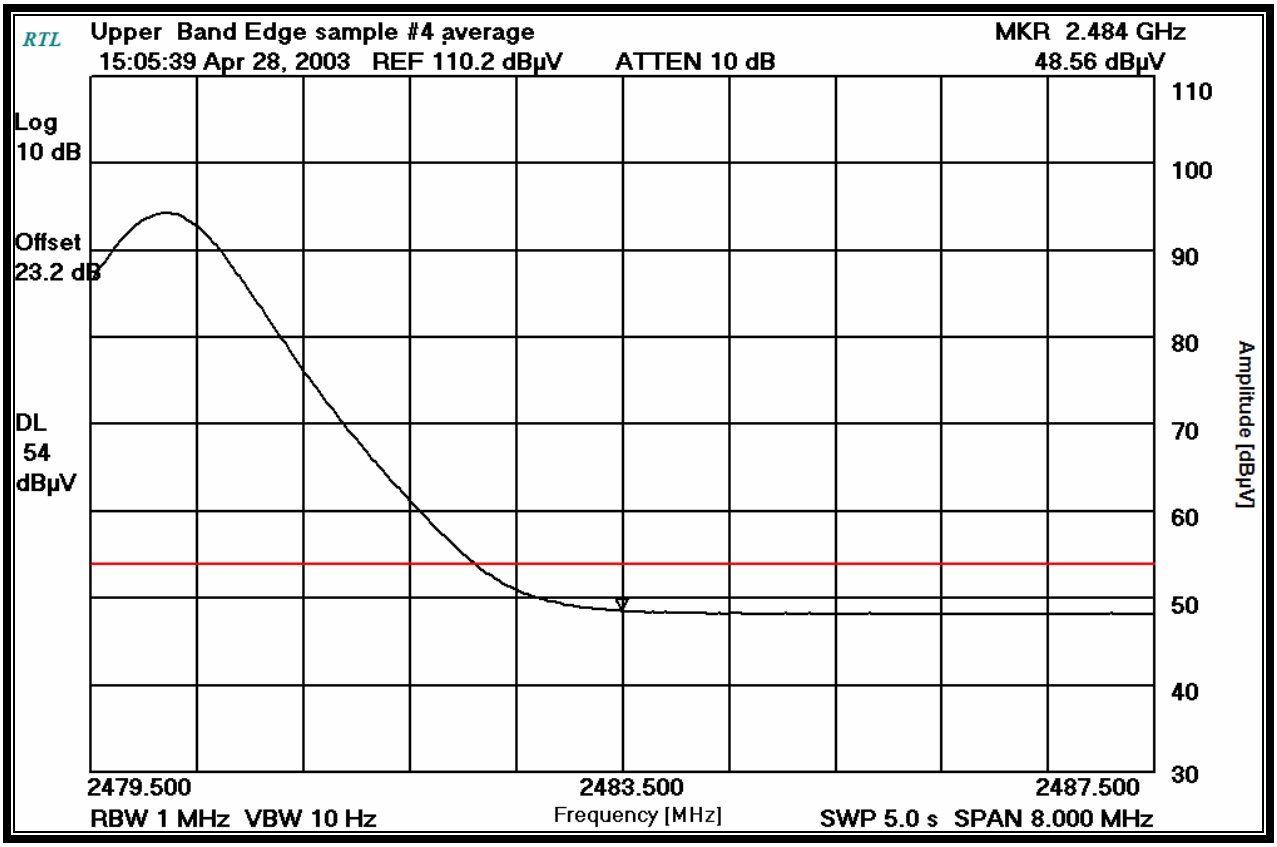
Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20

PLOT 3-18: UPPER BAND EDGE: PEAK MEASUREMENT QL-220



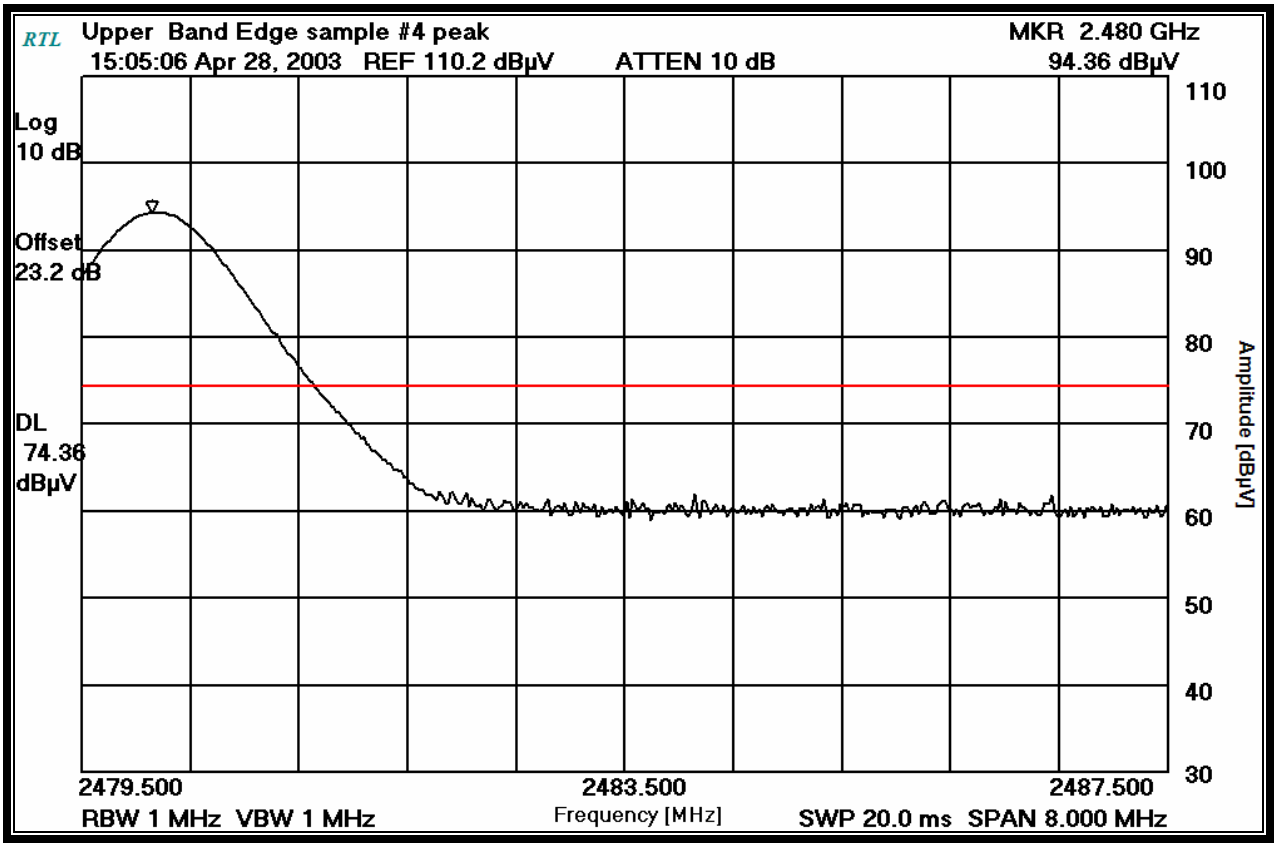
Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	7.5

PLOT 3-19: UPPER BAND EDGE: AVERAGE MEASUREMENT CAMEO 3 SC



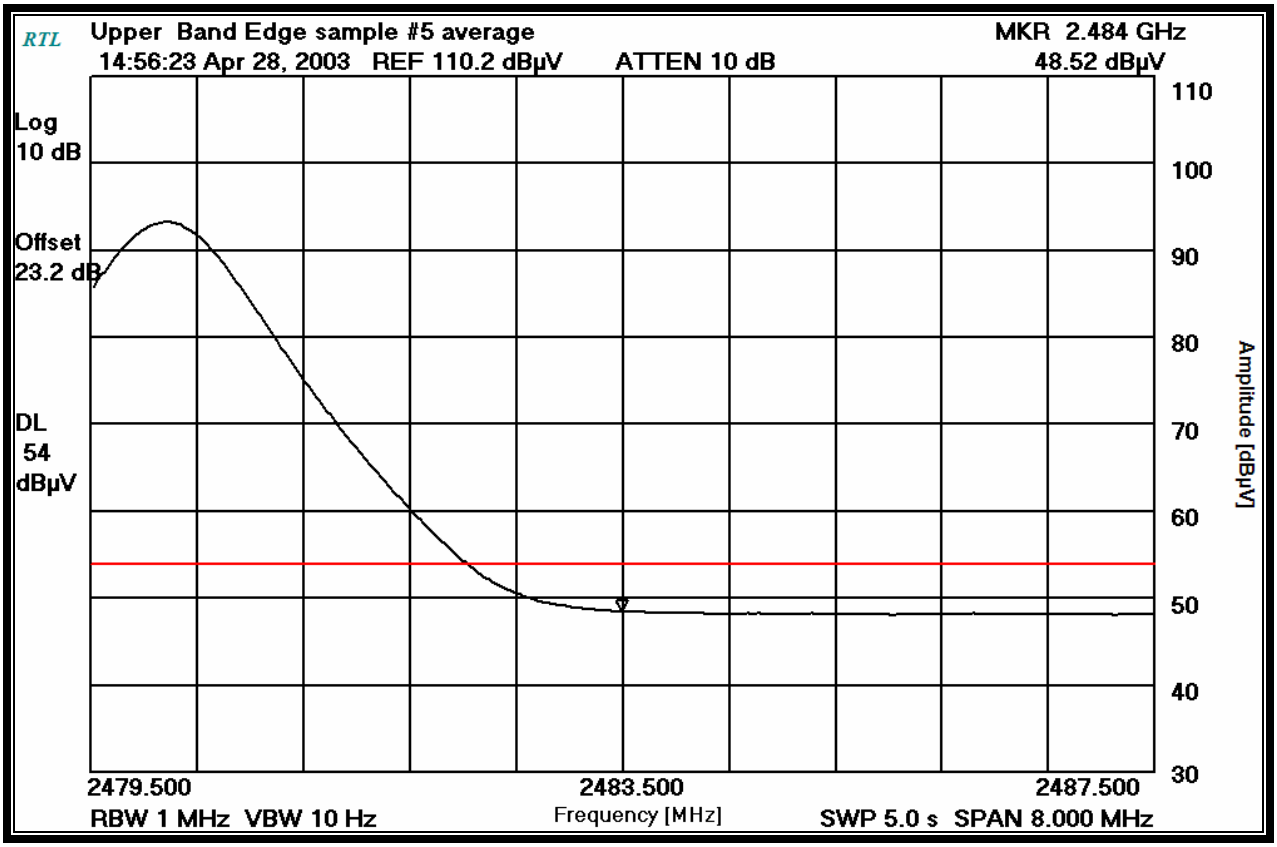
Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20

