Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 15.247 AND 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 FCCINFO@rheintech.com	Vivato, Inc. 12610 E. Mirabeau Parkway Suite 900 Spokane, WA 99216 Contact: Marcus daSilva Phone: 509-343-6001 Fax: 509-343-6020 Email: marcus_dasilva@vivato.net

FCC ID:	QLN-DP2310P0001	**GRANTEE FRN NUMBER:**	0004-3370-93
PLAT FORM:	N/A	**RTL WORK ORDER NUMBER:**	2002148
MODEL(S):	DP2310 Wi-Fi Switch	**RTL QUOTE NUMBER:**	QRTL02-534
DATE OF TEST REPORT:	August 20, 2002		

American National Standard Institute:	ANSI/TIA/EIA603 and ANSI/TIA/EIA 603-1
FCC Classification:	DSS – Spread Spectrum Transmitter
FCC Rule Part(s):	Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence 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
2412-2462	0.017	N/A	N/A

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. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

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

Signature: _____ Date: August 20, 2002

Typed/Printed Name: Desmond A. Fraser Position: President

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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 for Certification on the Vivato, Inc. Wireless Packet Switch Multiple Point-to-Point Links, Model Number: DP2310 Wi-Fi Switch, FCC ID: QLN-DP2310P0001. The IF, LO and up to the 2nd LO were investigated and tested.

2 TEST INFORMATION

2.1 TEST JUSTIFICATION

The EUT was tested and investigated in all worst case modes (zero steering, i.e. 0 degree phase angle, negative maximum steering, i.e. -48 degree phase angle, positive maximum steering, i.e. +48 degree phase angle). Furthermore, all phase angles in between -48 degrees and + 48 degrees were investigated as well. Channel 1 at 2412 MHz, Channel 6 at 2437 MHz and channel 11 at 2462 MHz were tested and investigated from 9 kHz to 24 GHz. Data for all three channels and three types of modulations (DBPSK at 1Mbps, DQPSK at 2Mbps, and CCK at 11Mbps) are presented in this report. The data rate at 5.5Mbps CCK modulation was not investigated because the 11Mbps CCK modulation represents the worst case data rate for CCK type modulations.

The EUT contains five 802.11(b) WLAN radio PCI cards. Only one transmits and is connected to 16 output connectors, each driving one element of a multi element antenna, while the other 4 WLAN radio PCI cards are in receive mode for diversity. The change in the output power envelope did not cause the EUT to be non-compliant in any of the aforementioned modes. The table below contains the maximum duty cycle used for each modulation type. Please note that this is the maximum duty cycle that can be achieved when transmitting using each modulation type. Please refer to the manufacturer's attestation with respect to the duty cycle.

TABLE 2-1: MAXIMUM DUTY CYCLE BY MODULATION TYPE

Modulation Type	Data Rate (Mbps)	Duty Cycle
DBPSK	1	99%
DQPSK	2	94%
CCK	5.5	91%
CCK	11	75%

2.2 EXERCISING THE EUT

The EUT was provided with software to continuously transmit during testing including the enabling of steering modes and data rates (depending on the data rates, the duty cycle was found at more than 75 percent). The carrier was also checked to verify that information was being transmitted.

2.3 TEST RESULT SUMMARY

TABLE 2-2: FCC PART 15.247: DIRECT SEQUENCE SPREAD SPECTRUM TEST RESULT SUMMARY

SECTION	Requirement	2400-2483.5 MHz	SUMMARY
a) 2)	The minimum 6 dB bandwidth shall be at least 500 kHz.	Applicable	Measurements in report
b) 1)	The maximum peak output power shall not exceed 1 W.	Applicable	Conducted measurements
b) 3)	If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power stated in b) 1) shall be reduced by the amount of dB that the gain exceeds 6 dBi. Exceptions from this requirement are listed below in the b) 3) i, ii, iii.	Applicable	Measurements in report
b) 3) i)	Systems used exclusively for fixed, point-to-point operations may employ antennas with directional gain of more than 6 dBi. In this case, maximum peak output power of radiator must be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.	Applicable	Professional installation manual attached
b) 3) ii)	In the shown frequency range, systems used exclusively for fixed, point-to-point operations may employ antenna with gain more than 6 dBi without any corrections of transmitter output power.		Not applicable
b) 3) iii)	Exceptions from the b) 3) i and b) 3) ii) shall be made for: - point-to-multipoint systems, - omni directional applications, - multiple co-located intentional radiators. For these systems use requirement listed in Section b) 3).	Applicable	Professional installation manual attached
b) 4)	Systems shall be operated in a manner that ensures that the public is not exposed to RF energy levels more than are permitted via 47CFR paragraph 1.1307 (b)(1), (which refers to paragraph 1.1310).	Applicable	RF Exposure calculation attached
c)	In any 100 kHz bandwidths outside the frequency band in which the radiator is operating (and up to the tenth harmonic of the highest fundamental frequency, or to 40 GHz, whichever is lower – (see Section 15.33), the RF power that is produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency, shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the RF power produced by the radiator. - Attenuation below the general limits specified in 15.209(a) is not required. - Radiated emissions which fall in the restricted band specified in 15.205 (a), must comply with the radiated emission limits of 15.209(a) (up to the tenth harmonic of the highest fundamental frequency, or to 40 GHz, whichever is lower).	Applicable	Measurements in report
d)	The peak power spectral density conducted from the radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.	Applicable	Measurements in report

e)	The processing gain of this kind of system shall be at least 10 dB. (The processing gain shall be determined from the ratio in dB of the signal to noise ratio with the system spreading code turned off and the signal to noise ratio with the system spreading code turned on, as measured at the demodulated output of the receiver).	Applicable	Not applicable
f)	- Hybrid systems that employ a combination of both direct sequence and frequency hopping modulation techniques shall achieve a processing gain of at least 17 dB from the combined techniques. - The frequency hopping operation of the hybrid system, with the direct sequence operation turned off, shall have an average time of occupancy on any frequency less or equal to 0.4 sec within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4. - The frequency hopping operation of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of 15.247.d	Applicable	Not applicable EUT is not a hybrid

TABLE 2-3: TEST RESULT SUMMARY WITH 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	Pass

2.4 TEST SYSTEM DETAILS

The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system are shown in Table 2-4:

TABLE 2-4: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
WI-FI SWITCH	VIVATO, INC.	DP2310 WI-FI SWITCH	N/A	QLN-DP2310P0001	N/A	14594
FRAME	VIVATO, INC.	N/A	N/A	N/A	N/A	14595

TABLE 2-5: EXTERNAL COMPONENTS IN TEST CONFIGURATION

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
MONITOR	VIEWSONIC	VG150B	IQ20651279	DOC	VIDEO/POWER SUPPLY	14596
MOUSE	HP	M-S35	LZE01904794	DOC	NO SHIELDING	14599
HUB	PHOEBE	5 PORT DUAL SPEED HUB	OCTOPU55TX	DOC	ETHERNET CABLE/ EXTERNAL AC/DC CONVERTER	901216
KEYBOARD	IBM	SK-8811	02001080	DOC	NO SHIELDING	14597

2.5 CONFIGURATION OF TESTED SYSTEM

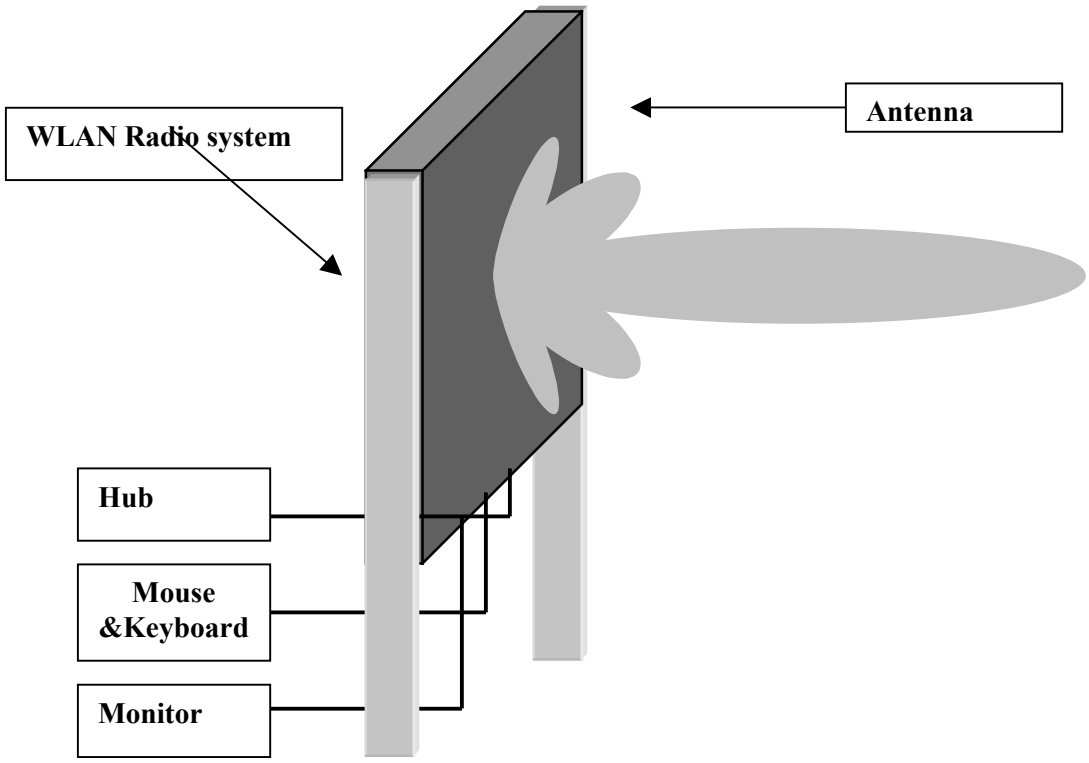


FIGURE 1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

3 COMPLIANCE WITH THE RESTRICTED BAND EDGE - §15.205

3.1 TEST PROCEDURE

Compliance with the band edges was performed using the rules found in FCC parts 15.205 and 15.209 respectively. The final data derived below are from radiated measurements applying absolute detector values only. The data taken in this report represents the worst-case band edges at 11Mbps, 2Mbps and 1Mbps with a duty cycle higher than 75 percent.