PLOT 3-20: UPPER BAND EDGE: PEAK MEASUREMENT CAMEO 3 SC



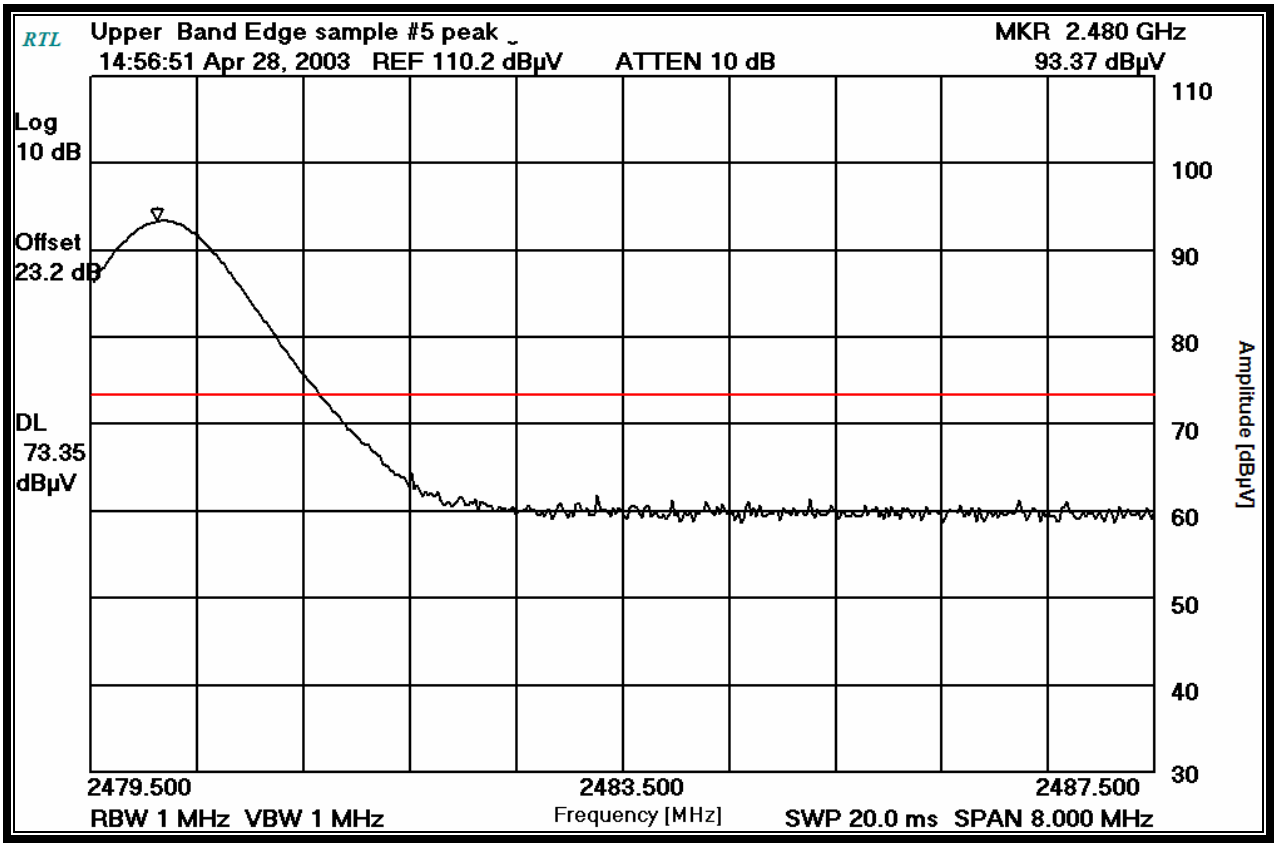
Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	7.5

PLOT 3-21: UPPER BAND EDGE: AVERAGE MEASUREMENT QL-320



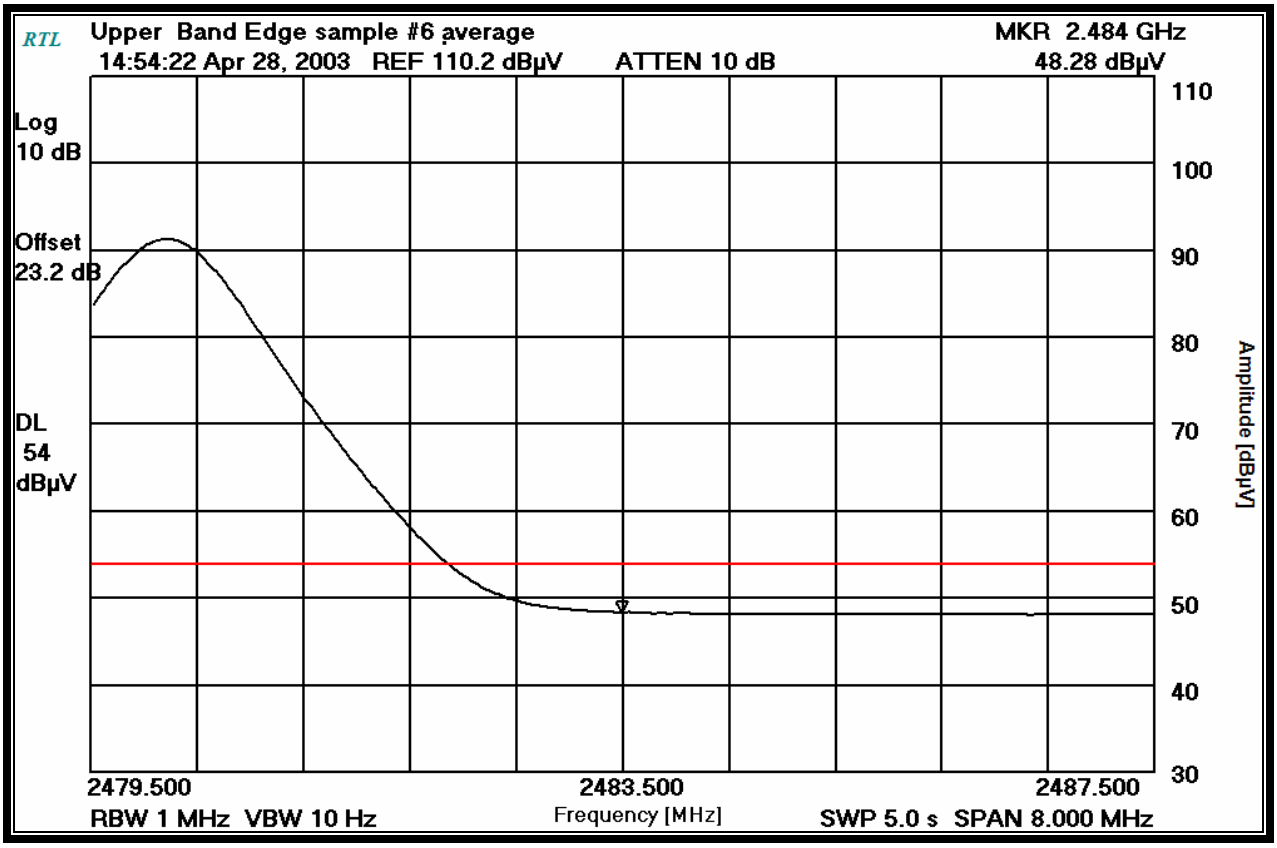
Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20

PLOT 3-22: UPPER BAND EDGE: PEAK MEASUREMENT QL-320



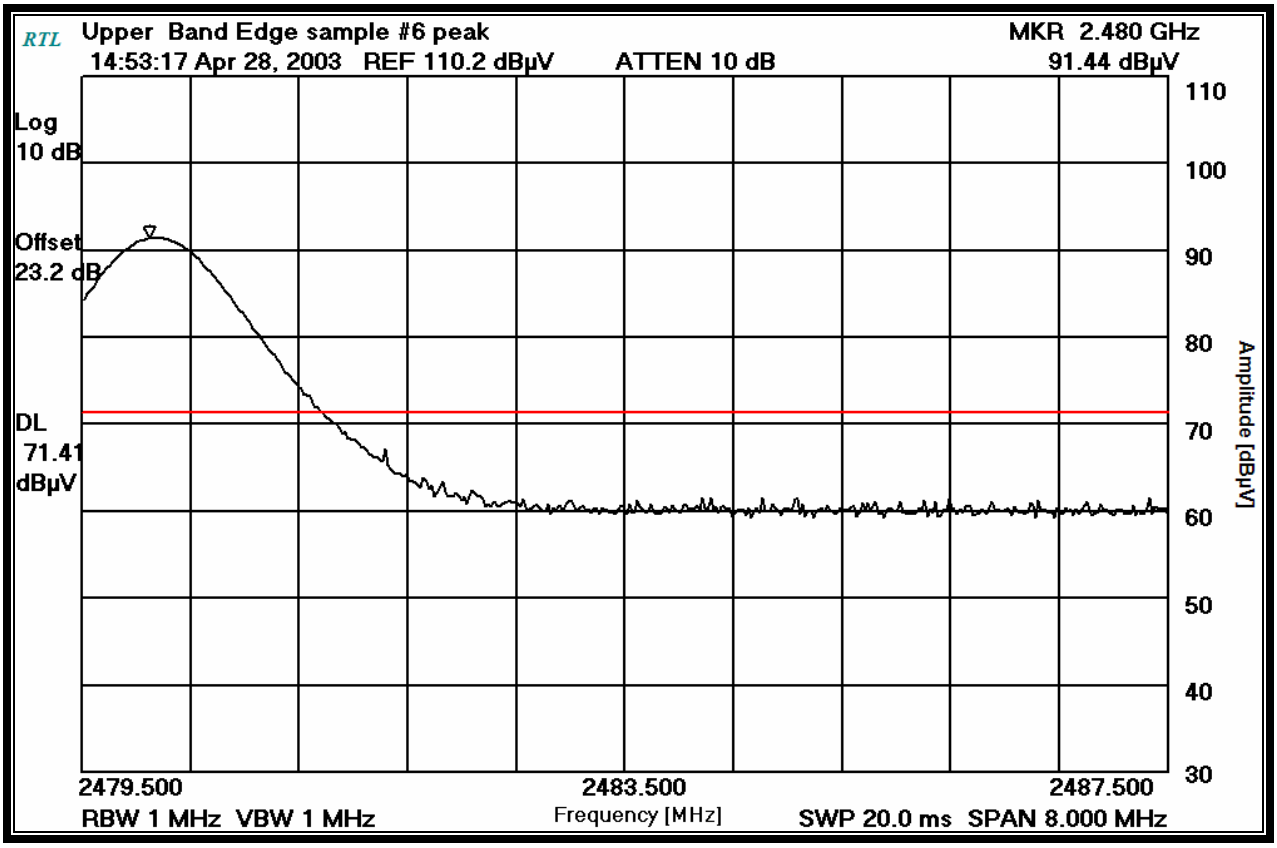
Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	7.5

PLOT 3-23: UPPER BAND EDGE: AVERAGE MEASUREMENT ZPR POD



Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20

PLOT 3-24: UPPER BAND EDGE: PEAK MEASUREMENT ZPR POD



TEST PERSONNEL:

Daniel W. Baltzell		April 28, 2003
Test Engineer	Signature	Date Of Test

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

The EUT is battery operated, but an AC Adapter provided 9 VDC to power the Bluetooth module, and conducted line emission data is presented as follows.

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 (EUT 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 7 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 7 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. No video filter less than 10 times the resolution bandwidth was 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 limit were measured and have been recorded in this report.

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 initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emissions exceed the limit with the instrument set to the quasi-peak mode, then measurements are made in the average mode. If the quasi-peak measurement is at least 6dB higher than the amplitude in the average mode, the level measured in the quasi-peak mode may be reduced by 13dB before comparing it to the limit.

The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and PHASE SIDE.

TABLE 4-1: CONDUCTED EMISSION TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibaration Due Date
900339	Hewlett Packard	85650A	Quasi-Peak Adapter (30 Hz - 1 GHz)	2521A00743	4/10/04
901084	AFJ international	LS16	16A LISN	16010020082	11/4/03
900968	Hewlett Packard	8567A	Spectrum Analyzer (10 kHz - 1.5 GHz)	2602A00160	4/10/04
900970	Hewlett Packard	85662A	Spectrum Analyzer Display	2542A11239	4/10/04

4.3 CONDUCTED SPURIOUS EMISSIONS TEST DATA

TABLE 4-2: CONDUCTED EMISSIONS RECEIVER (LINE 1)

Temperature: 74°F Humidity: 43%										
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail	Comments
0.203	Pk	36.5	1.6	38.1	63.5	-25.4	53.5	-15.4	Pass	
0.397	Pk	31.6	1.0	32.6	57.9	-25.3	47.9	-15.3	Pass	
0.790	Pk	26.0	0.9	26.9	56.0	-29.1	46.0	-19.1	Pass	
1.212	Pk	25.7	1.0	26.7	56.0	-29.3	46.0	-19.3	Pass	
1.605	Pk	25.4	1.2	26.6	56.0	-29.4	46.0	-19.4	Pass	
2.614	Pk	22.0	1.5	23.5	56.0	-32.5	46.0	-22.5	Pass	
4.825	Pk	20.2	1.9	22.1	56.0	-33.9	46.0	-23.9	Pass	

TABLE 4-3: CONDUCTED EMISSIONS RECEIVER (LINE 2)

Temperature: 74°F Humidity: 43%										
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail	Comments
0.203	Pk	32.8	1.6	34.4	63.5	-29.1	53.5	-19.1	Pass	
0.402	Pk	29.6	1.0	30.6	57.8	-27.2	47.8	-17.2	Pass	
0.810	Pk	29.7	0.9	30.6	56.0	-25.4	46.0	-15.4	Pass	
1.198	Pk	24.1	1.0	25.1	56.0	-30.9	46.0	-20.9	Pass	
1.610	Pk	24.7	1.2	25.9	56.0	-30.1	46.0	-20.1	Pass	
2.027	Pk	22.2	1.4	23.6	56.0	-32.4	46.0	-22.4	Pass	
4.874	Pk	20.9	1.9	22.8	56.0	-33.2	46.0	-23.2	Pass	

TABLE 4-4: CONDUCTED EMISSIONS TRANSMITTER (LINE 1) CHANNEL 2 (2402 MHZ)

Temperature: 74°F Humidity: 43%										
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail	Comments
0.150	Pk	40.5	2.0	42.5	66.0	-23.5	56.0	-13.5	Pass	
0.405	Pk	33.4	1.0	34.4	57.8	-23.4	47.8	-13.4	Pass	
0.812	Pk	34.7	0.9	35.6	56.0	-20.4	46.0	-10.4	Pass	
1.230	Pk	15.7	1.0	16.7	56.0	-39.3	46.0	-29.3	Pass	
4.510	Pk	13.1	1.9	15.0	56.0	-41.0	46.0	-31.0	Pass	
18.140	Pk	15.6	3.7	19.3	60.0	-40.7	50.0	-30.7	Pass	

TABLE 4-5: CONDUCTED EMISSIONS TRANSMITTER (LINE 2) CHANNEL 2 (2402 MHZ)

Temperature: 74°F Humidity: 43%										
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail	Comments
0.151	Pk	40.8	2.0	42.8	65.9	-23.1	55.9	-13.1	Pass	
0.268	Pk	37.9	1.3	39.2	61.2	-22.0	51.2	-12.0	Pass	
0.463	Pk	34.6	0.9	35.5	56.6	=21.1	46.6	-11.1	Pass	
0.770	Pk	31.8	0.9	32.7	56.0	-23.3	46.0	-13.3	Pass	
0.808	Pk	33.7	0.9	34.6	56.0	-21.4	46.0	-11.4	Pass	
1.060	Pk	22.4	1.0	23.4	56.0	-32.6	46.0	-22.6	Pass	
20.200	Pk	19.0	3.8	22.8	60.0	-37.2	50.0	-27.2	Pass	

TABLE 4-6: CONDUCTED EMISSIONS TRANSMITTER (LINE 1) CHANNEL 40 (2440 MHZ)

Temperature: 74°F Humidity: 43%										
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**QP Limit (dBuV)**	**QP Margin (dBuV)**	**AV Limit (dBuV)**	**AV Margin (dBuV)**	**Pass/ Fail**	**Comments**
0.163	Pk	40.9	1.9	42.8	65.3	-22.5	55.3	-12.5	Pass	
0.309	Pk	37.0	1.0	38.0	60.0	-22.0	50.0	-12.0	Pass	
0.803	Pk	32.7	0.9	33.6	56.0	-22.4	46.0	-12.4	Pass	
1.150	Pk	20.0	1.0	21.0	56.0	-35.0	46.0	-25.0	Pass	
4.360	Pk	16.7	1.8	18.5	56.0	-37.5	46.0	-27.5	Pass	
19.360	Pk	18.1	3.7	21.8	60.0	-38.2	50.0	-28.2	Pass	

TABLE 4-7: CONDUCTED EMISSIONS TRANSMITTER (LINE 2) CHANNEL 40 (2440 MHZ)

Temperature: 74°F Humidity: 43%										
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**QP Limit (dBuV)**	**QP Margin (dBuV)**	**AV Limit (dBuV)**	**AV Margin (dBuV)**	**Pass/ Fail**	**Comments**
0.154	Pk	40.6	2.0	42.6	65.8	-23.2	55.8	-13.2	Pass	
0.267	Pk	38.6	1.3	39.9	61.2	-21.3	51.2	-11.3	Pass	
0.416	Pk	35.4	1.0	36.4	57.5	-21.1	47.5	-11.1	Pass	
0.795	Pk	33.3	0.9	34.2	56.0	-21.8	46.0	-11.8	Pass	
1.060	Pk	21.0	1.0	22.0	56.0	-34.0	46.0	-24.0	Pass	
8.420	Pk	16.6	2.5	19.1	60.0	-40.9	50.0	-30.9	Pass	
17.070	Pk	15.8	3.6	19.4	60.0	-40.6	50.0	-30.6	Pass	

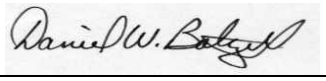
TABLE 4-8: CONDUCTED EMISSIONS TRANSMITTER (LINE 1) CHANNEL 80 (2480 MHZ)

Temperature: 74°F Humidity: 43%										
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**QP Limit (dBuV)**	**QP Margin (dBuV)**	**AV Limit (dBuV)**	**AV Margin (dBuV)**	**Pass/ Fail**	**Comments**
0.159	Pk	40.8	2.0	42.8	65.5	-22.7	55.5	-12.7	Pass	
0.380	Pk	36.3	1.0	37.3	58.3	-21.0	48.3	-11.0	Pass	
0.530	Pk	32.0	0.8	32.8	56.0	-23.2	-46.0	-13.2	Pass	
0.797	Pk	31.9	0.9	32.8	56.0	-23.2	46.0	-13.2	Pass	
1.170	Pk	18.6	1.0	19.6	56.0	-36.4	46.0	-26.4	Pass	
4.480	Pk	16.8	1.9	18.7	56.0	-37.3	46.0	-27.3	Pass	
18.780	Pk	17.6	3.7	21.3	60.0	-38.7	50.0	-28.7	Pass	

TABLE 4-9: CONDUCTED EMISSIONS TRANSMITTERS (LINE 2) CHANNEL 80 (2480 MHZ)

Temperature: 74°F Humidity: 43%										
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**QP Limit (dBuV)**	**QP Margin (dBuV)**	**AV Limit (dBuV)**	**AV Margin (dBuV)**	**Pass/ Fail**	**Comments**
0.154	Pk	40.6	2.0	42.6	65.8	-23.2	55.8	-13.2	Pass	
0.267	Pk	38.6	1.3	39.9	61.2	-21.3	51.2	-11.3	Pass	
0.416	Pk	35.4	1.0	36.4	57.5	-21.1	47.5	-11.1	Pass	
0.795	Pk	33.3	0.9	34.2	56.0	-21.8	46.0	-11.8	Pass	
1.060	Pk	21.0	1.0	22.0	56.0	-34.0	46.0	-24.0	Pass	
8.420	Pk	16.6	2.5	19.1	60.0	-40.9	50.0	-30.9	Pass	
17.070	Pk	15.8	3.6	19.4	60.0	-40.6	50.0	-30.6	Pass	

TEST PERSONNEL:



Daniel W. Baltzell		May 28, 2003
Test Engineer	Signature	Date Of Test

5 RADIATED EMISSION LIMITS RECEIVER/DIGITAL INTERFACE – FCC §15.209; IC RSS-210 §7.3

5.1 RECEIVER/DIGITAL INTERFACE RADIATED EMISSION LIMITS TEST PROCEDURE

Emissions from the digital portion of the EUT were tested and found to comply with the requirements of FCC Part 15.209.