3.2 COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA IN 0 DEGREE STEERING MODE

Operating Frequency (MHz): 2412-2462
Channel: 1 & 11
Distance (m): 3
Limit (dBuV/m): 54

TABLE 3-1: COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA (1MBPS)

Channel Set to	Frequency tested (MHz)	Detector	Field Strength Level (dBµV/m)	Level Corrected (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)
1	2390.0	Absolute measurement	23	49.4	54.0	-4.6
11	2483.5	Absolute measurement	18.7	45.1	54.0	-8.9

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

Channel Set to	Frequency tested MHz	Detector	Field Strength Level (dBµV/m)	Level Corrected (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)
1	2390.0	Absolute measurement	23	49.4	54.0	-4.6
11	2483.5	Absolute measurement	18.6	45.0	54.0	-9

TABLE 3-3: COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA (11MBPS)

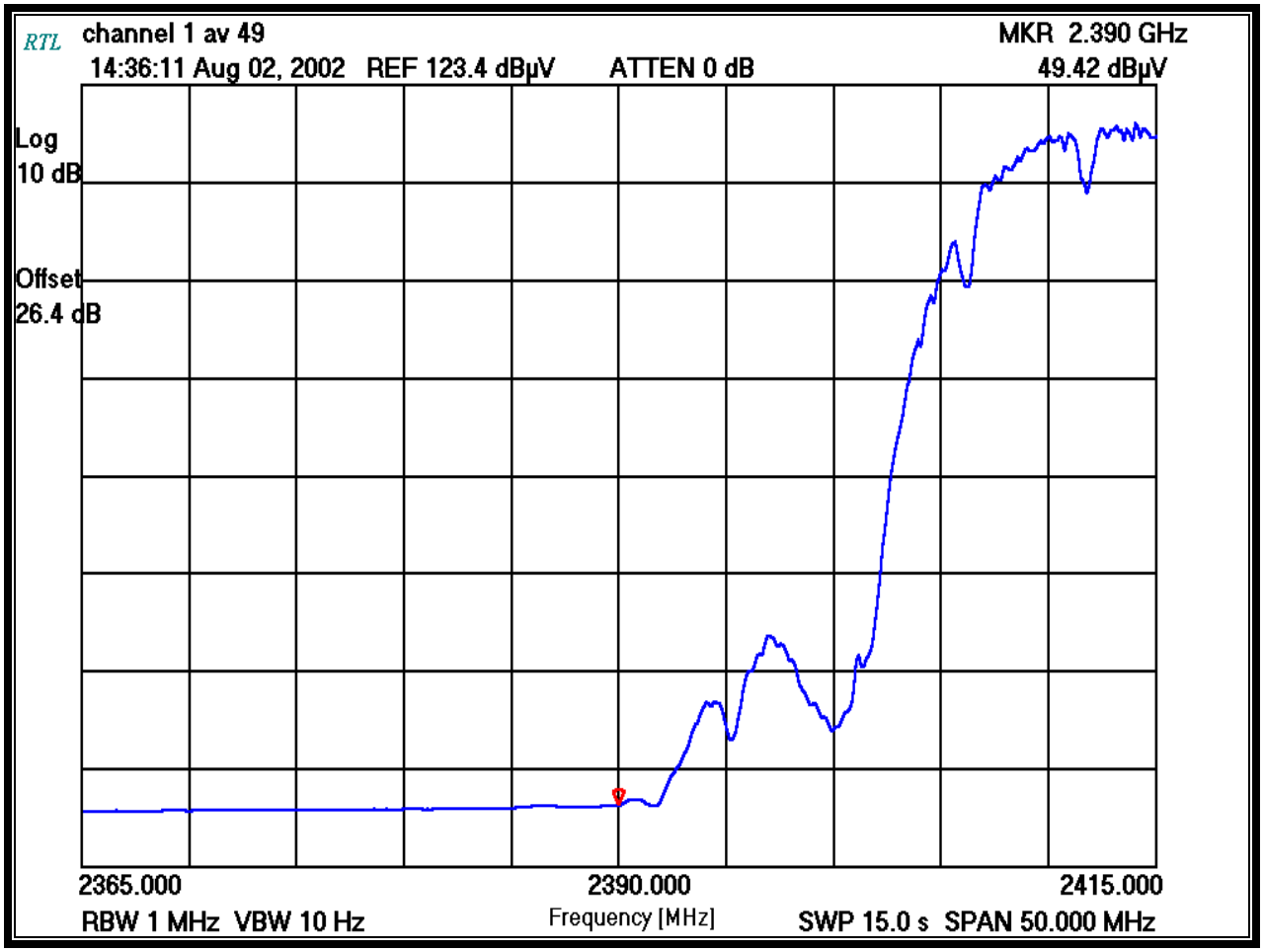
Channel Set to	Frequency tested MHz	Detector	Field Strength Level (dBµV/m)	Level Corrected (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)
1	2390.0	Absolute measurement	17	43.0	54.0	-11
11	2483.5	Absolute measurement	18.4	44.8	54.0	-9.2

TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	1
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-1: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 1 AT 1MBPS



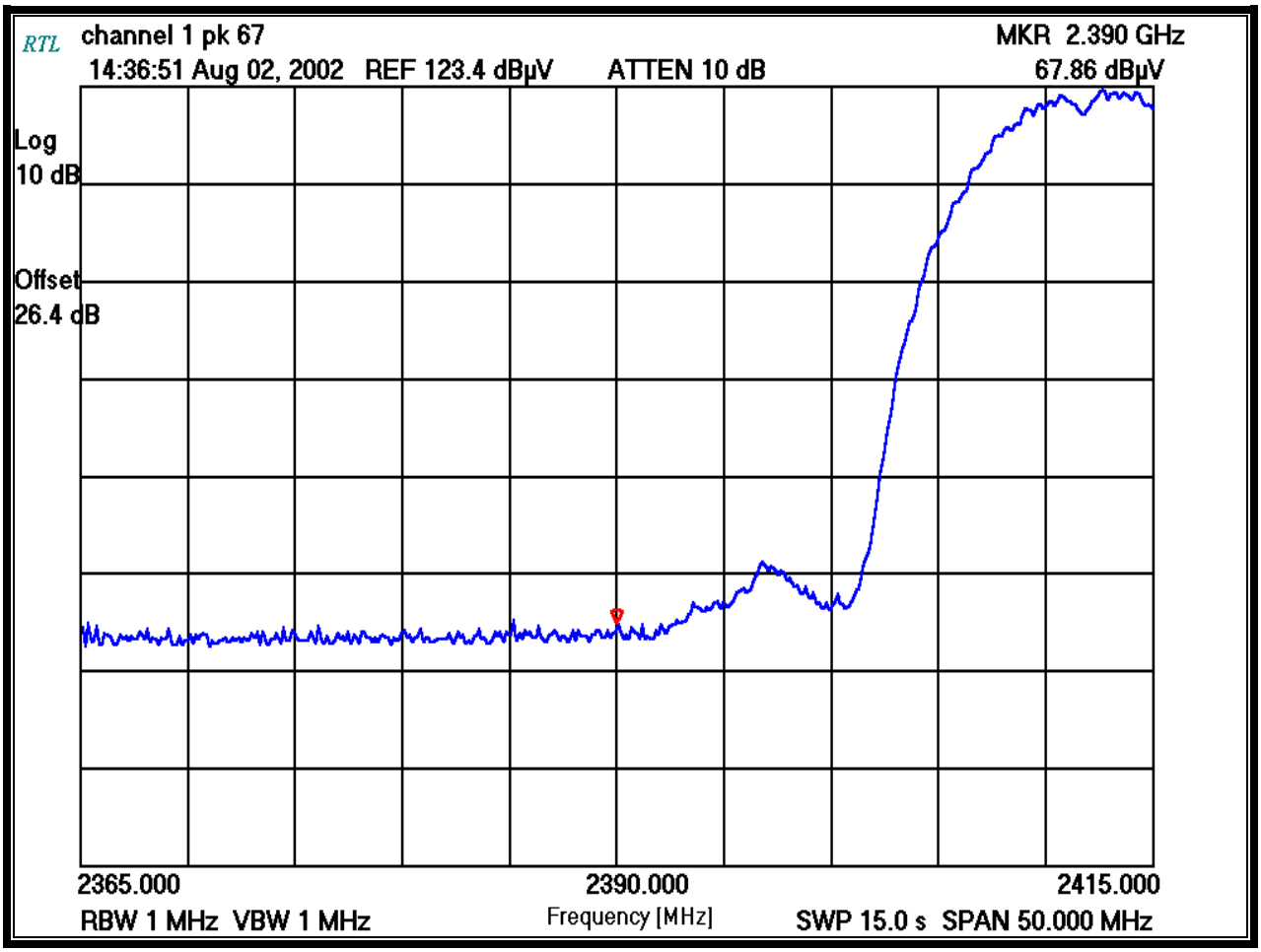
TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

[

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	1
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (s):	15.0