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	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	5/10/03
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	5/10/03
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 EMISSION

Temperature: 74°F Humidity: 43%									
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)**
32.000	Qp	H	0	1.0	34.2	-11.0	23.2	40.0	-16.8
48.000	Qp	H	90	2.0	41.6	-19.8	21.8	40.0	-18.2
64.000	Qp	H	90	2.0	42.5	-23.3	19.2	40.0	-20.8
79.389	Qp	V	30	1.0	55.1	-23.0	32.1	40.0	-7.9
96.000	Qp	H	0	1.0	47.7	-19.6	28.1	43.5	-15.4
112.000	Qp	V	225	1.0	41.8	-16.4	25.4	43.5	-18.1
128.000	Qp	V	225	1.0	41.9	-16.2	25.7	43.5	-17.8
144.000	Qp	H	90	2.2	45.2	-17.8	27.4	43.5	-16.1
160.000	Qp	H	30	2.2	50.2	-18.6	31.6	43.5	-11.9
176.000	Qp	V	0	1.0	38.5	-18.7	19.8	43.5	-23.7
192.000	Qp	H	255	1.5	38.6	-19.6	19.0	43.5	-24.5
208.000	Qp	H	225	1.5	39.7	-18.6	21.1	43.5	-22.4

QP: RES. =100 KHZ, VID= 100 KHZ

TEST PERSONNEL:

Daniel W. Baltzell		April 28, 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 applies 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. The EUT was tested in the 3 orthogonal planes.

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	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	Electro-Metrics	EM-6961 (RGA-60)	Double Ridged Guide Antenna 1 - 18 GHz	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	5/10/03
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	5/10/03
900932	Hewlett Packard	8449B	Microwave Preamplifier, 1 to 26.5 GHz	3008A00505	7/15/03
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	5/10/03

6.3 RADIATED EMISSIONS HARMONICS/SPURIOUS TEST DATA

Operating Frequency (MHz): 2440
Measured Level at 100 kHz (dBuV/m): 94.1
Limit (dBuV/m): 74.1

TABLE 6-2: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 40; 2440 MHZ; CAMEO 3)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB0
4879.989	21.7	14.3	13.5	27.8	54.0	-26.2
7319.984	27.2	23.7	12.1	35.8	54.0	-18.2
9759.979	27.2	22.5	17.1	39.6	74.1	-34.5
12199.979	13.8	6.8	16.5	23.3	54.0	-30.7
14639.979	13.5	6.5	22.9	29.4	74.1	-44.7
17079.979	17.3	7.8	24.3	32.1	74.1	-42.0
19519.979	17.2	9.2	26.1	35.3	54.0	-18.7
21959.979	18.3	7.7	27.0	34.7	74.1	-39.4
24399.979	19.0	9.8	30.1	39.9	74.1	-34.2

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

Operating Frequency (MHz): 2440
Measured Level at 100 kHz (dBuV/m): 93.8
Limit (dBuV/m): 73.8

TABLE 6-3: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 40; 2440 MHZ; CAMEO 2)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB0
4879.982	18.3	13.7	13.5	27.2	54.0	-26.8
7319.984	25.7	22.0	12.1	34.1	54.0	-19.9
9759.979	25.2	21.8	17.1	38.9	73.8	-34.9
12199.979	16.3	6.3	16.5	22.8	54.0	-31.2
14639.979	17.8	10.8	22.9	33.7	73.8	-40.1
17079.979	16.6	8.2	24.3	32.5	73.8	-41.3
19519.979	20.2	8.3	26.1	34.4	54.0	-19.6
21959.979	14.0	7.8	27.0	34.8	73.8	-39.0
24399.979	18.2	9.2	30.1	39.3	73.8	-34.5

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

Operating Frequency (MHz): 2440
Measured Level at 100 kHz (dBuV/m): 88.9
Limit (dBuV/m): 68.9

TABLE 6-4: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 40; 2440 MHZ; QL-220)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB0
4879.982	20.2	13.7	13.5	27.2	54.0	-26.8
7319.984	21.3	17.3	12.1	29.4	54.0	-24.6
9759.979	23.3	19.3	17.1	36.4	68.9	-32.5
12199.979	14.3	6.8	16.5	23.3	54.0	-30.7
14639.979	18.0	9.3	22.9	32.2	68.9	-36.7
17079.979	17.3	9.0	24.3	33.3	68.9	-35.6
19519.979	15.0	9.5	26.1	35.6	54.0	-18.4
21959.979	16.7	9.0	27.0	36.0	68.9	-32.9
24399.979	18.2	10.2	30.1	40.3	68.9	-28.6

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

Operating Frequency (MHz): 2440
Measured Level at 100 kHz (dBuV/m): 90.6
Limit (dBuV/m): 70.6

TABLE 6-5: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 40; 2440 MHZ; CAMEO 3 SC)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB0
4879.998	21.7	15.7	13.5	29.2	54.0	-24.8
7319.996	32.2	30.7	12.1	42.8	54.0	-11.2
9759.979	32.0	30.7	17.1	47.8	70.6	-22.8
12199.979	19.3	10.8	16.5	27.3	54.0	-26.7
14639.979	17.7	8.7	22.9	31.6	70.6	-39.0
17079.979	15.3	8.7	24.3	33.0	70.6	-37.6
19519.979	16.5	8.8	26.1	34.9	54.0	-19.1
21959.979	16.3	8.2	27.0	35.2	70.6	-35.4
24399.979	17.0	9.5	30.1	39.6	70.6	-31.0

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

Operating Frequency (MHz): 2440
Measured Level at 100 kHz (dBuV/m): 91.6
Limit (dBuV/m): 71.6

TABLE 6-6: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 40; 2440 MHZ; QL-320)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB0
4879.995	19.8	12.0	13.5	25.5	54.0	-28.5
7319.984	20.0	15.0	12.1	27.1	54.0	-26.9
9759.979	20.5	12.2	17.1	29.3	71.6	-42.3
12199.979	13.2	6.2	16.5	22.7	54.0	-31.3
14639.979	16.2	9.0	22.9	31.9	71.6	-39.7
17079.979	16.7	8.2	24.3	32.5	71.6	-39.1
19519.979	17.0	8.7	26.1	34.8	54.0	-19.2
21959.979	16.5	8.0	27.0	35.0	71.6	-36.6
24399.979	17.8	10.2	30.1	40.3	71.6	-31.3

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

Operating Frequency (MHz): 2440
Measured Level at 100 kHz (dBuV/m): 89.9
Limit (dBuV/m): 69.9

TABLE 6-7: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 40; 2440 MHZ; ZPR POD)

Emission Frequency (MHz)	Analyzer Reading (dBuV) Peak	Analyzer Reading (dBuV) Average	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB0
4879.982	19.5	13.0	13.5	26.5	54.0	-27.5
7319.984	25.5	22.8	12.1	34.9	54.0	-19.1
9759.988	23.0	19.2	17.1	36.3	69.9	-33.6
12199.988	18.5	7.5	16.5	24.0	54.0	-30.0
14639.988	19.5	7.8	22.9	30.7	69.9	-39.2
17079.988	15.2	8.0	24.3	32.3	69.9	-37.6
19519.988	17.7	8.3	26.1	34.4	54.0	-19.6
21959.988	15.7	2.0	27.0	29.0	69.9	-40.9
24399.988	17.5	9.0	30.1	39.1	69.9	-30.8

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ

TEST PERSONNEL:

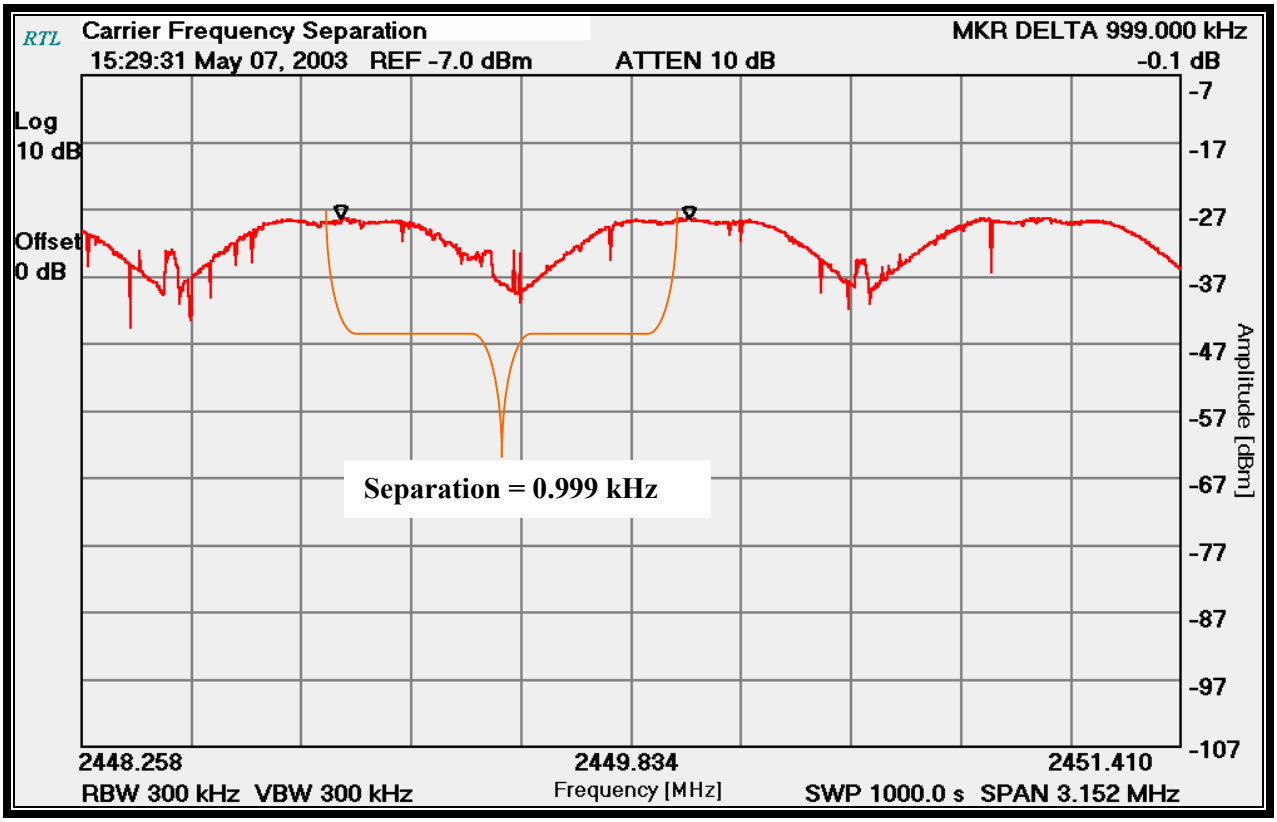
Daniel W. Baltzell		April 29, 2003
EMC Test Engineer	Signature	Date Of Test

7 CARRIER FREQUENCY SEPARATION - §15.247 (A)(1)

Frequency Hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Measured frequency separation = 0.999 kHz

PLOT 7-1: CARRIER FREQUENCY SEPARATION



TEST PERSONNEL:

Daniel W. Baltzell		May 7, 2003
EMC Test Engineer	Signature	Date Of Test

7.1 20 DB BANDWIDTH TEST PROCEDURE – FCC §15.247 (a)(1)(ii); IC RSS-210 §5.9.1

The minimum 20 dB bandwidths per RSS-210 were measured using a 50 ohm spectrum analyzer. The carrier was adjusted on the analyzer so that it was displayed entirely on the Spectrum Analyzer. The sweep time was set to 10 seconds and allowed through several sweeps with the max hold function used in peak detector mode. The resolution bandwidth was set to 100 kHz, and the video bandwidth set at 300 kHz. The minimum 20 dB bandwidths were measured using the spectrum analyzer delta marker set 20 dB down from the peak of the carrier and modulated with a 2 Mbps data rate. The table below contains the bandwidth measurement results.

TABLE 7-1 20 DB BANDWIDTH TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771	5/10/03

TABLE 7-2 MODULATED BANDWIDTH TEST DATA

Minimum 20 dB bandwidths

CHANNEL	20 dB BANDWIDTH (kHz)
2	143.0
40	143.0
80	143.0

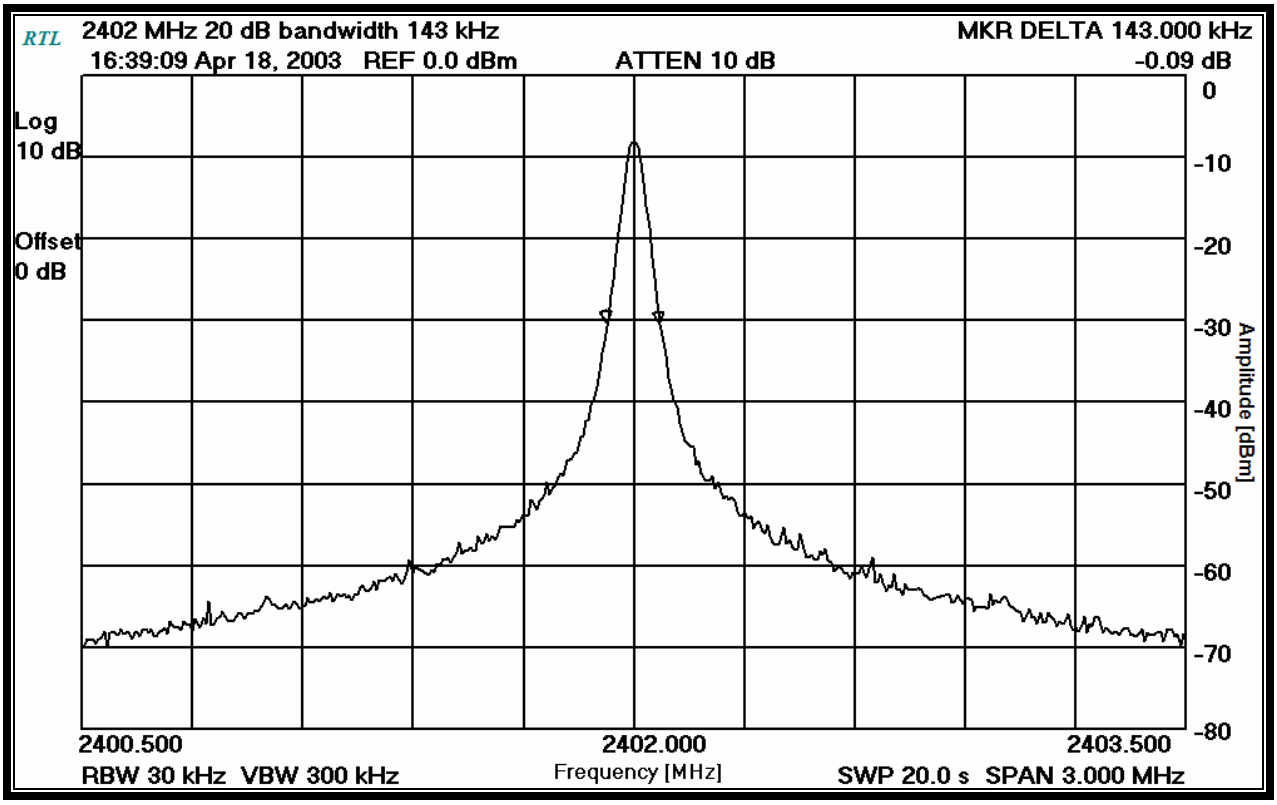
TEST PERSONNEL:

Daniel W. Baltzell		April 18, 2003
EMC Test Engineer	Signature	Date Of Test

20 dB Bandwidth Plots

Channel:	2
Channel Frequency (MHz):	2402
Resolution Bandwidth (kHz):	30
Video Bandwidth (kHz):	300
Span (MHz):	3

PLOT 7-2: 20 DB BANDWIDTH CHANNEL 2

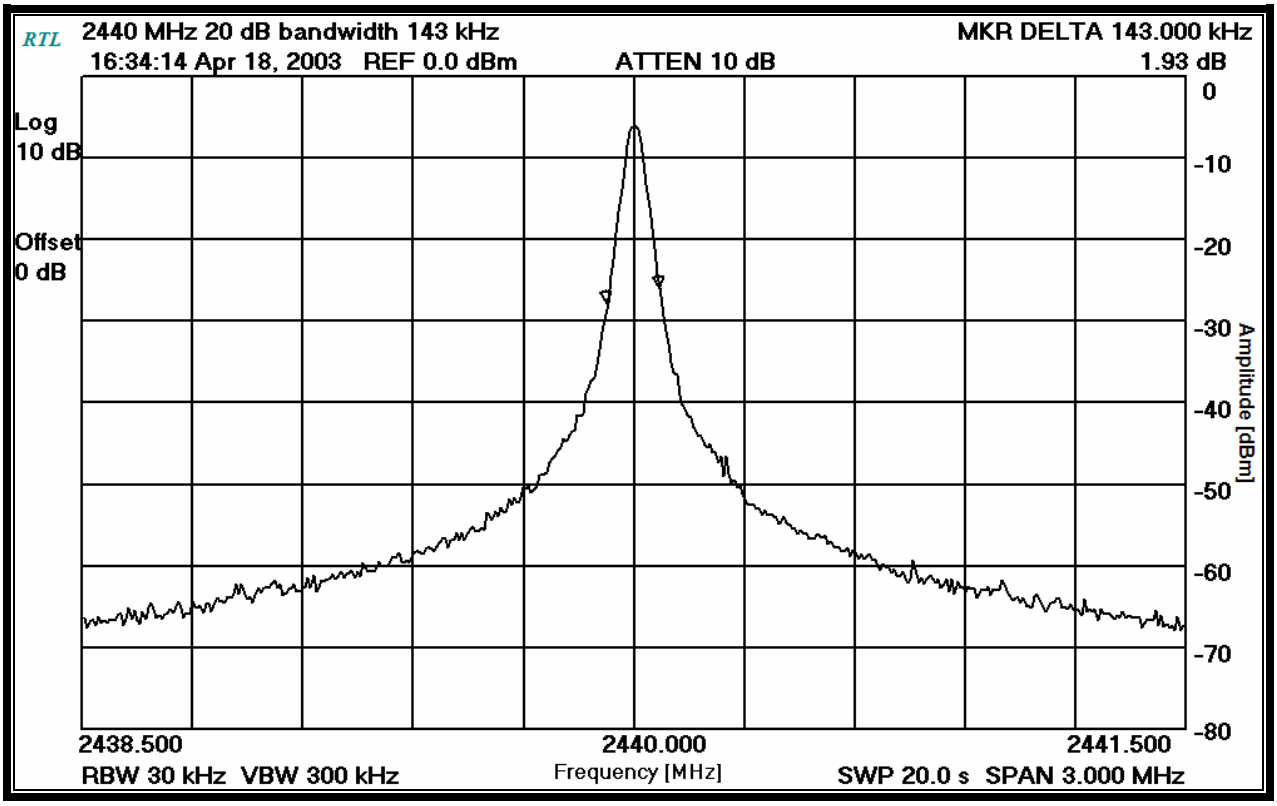


TEST PERSONNEL:

Daniel W. Baltzell		April 18, 2003
EMC Test Engineer	Signature	Date Of Test

Channel:	40
Channel Frequency (MHz):	2440
Resolution Bandwidth (kHz):	30
Video Bandwidth (kHz):	300
Span (MHz):	3