PLOT 3-2: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 1 AT 1MBPS

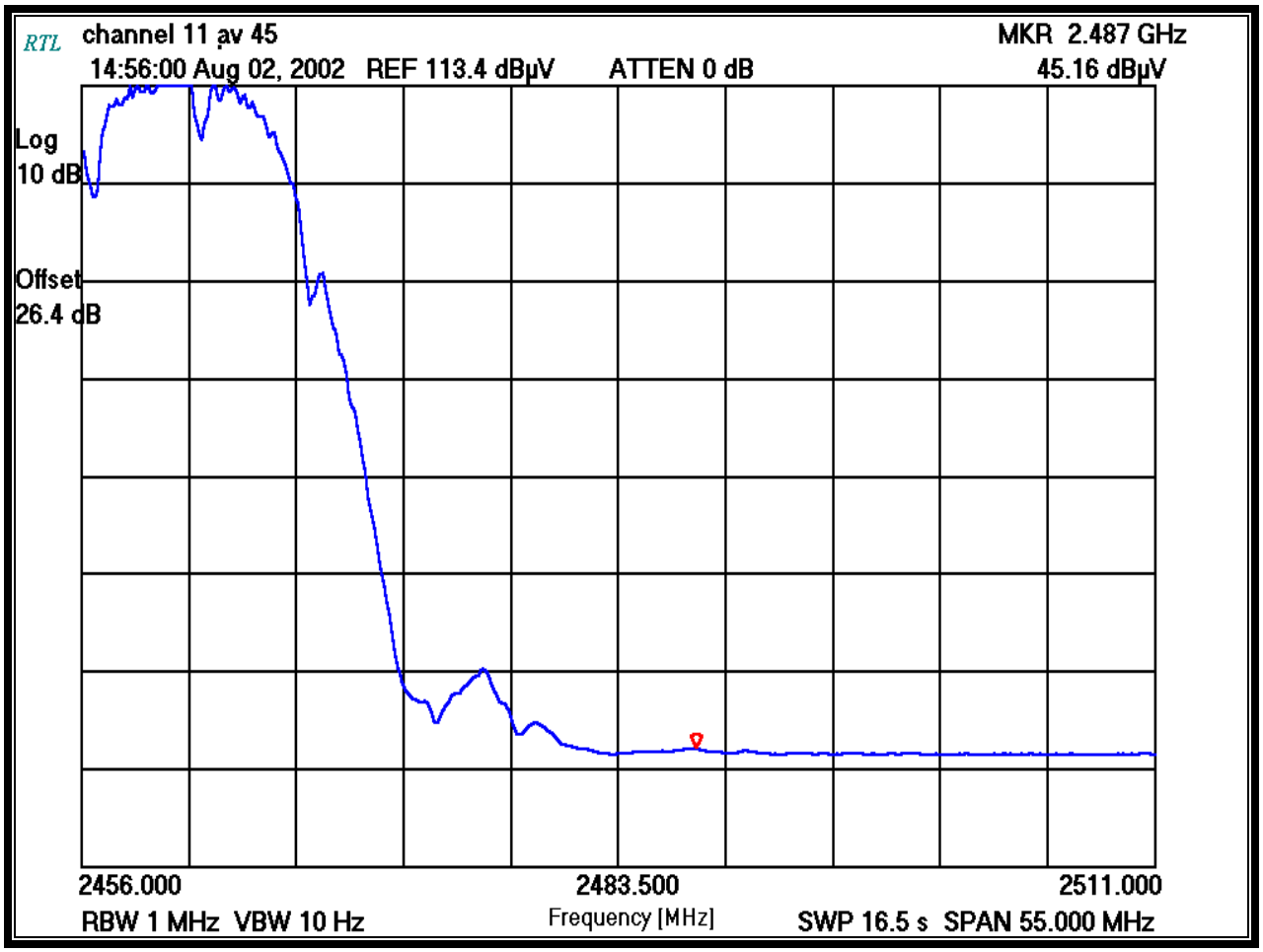


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	1
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	16.5

PLOT 3-3: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 11 AT 1MBPS

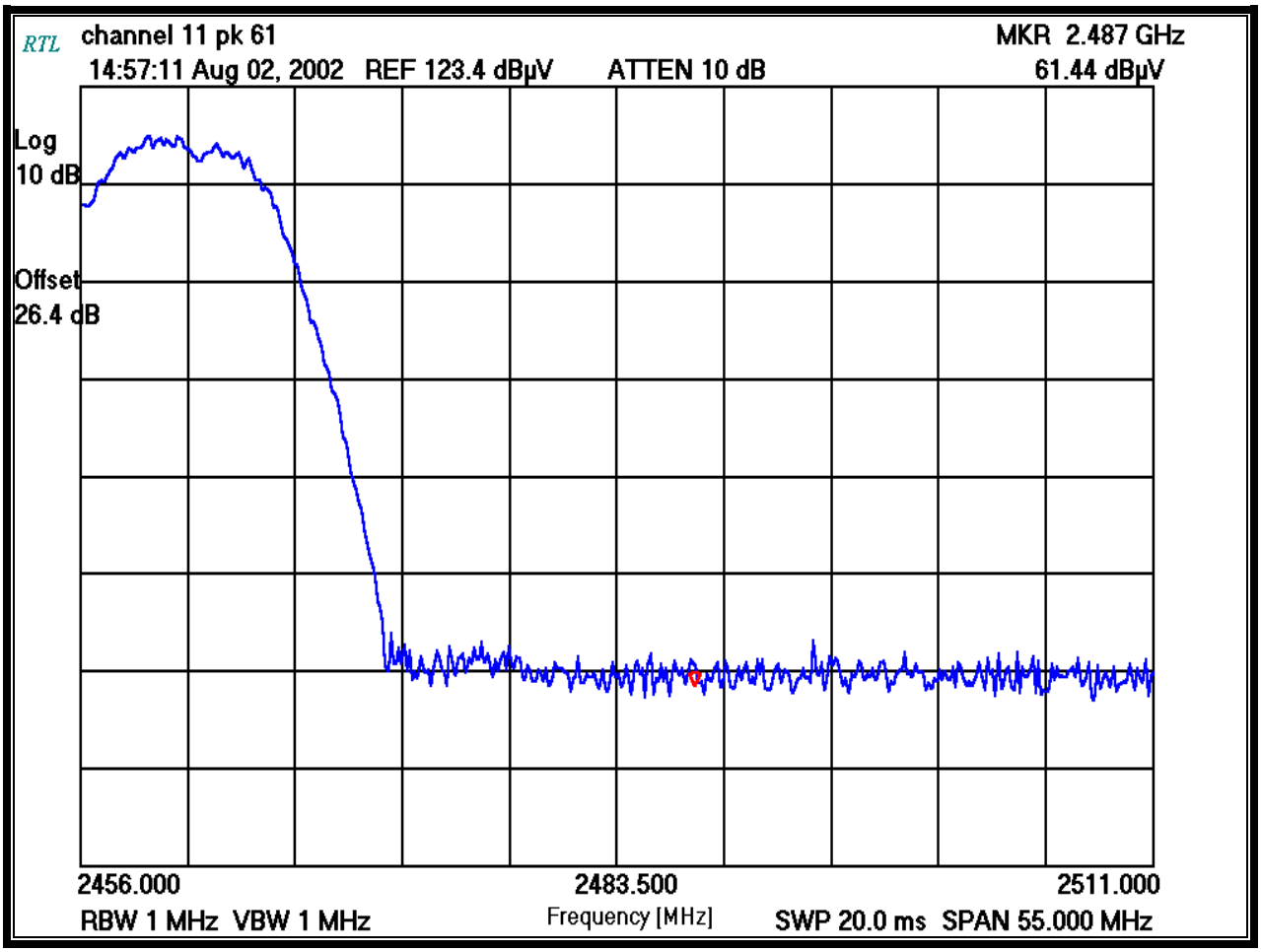


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	1
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-4: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 11 AT 1MBPS

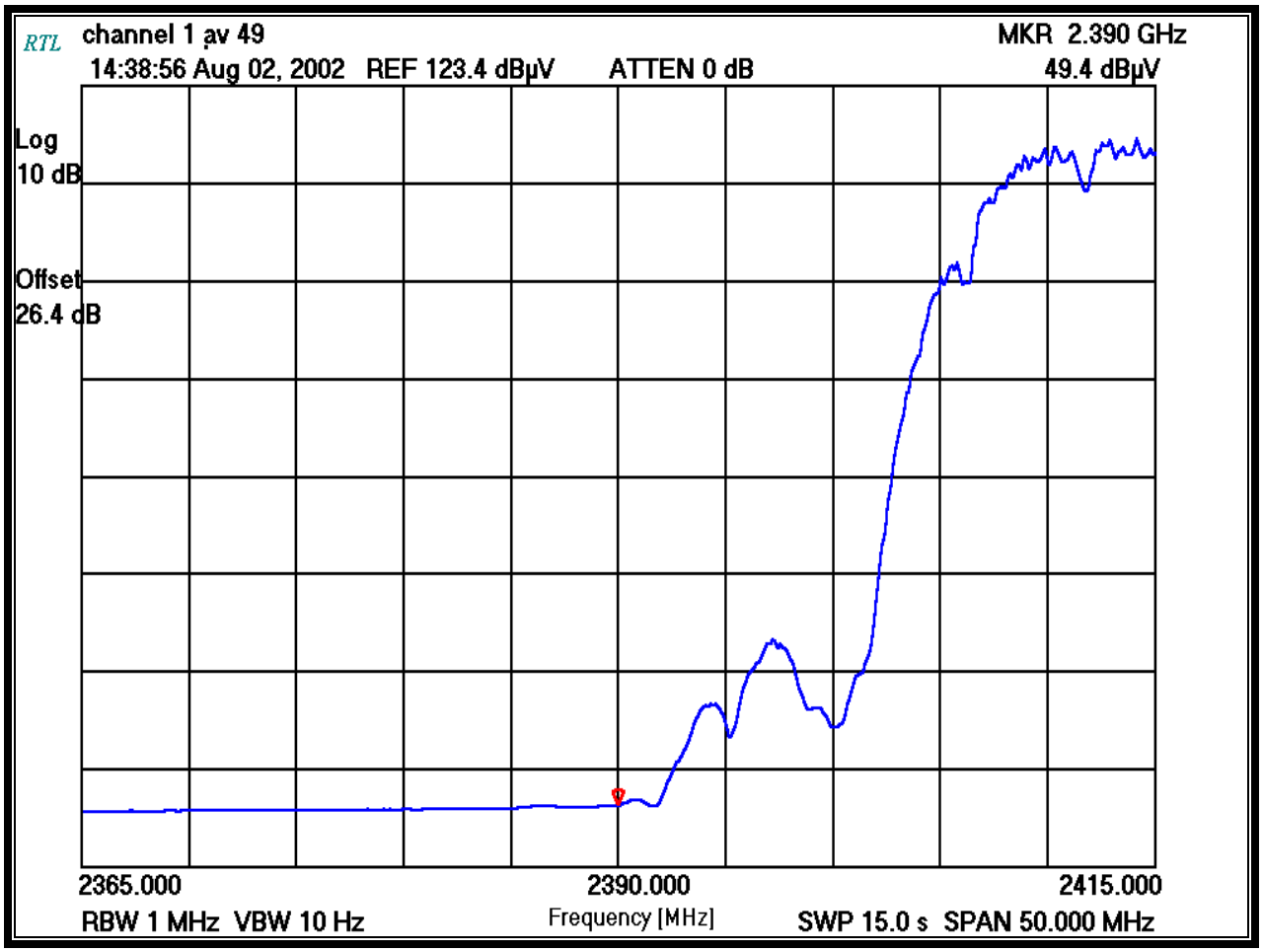


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	2
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-5: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 1 AT 2MBPS