PLOT 7-3: 20 DB BANDWIDTH CHANNEL 40

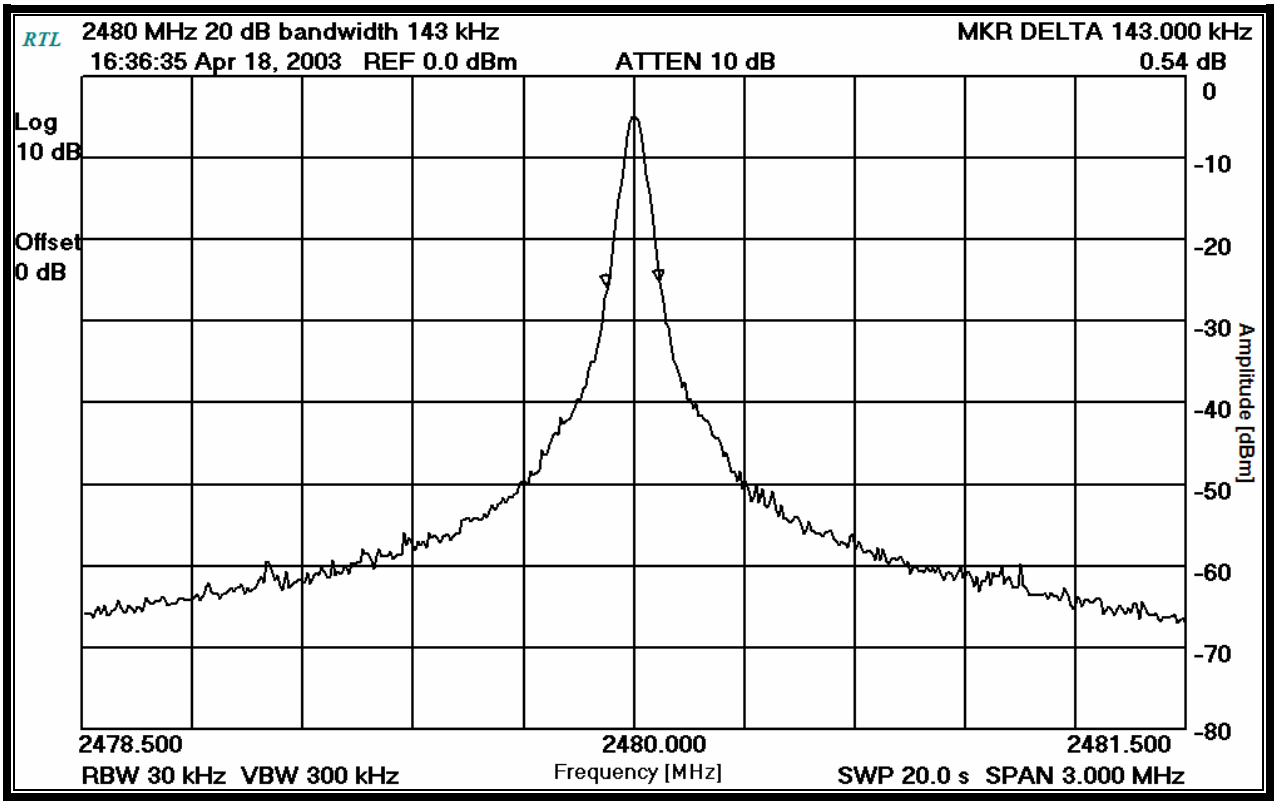


TEST PERSONNEL:

Daniel W. Baltzell		April 18, 2003
EMC Test Engineer	Signature	Date Of Test

Channel:	80
Channel Frequency (MHz):	2480
Resolution Bandwidth (kHz):	30
Video Bandwidth (kHz):	300
Span (MHz):	3

PLOT 7-4: 20 DB BANDWIDTH CHANNEL 80



TEST PERSONNEL:

Daniel W. Baltzell		April 18, 2003
EMC Test Engineer	Signature	Date Of Test

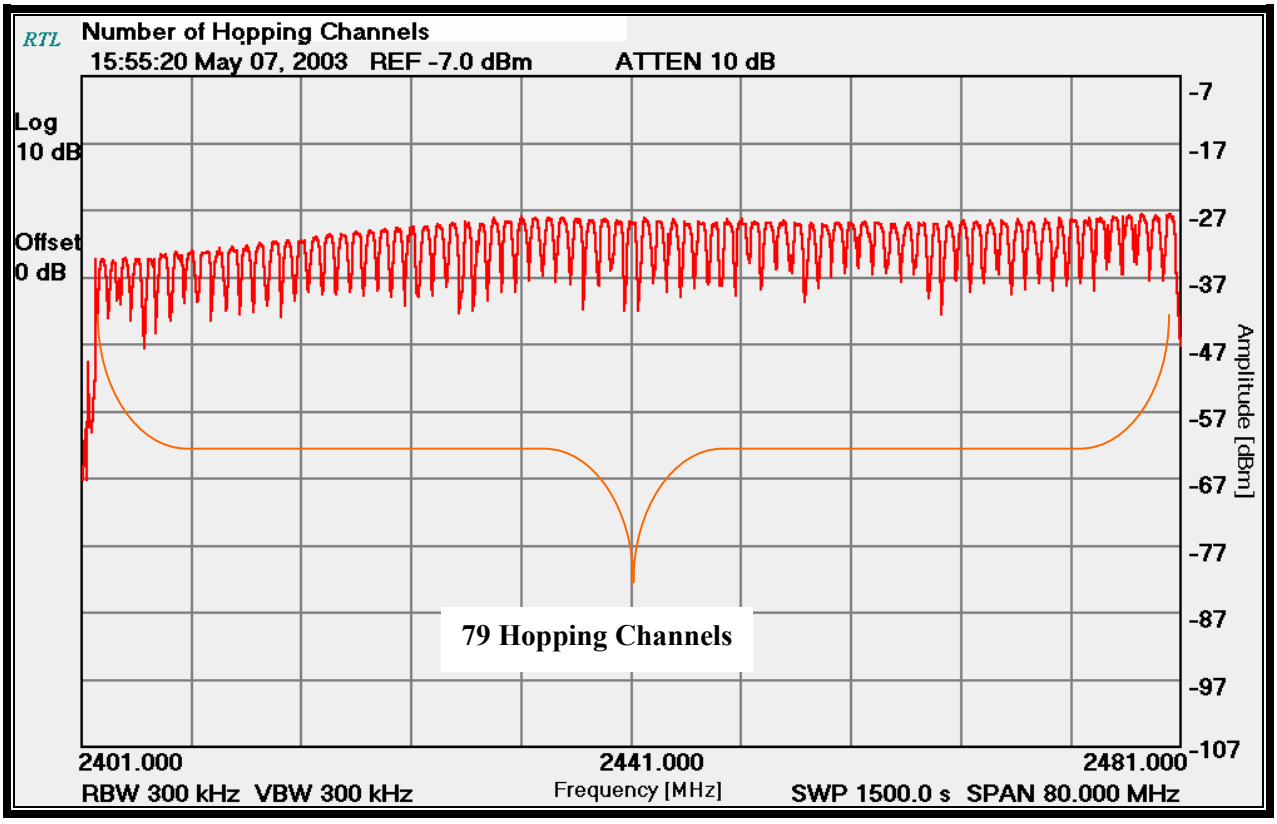
8 HOPPING CHARACTERISTICS – FCC §15.247 (A)(1)(III); IC RSS-210 §6.2.2(O)

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems which use fewer than 75 hopping frequencies may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels are used.

8.1 NUMBER OF HOPPING FREQUENCIES

Measured number of hopping frequencies = 79

PLOT 8-1: NUMBER OF HOPPING FREQUENCIES



TEST PERSONNEL:

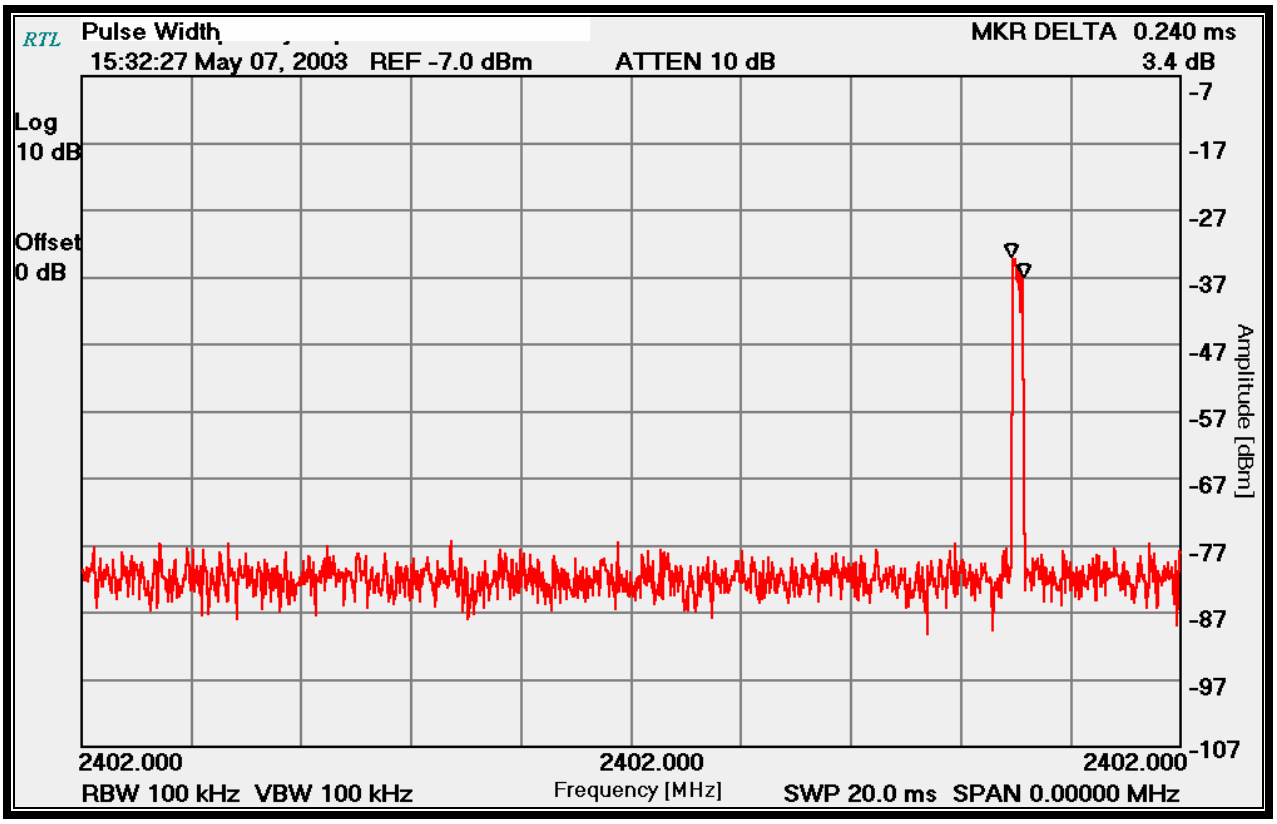
Daniel W. Baltzell		May 7, 2003
EMC Test Engineer	Signature	Date Of Test

8.2 AVERAGE TIME OF OCCUPANCY

The spectrum analyzer sweep was set to 0.020 second, with a zero span and max hold until a pulse from the device under test was captured. A marker delta was used to measure dwell time for this plot. The sweep was then set to single sweep for 30 seconds for the required average time and the number of pulses counted to calculate the average time of occupancy as:

Number of Pulses in 30 Seconds (84) x Dwell Time Measured (0.240 milliseconds) = 19.9 ms Average Occupancy in 30 seconds. Since the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed, and the number of hopping channels is 79, then: 79x 0.4s = 31.6s and the number of the average occupancy on any channel is 0.02 s within a 30 second period which meets this criteria.