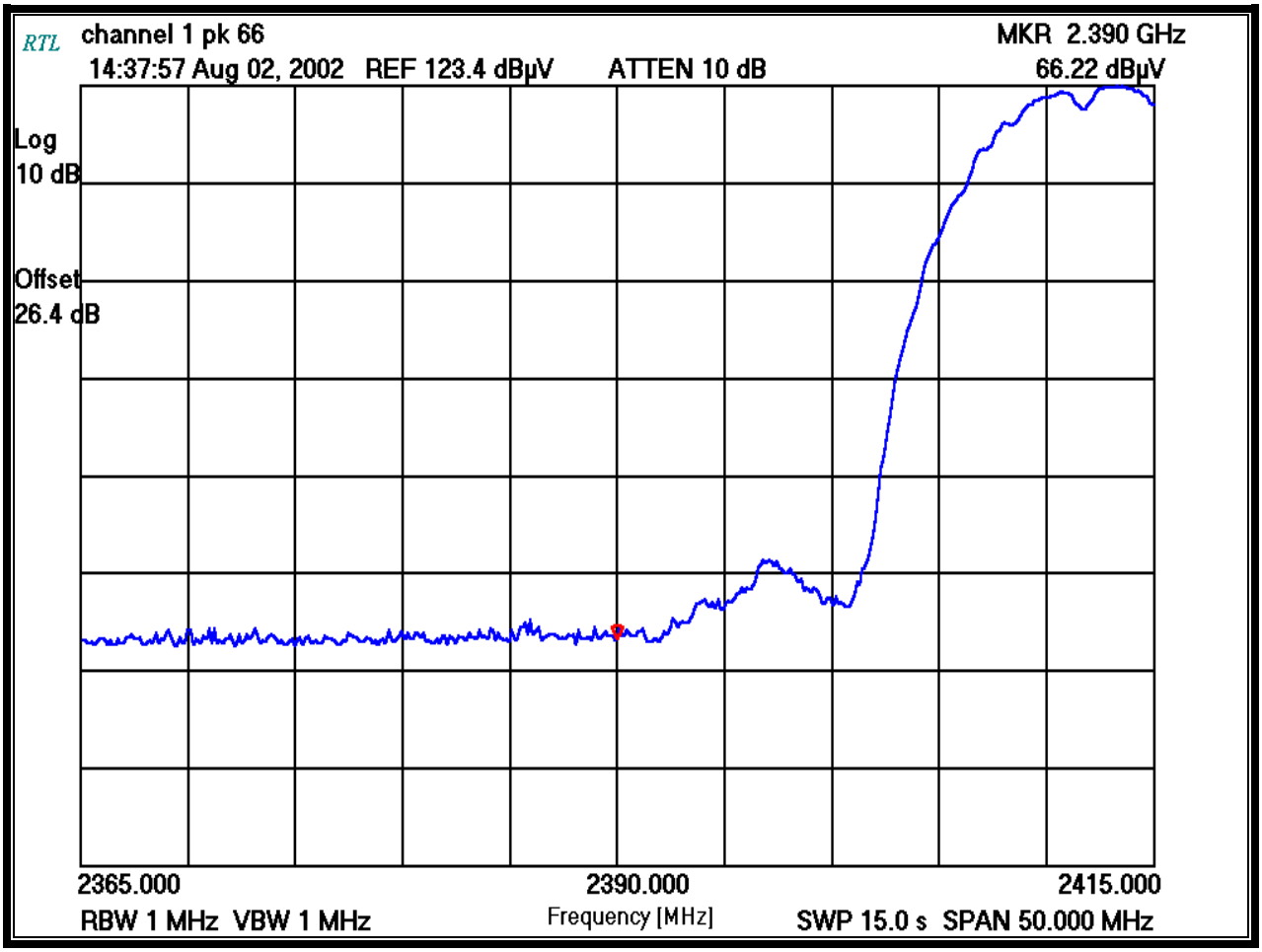


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	2
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (s):	15.0

PLOT 3-6: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 1 AT 2MBPS

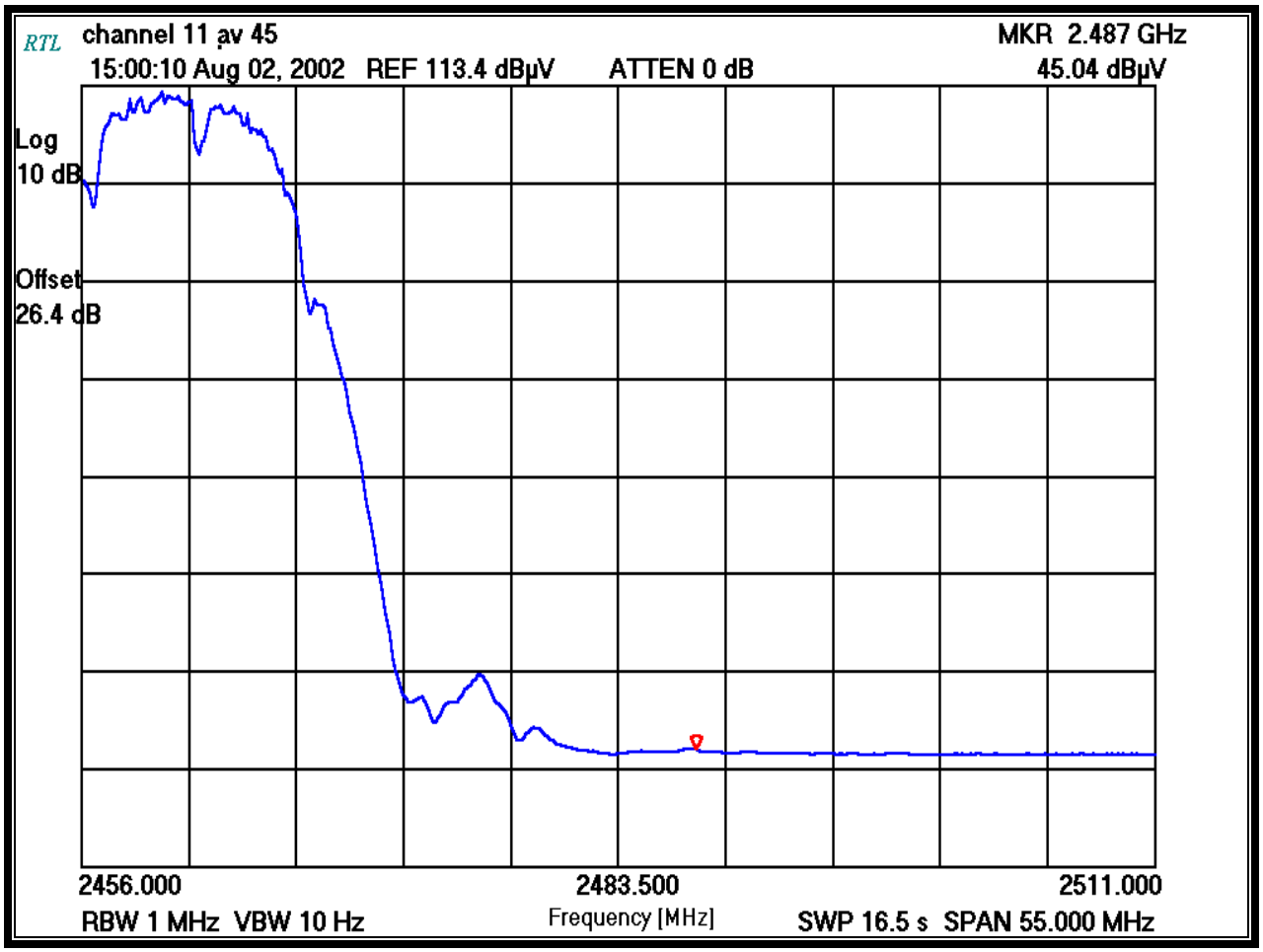


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	2
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	16.5

PLOT 3-7: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 11 AT 2MBPS

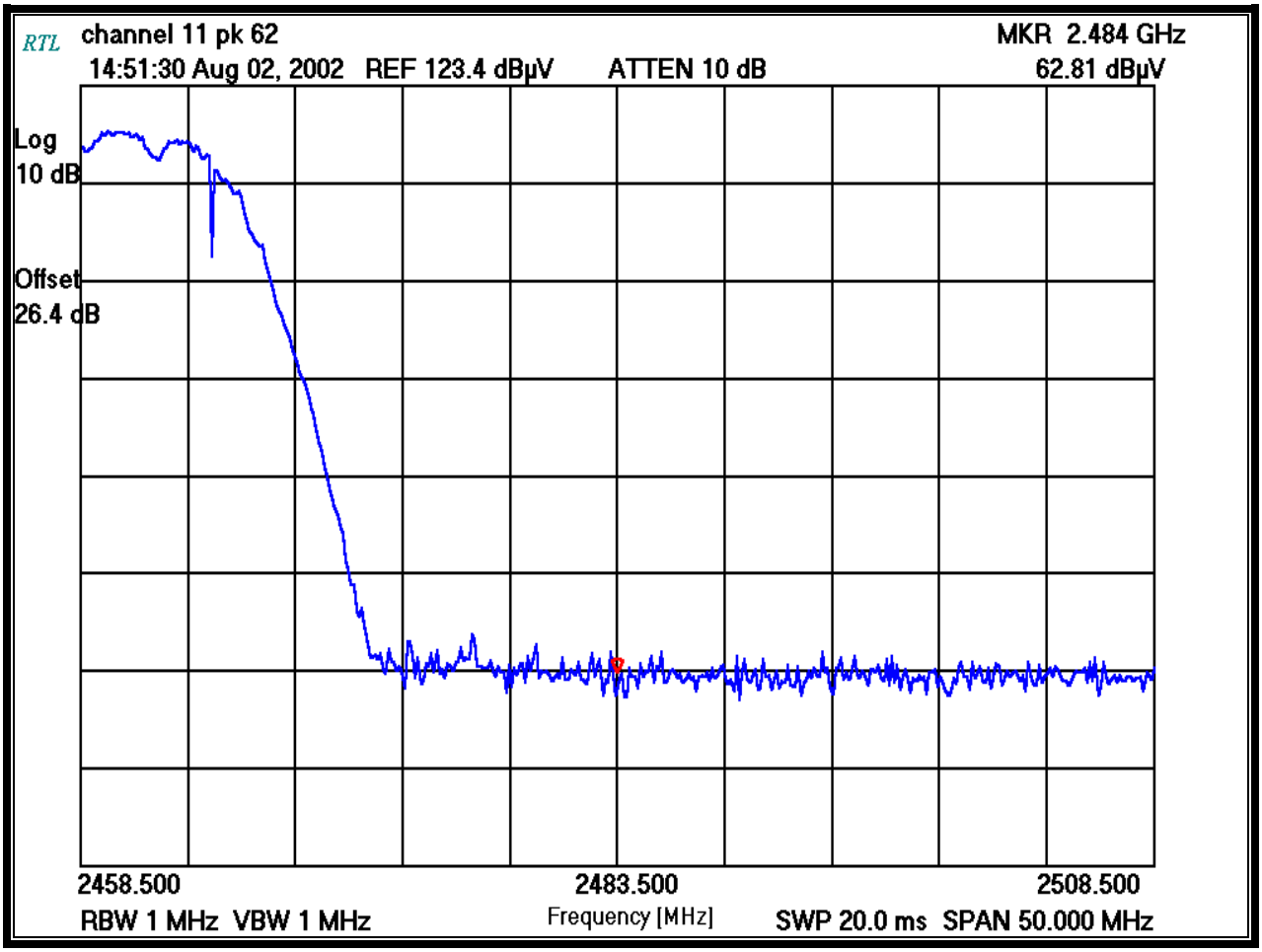


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	2
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-8: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 11 AT 2MBPS

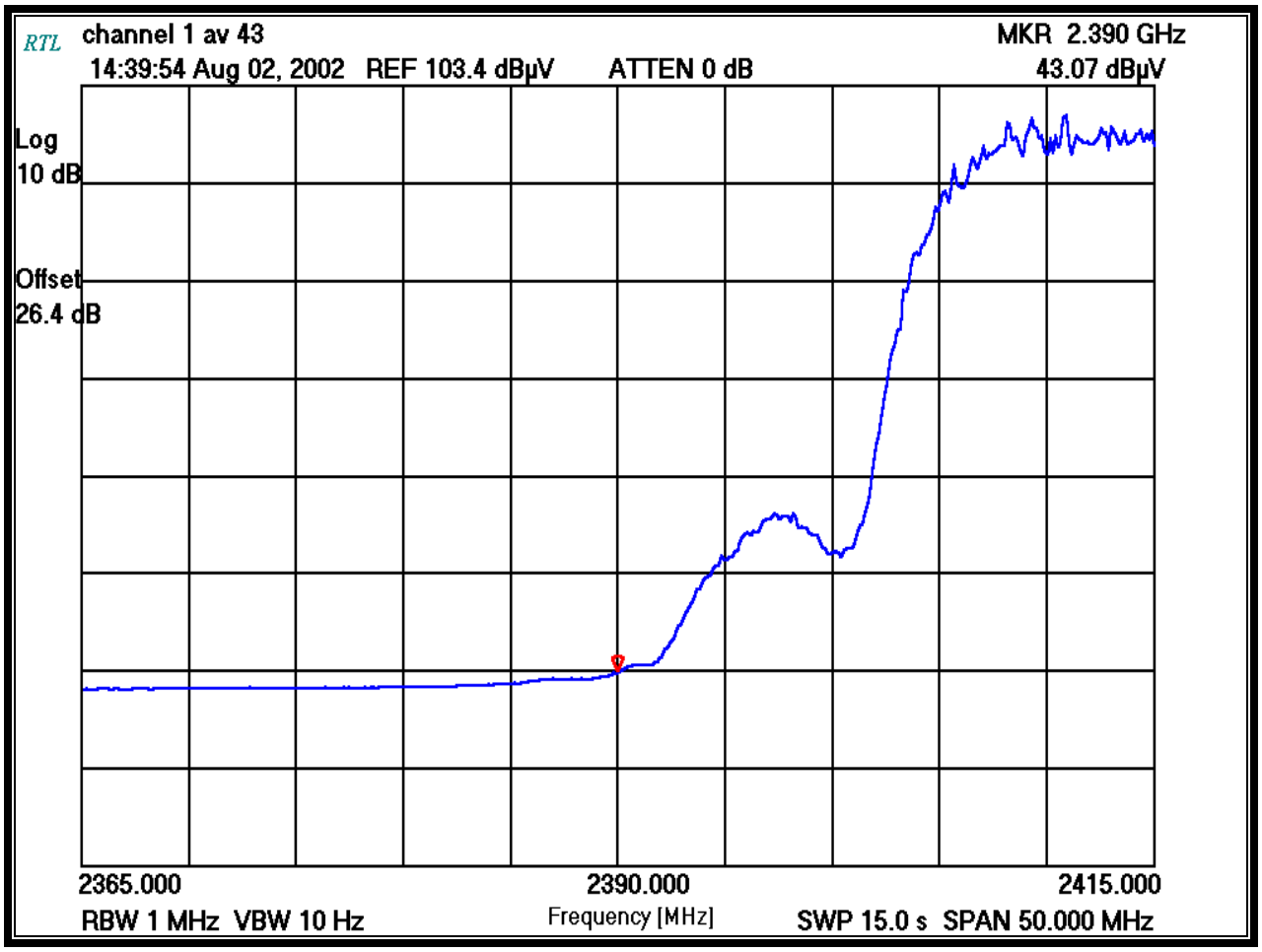


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	11
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-9: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 1 AT 11MBPS

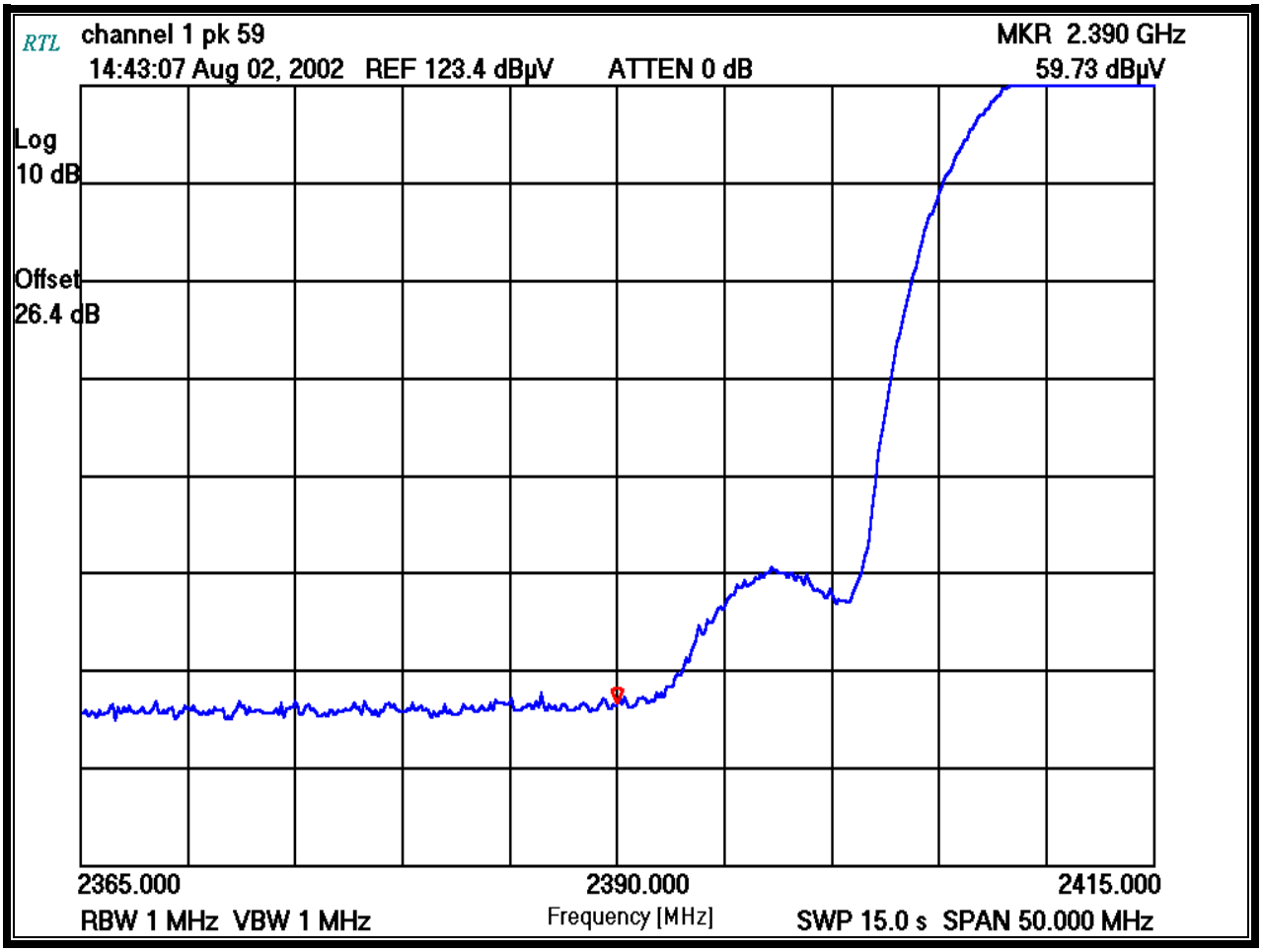


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	11
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (s):	15.0