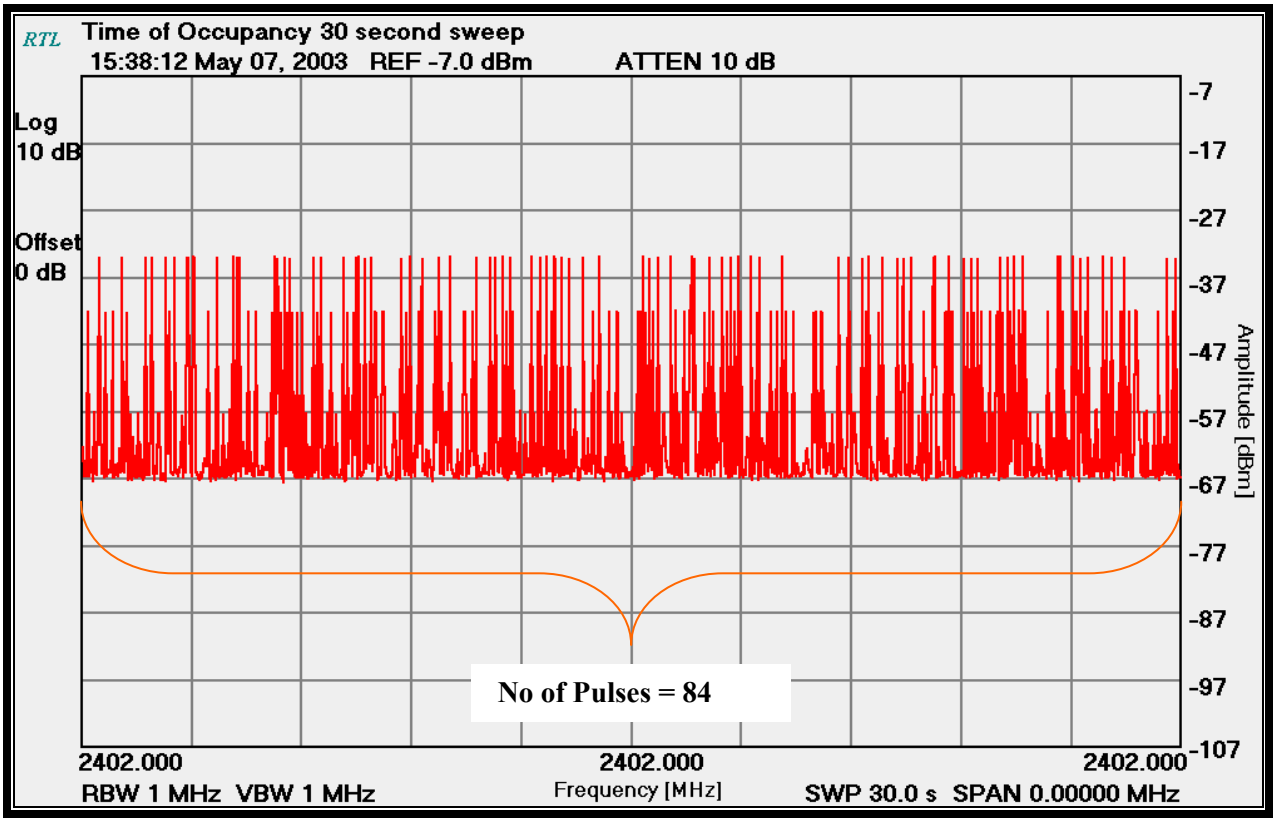
PLOT 8-2: TIME OF OCCUPANCY (DWELL TIME)



TEST PERSONNEL:

Daniel W. Baltzell		May 7, 2003
EMC Test Engineer	Signature	Date Of Test

PLOT 8-3: TIME OF OCCUPANCY (DWELL TIME 30 SECOND SWEEP)



TEST PERSONNEL:

Daniel W. Baltzell		May 7, 2003
EMC Test Engineer	Signature	Date Of Test

9 MODULATED BANDWIDTH - §15.247(A)(2)

9.1 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 300 kHz. The minimum 6 dB bandwidths are presented in Table 9-2.

9.2 BANDWIDTH TEST EQUIPMENT

TABLE 9-1: BANDWIDTH TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DUE DATE
900931	HEWLETT PACKARD	8566B	SPECTRUM ANALYZER (100HZ – 22 GHZ)	3138A07771	5/10/03

9.3 BANDWIDTH TEST DATA

TABLE 9-2: MINIMUM 6 DB BANDWIDTH TEST DATA

CHANNEL	6 dB BANDWIDTH (kHz)
2	53
40	53
80	60

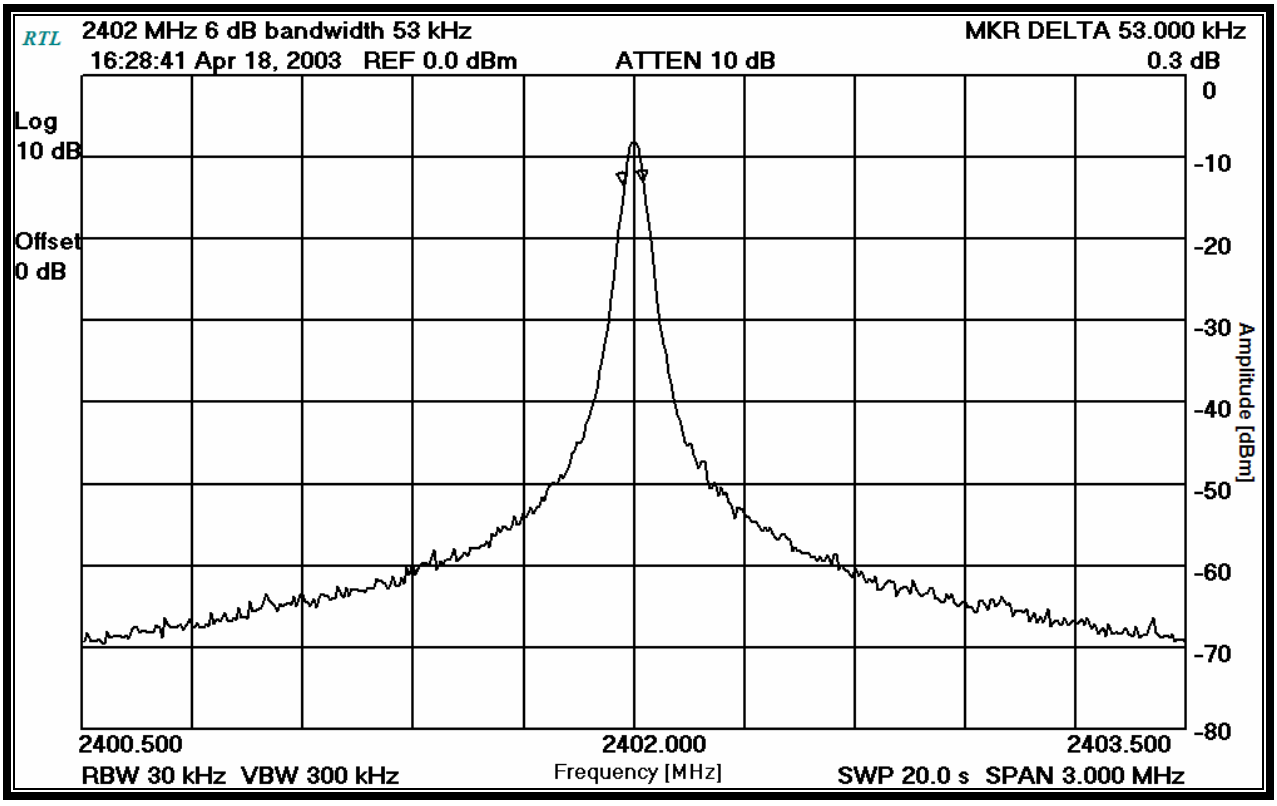
TEST PERSONNEL:

Daniel W. Baltzell		April 18, 2003
EMC Test Engineer	Signature	Date Of Test

9.4 MODULATED BANDWIDTH PLOTS

Channel Number:	2
Frequency (MHz):	2402
Resolution Bandwidth (kHz):	30
Video Bandwidth (kHz):	100
Sweep Time (s):	20

PLOT 9-1: MODULATED BANDWIDTH CHANNEL 2

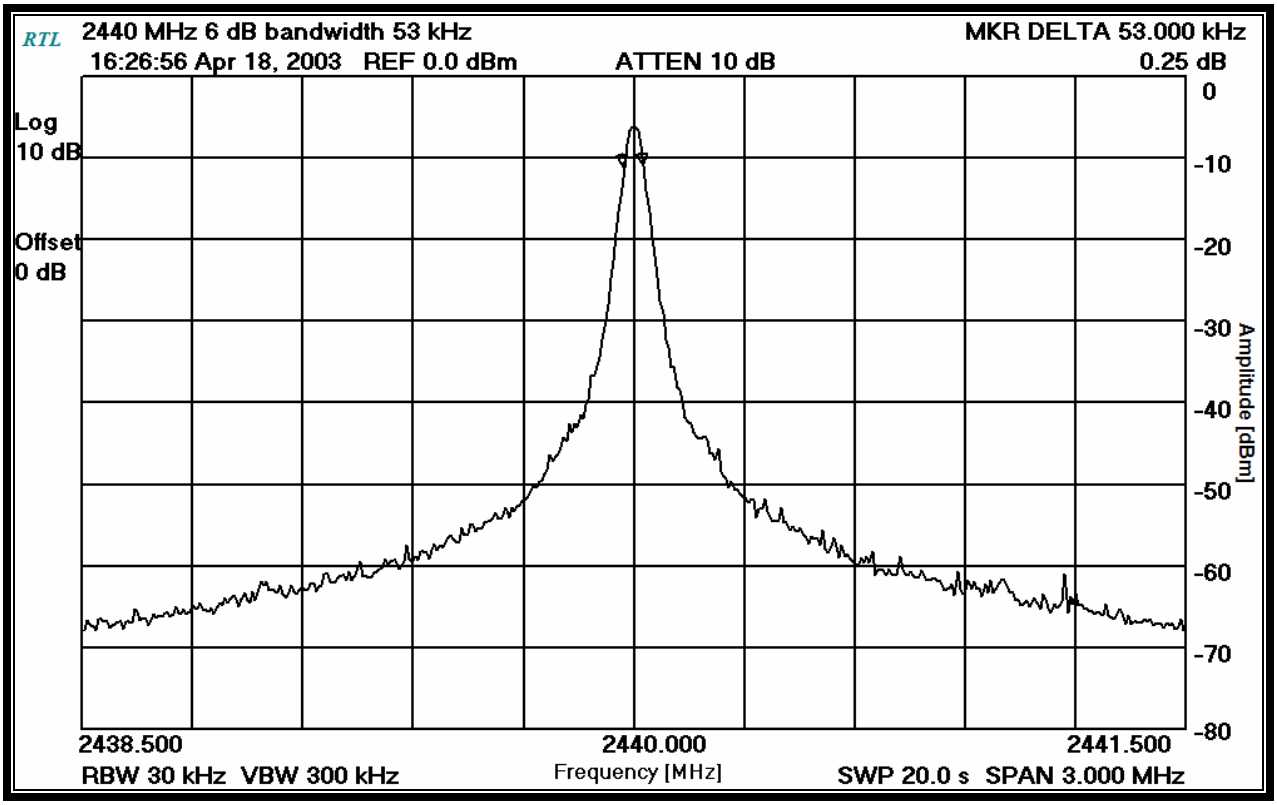


TEST PERSONNEL:

Daniel W. Baltzell		April 18, 2003
EMC Test Engineer	Signature	Date Of Test

Channel Number:	40
Frequency (MHz):	2440
Resolution Bandwidth (kHz):	30
Video Bandwidth (kHz):	100
Sweep Time (s):	20

PLOT 9-2: MODULATED BANDWIDTH CHANNEL 40

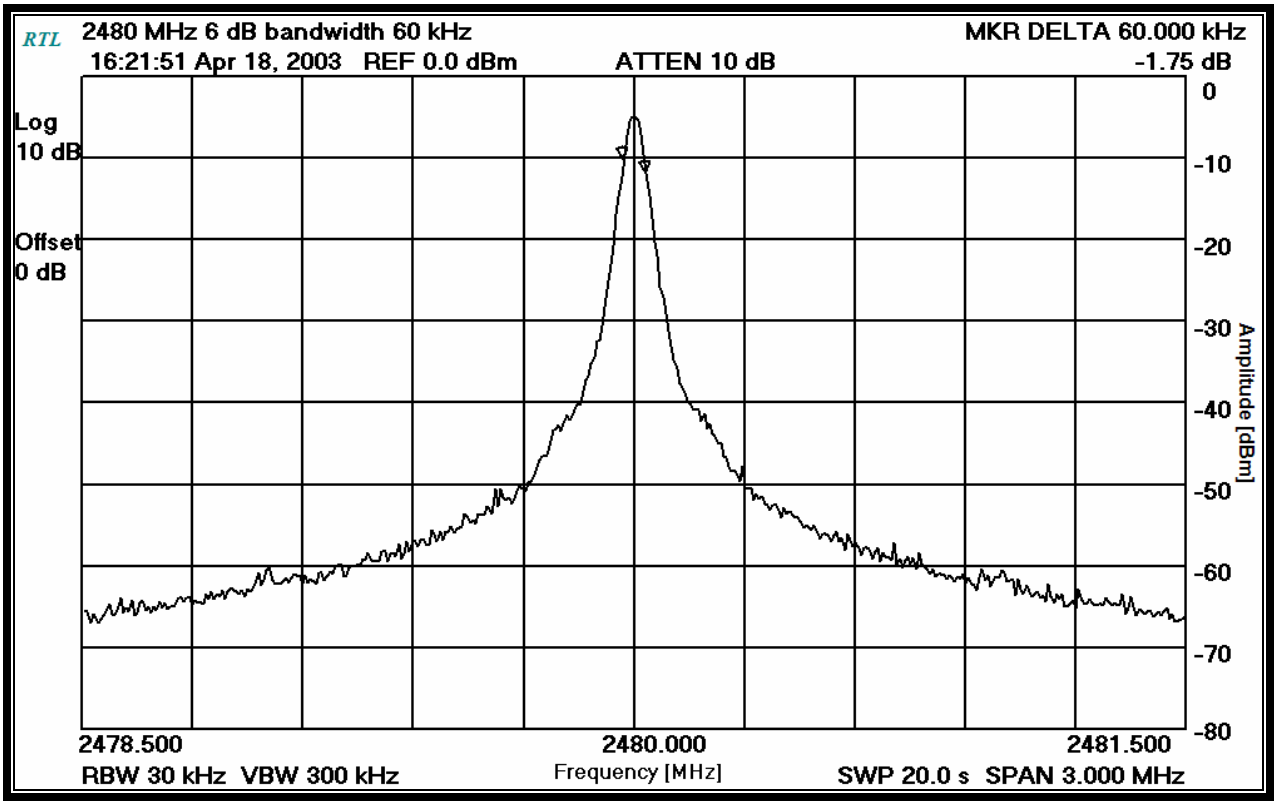


TEST PERSONNEL:

Daniel W. Baltzell		April 18, 2003
EMC Test Engineer	Signature	Date Of Test

Channel Number:	80
Frequency (MHz):	2480
Resolution Bandwidth (kHz):	30
Video Bandwidth (kHz):	100
Sweep Time (s):	20

PLOT 9-3: MODULATED BANDWIDTH CHANNEL 80



TEST PERSONNEL:

Daniel W. Baltzell		April 18, 2003
EMC Test Engineer	Signature	Date Of Test

10 PEAK OUTPUT POWER - FCC §15.247(B)(1); IC RSS-210 §6.2.2(o)(b)

10.1 CONDUCTED ANTENNA PORT POWER OUTPUT TEST PROCEDURE

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

10.2 CONDUCTED ANTENNA PORT POWER OUTPUT TEST EQUIPMENT

TABLE 10-1: CONDUCTED ANTENNA PORT 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

10.3 CONDUCTED ANTENNA PORT POWER OUTPUT TEST DATA

TABLE 10-2: CONDUCTED ANTENNA PORT POWER OUTPUT TEST DATA

FREQUENCY (MHZ)	CHANNEL	PEAK POWER CONDUCTED OUTPUT (dBm)	PEAK POWER CONDUCTED OUTPUT (mW)
2402	2	-3.68	0.4
2440	40	-1.17	0.8
2480	80	-0.99	0.8

TEST PERSONNEL:

Daniel W. Baltzell  April 16, 2003

EMC Test Engineer | Signature | Date Of Test

11 ANTENNA CONDUCTED SPURIOUS EMISSIONS - §15.247(C); IC RSS-210 §6.2.2(o)(e1)

11.1 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST PROCEDURES

Antenna spurious emission per FCC 15.247(c) was 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 2.402 GHz for the low channel, 2.440 GHz for the mid channel and 2.480 GHz for the high channel. No other harmonics or spurs were found within 20 dB of the carrier level from 9kHz to the carrier 10th harmonic. See the Antenna Conducted Spurious Noise Table. The low, middle, and high channels were investigated and tested. No notch filter was used during measurement since the fundamental did not overload the input to the spectrum analyzer.

11.2 ANTENNA CONDUCTED SPURIOUS TEST EQUIPMENT

TABLE 11-1: ANTENNA CONDUCTED SPURIOUS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771	5/10/03

11.3 ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 2

Operating Frequency (MHz): 2402
Channel: 2
Measured Level at 100kHz (dBm): -3.68
Limit (dBm): -23.68

TABLE 11-2: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 2

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
4804.0	-77.5	73.8	23.7	-50.1
7206.0	-77.5	73.8	23.7	-50.1
9608.0	-61.8	58.2	23.7	-34.5
12010.0	-84.0	80.3	23.7	-56.6
14412.0	-83.0	79.3	23.7	-55.6
16814.0	-84.3	80.7	23.7	-57.0
19216.0	-84.5	80.8	23.7	-57.1
21618.0	-83.5	79.8	23.7	-56.1
24020.0	-79.8	76.2	23.7	-52.5

TEST PERSONNEL:

Daniel W. Baltzell		April 16, 2003
EMC Test Engineer	Signature	Date Of Test

11.4 ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 40

Operating Frequency (MHz): 2440
Channel: 40
Measured Level at 100kHz (dBm): -1.17
Limit (dBm): -21.17

TABLE 11-3: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 40

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
4880.0	-74.3	74.3	21.2	-53.2
7320.0	-81.2	80.0	21.2	-58.8
9760.0	-56.0	54.8	21.2	-33.7
12200.0	-81.0	79.8	21.2	-58.7
14640.0	-81.7	80.5	21.2	-59.3
17080.0	-83.8	82.7	21.2	-61.5
19520.0	-83.3	82.2	21.2	-61.0
21960.0	-83.2	82.0	21.2	-60.8
24400.0	-82.7	81.5	21.2	-60.3

TEST PERSONNEL:

Daniel W. Baltzell		April 16, 2003
EMC Test Engineer	Signature	Date Of Test

11.5 ANTENNA CONDUCTED SPURIOUS EMISSIONS HIGH CHANNEL 80

Operating Frequency (MHz): 2480
Channel: 80
Measured Level at 100kHz (dBm): -1.0
Limit (dBm): -21.0

TABLE 11-4: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 80

Frequency (MHz)	Measured Level (dBm)	Measured Level (dBc)	Limit (dBc)	Margin (dB)
4960.0	-75.2	75.2	21.0	-54.2
7440.0	-71.3	70.3	21.0	-49.4
9920.0	-60.5	59.5	21.0	-38.5
12400.0	-85.0	84.0	21.0	-63.0
14880.0	-83.0	82.0	21.0	-61.0
17360.0	-83.7	82.7	21.0	-61.7
19840.0	-83.7	82.7	21.0	-61.7
22320.0	-83.0	82.0	21.0	-61.0
24800.0	-80.7	79.7	21.0	-58.7

TEST PERSONNEL:

Daniel W. Baltzell		April 16, 2003
EMC Test Engineer	Signature	Date Of Test

12 CONCLUSION

The data in this measurement report shows that the Zebra Technologies Model # CC16735-1, Model Name: ZBR-2, Bluetooth Modular Radio, FCC ID: I28MD-BTC2TY complies with all the requirements of Parts 2 and 15 of the FCC Rules and Industry Canada RSS-210. Furthermore, it meets the guidelines for limited modular transmitter approval as shown in FCC Publication DA 00-1407, and should be granted as such.