PLOT 3-10: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 1 AT 11MBPS

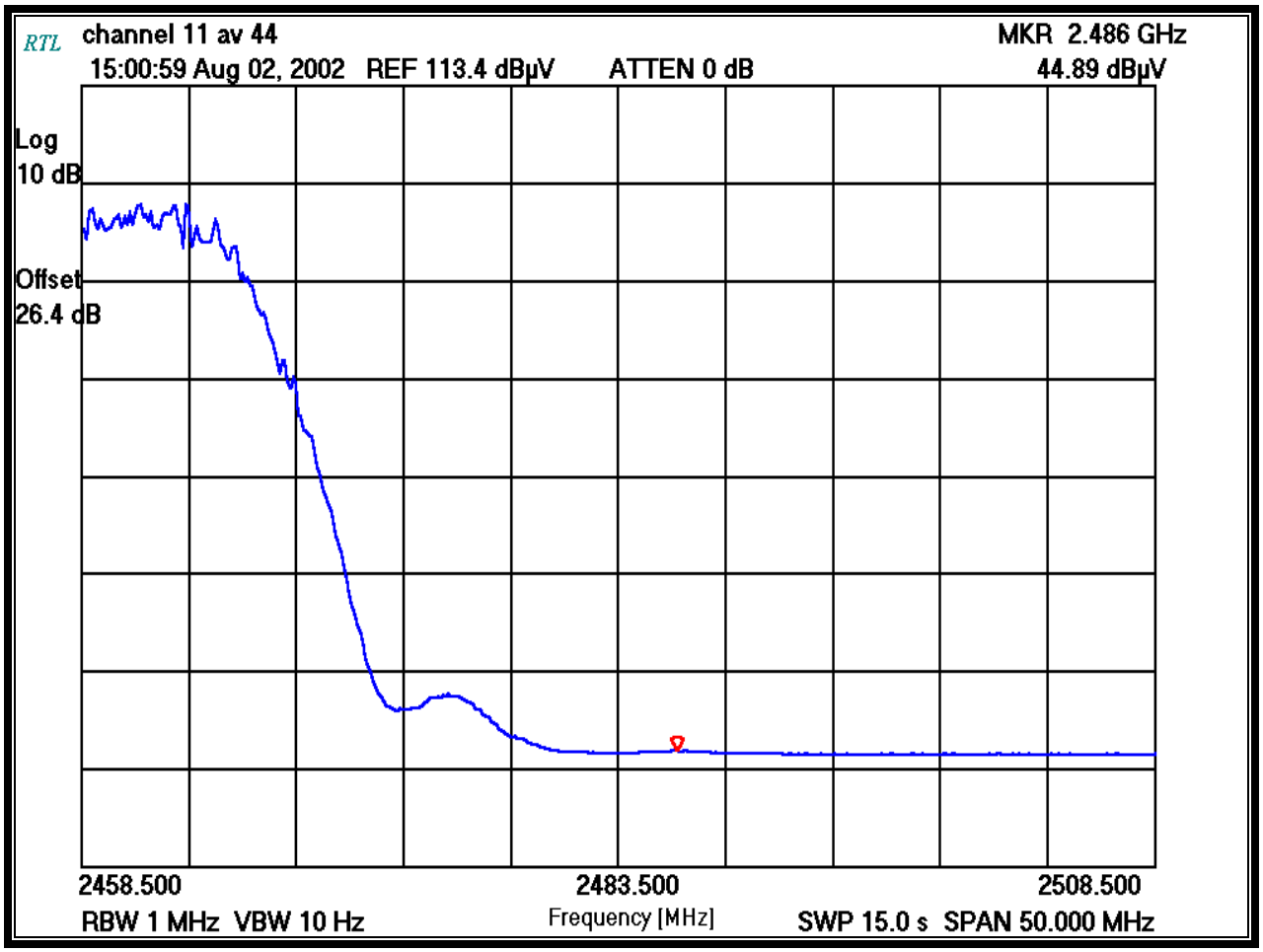


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency MHz):	2462
Data Rate (Mbps):	11
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-11: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 11 AT 11MBPS

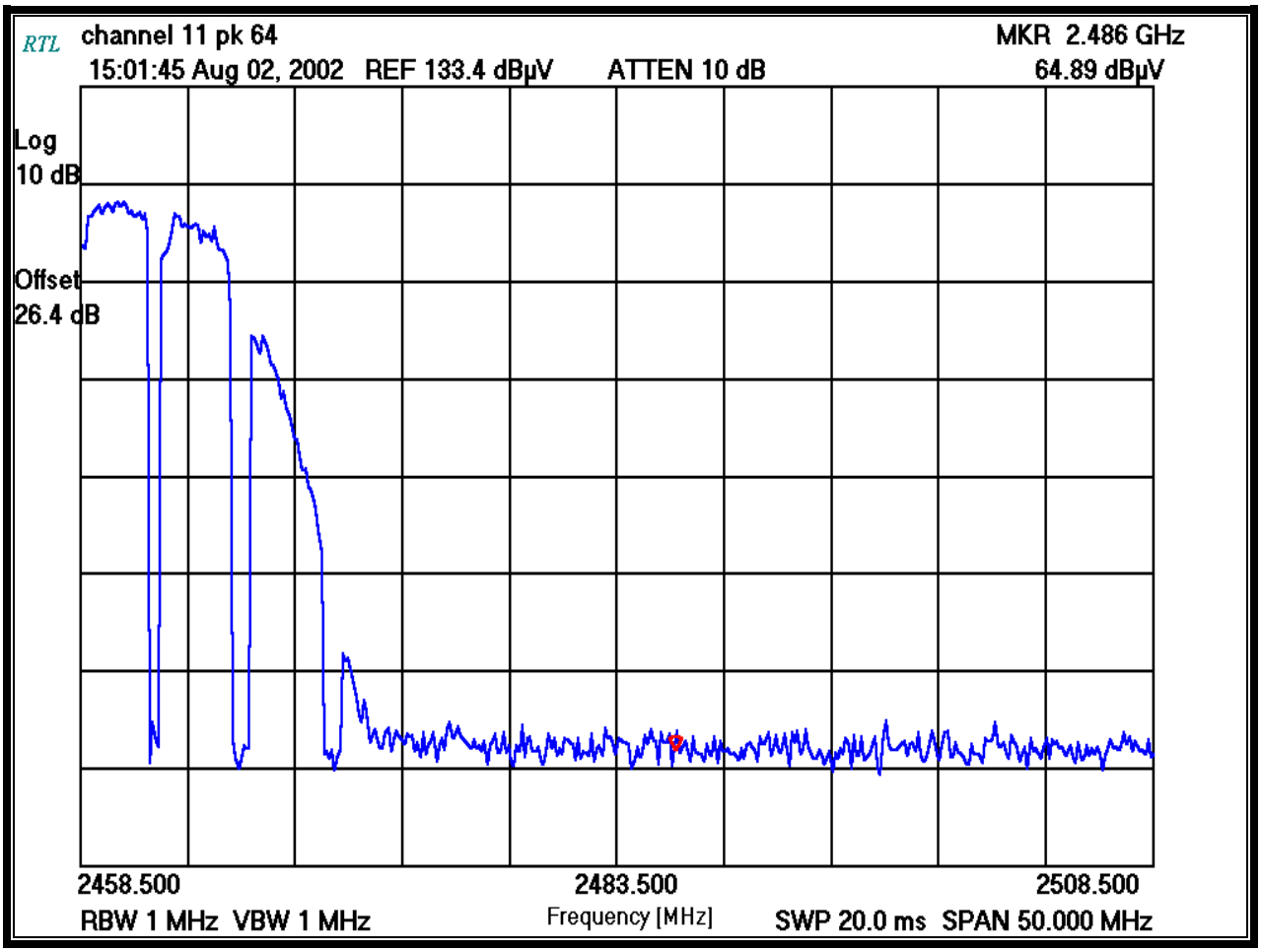


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps)	11
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-12: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 11 AT 11MBPS



TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

3.3 COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA IN MAX NEGATIVE STEERING MODE

Operating Frequency (MHz): 2412-2462
Channel: 1 & 11
Distance (m): 3
Limit (dBuV/m): 54

TABLE 3-4: COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA (1 MBPS)

Channel Set to	Frequency tested MHz	Detector	Field Strength Level (dBµV/m)	Level Corrected (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)
1	2390.0	Absolute measurement	23	49.1	54.0	-4.9
11	2483.5	Absolute measurement	19.7	46.1	54.0	-7.9

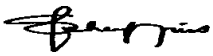
TABLE 3-5: COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA (2 MBPS)

Channel Set to	Frequency tested MHz	Detector	Field Strength Level (dBµV/m)	Level Corrected (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)
1	2390.0	Absolute measurement	19	45.3	54.0	-8.7
11	2483.5	Absolute measurement	19.6	46.0	54.0	-8

TABLE 3-6: COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA (11 MBPS)

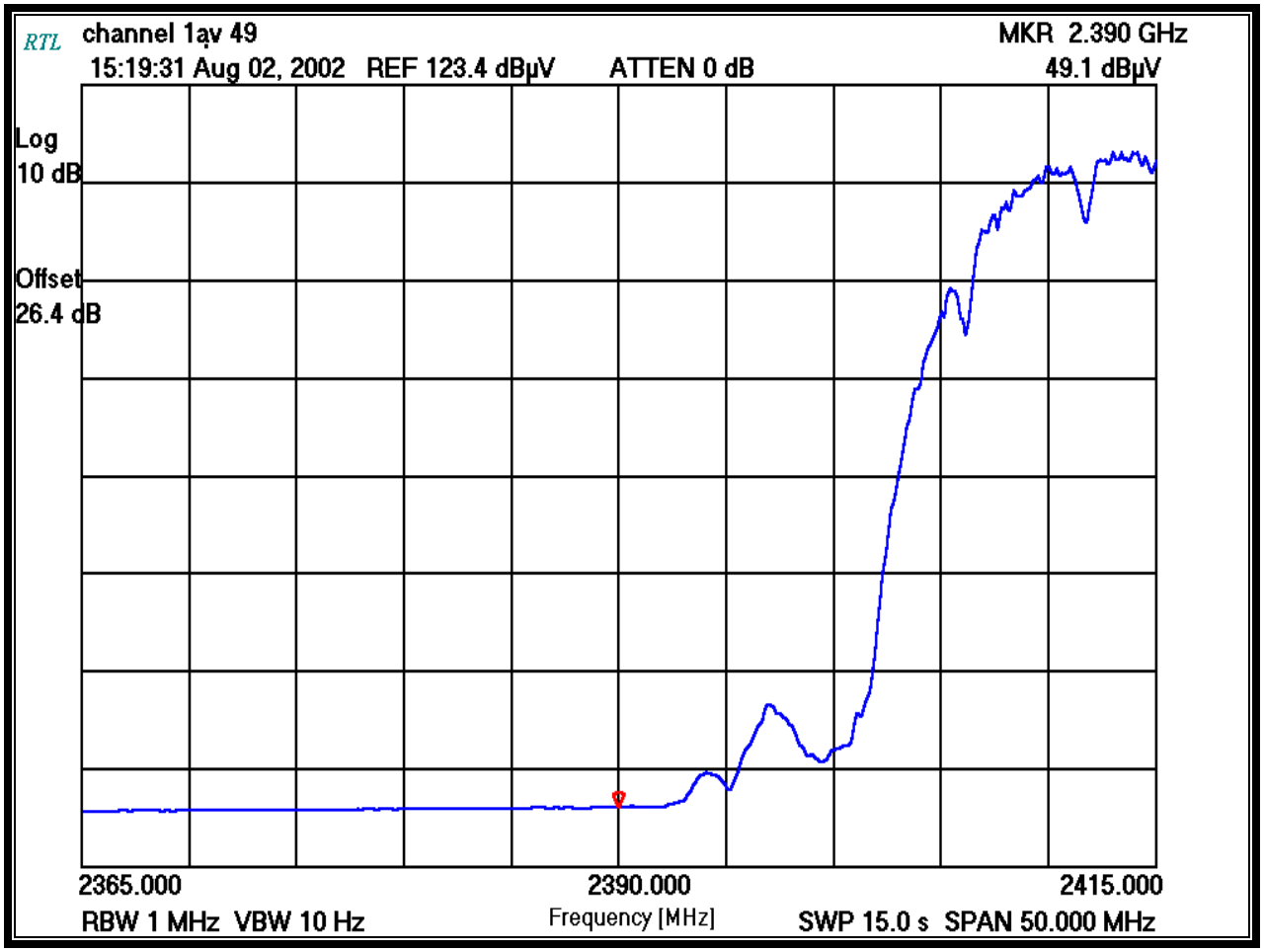
Channel Set to	Frequency tested MHz	Detector	Field Strength Level (dBµV/m)	Level Corrected (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)
1	2390.0	Absolute measurement	17	43.7	54.0	-10.3
11	2483.5	Absolute measurement	22.1	48.5	54.0	-5.5

TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	1
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-13: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 1 AT 1MBPS

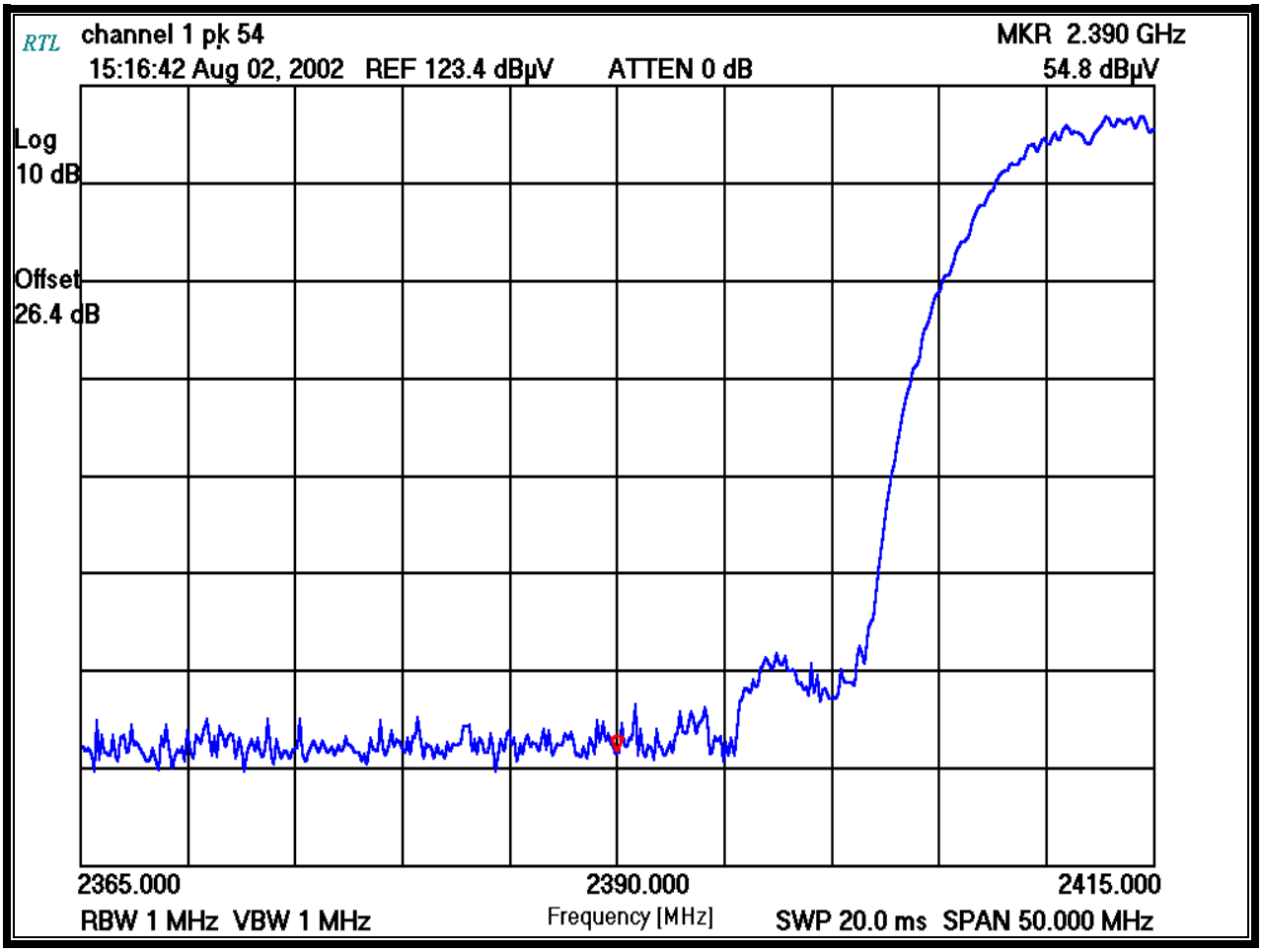


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps)	1
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-14: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 1 AT 1MBPS

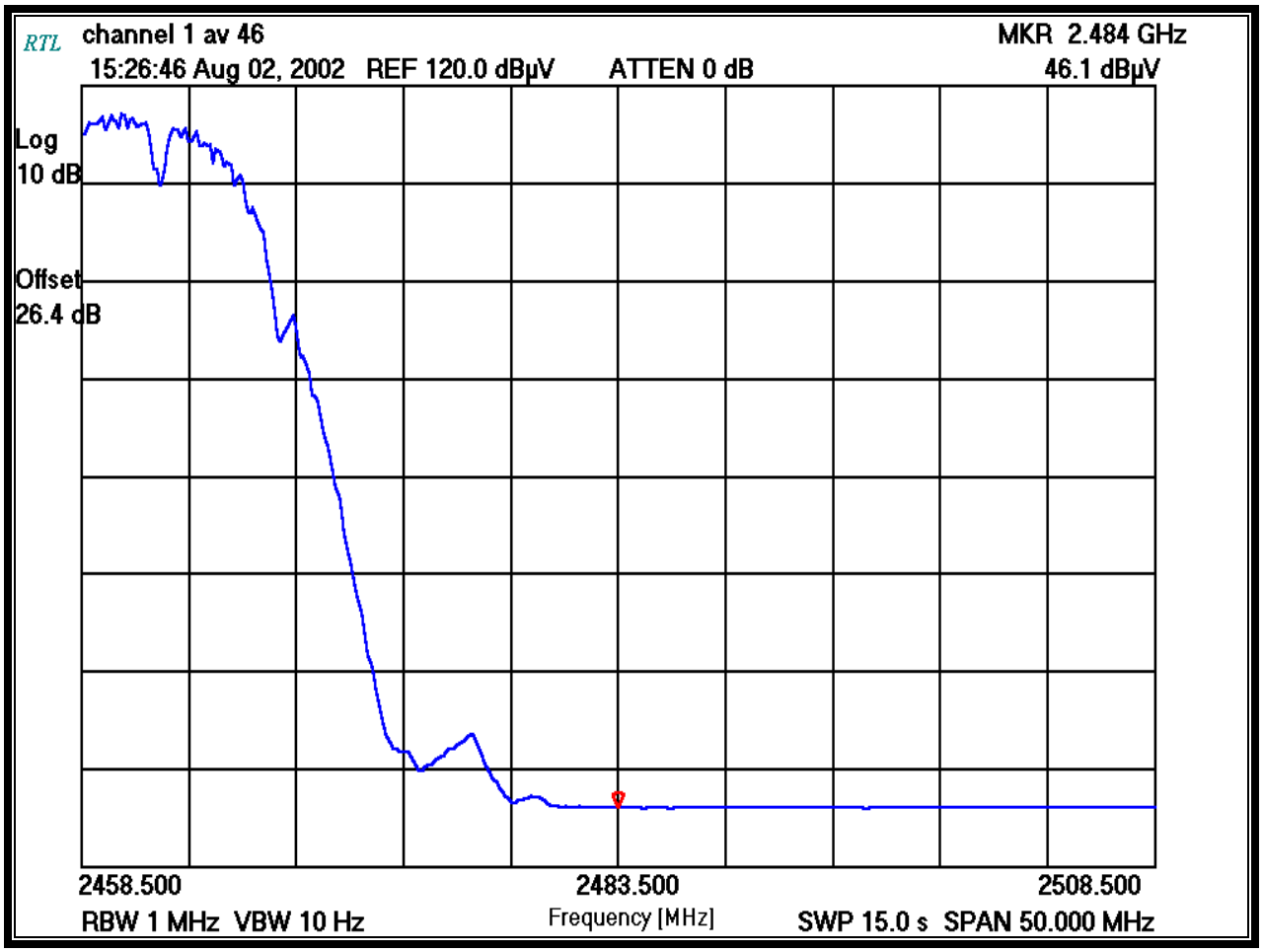


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	1
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-15: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 11 AT 1MBPS

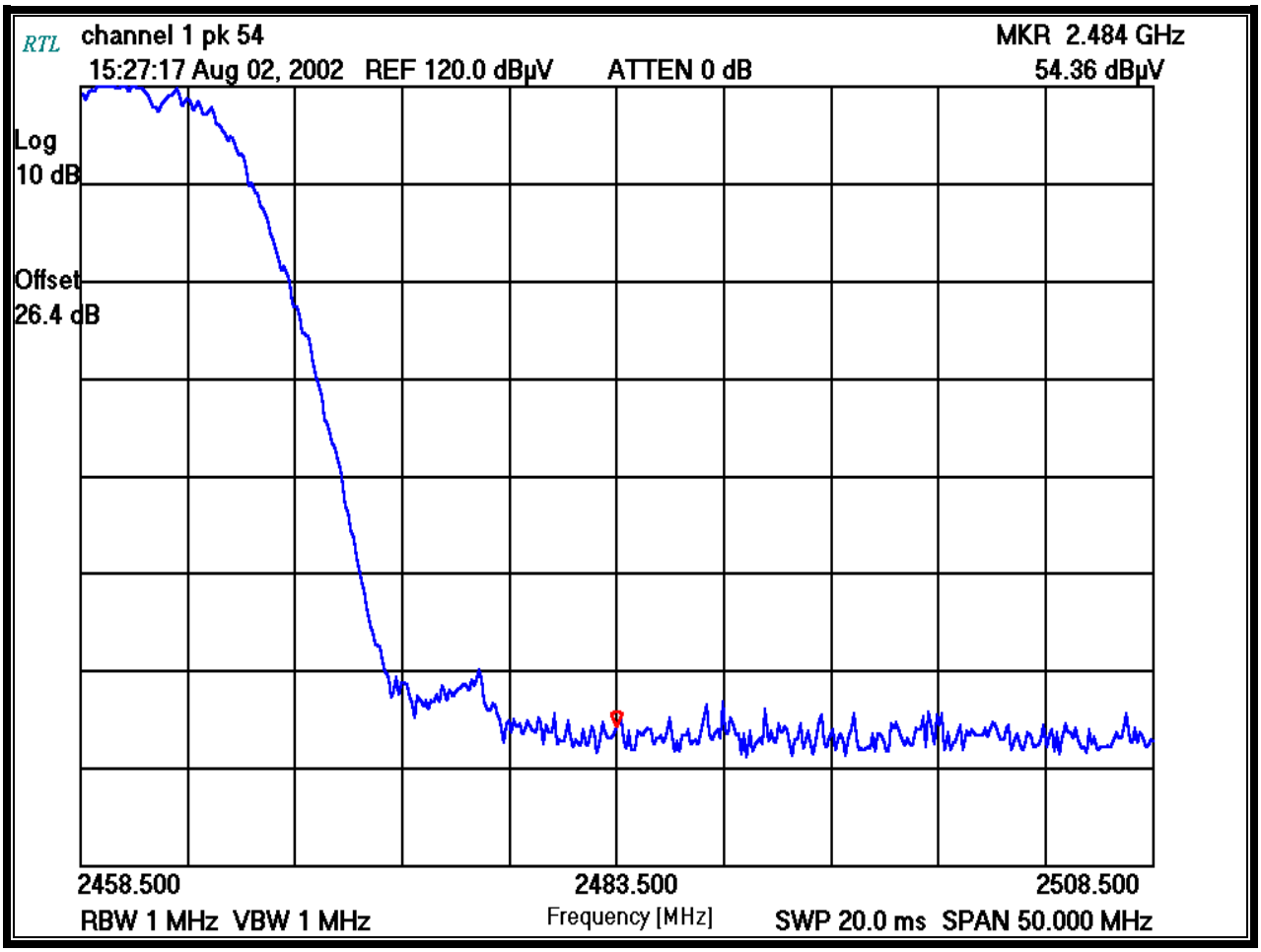


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps)	1
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-16: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 11 AT 1MBPS

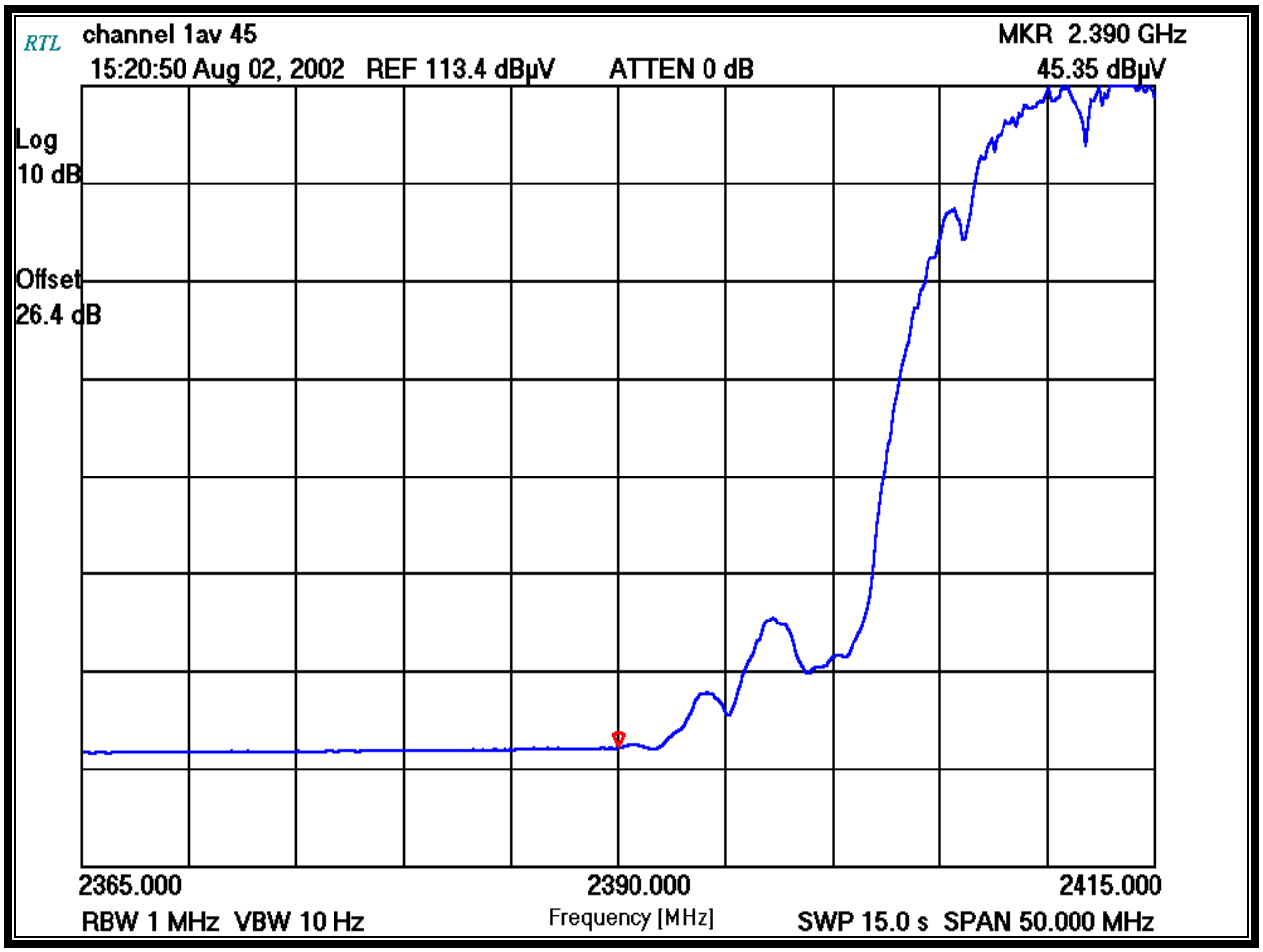


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	2
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-17: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 1 AT 2MBPS

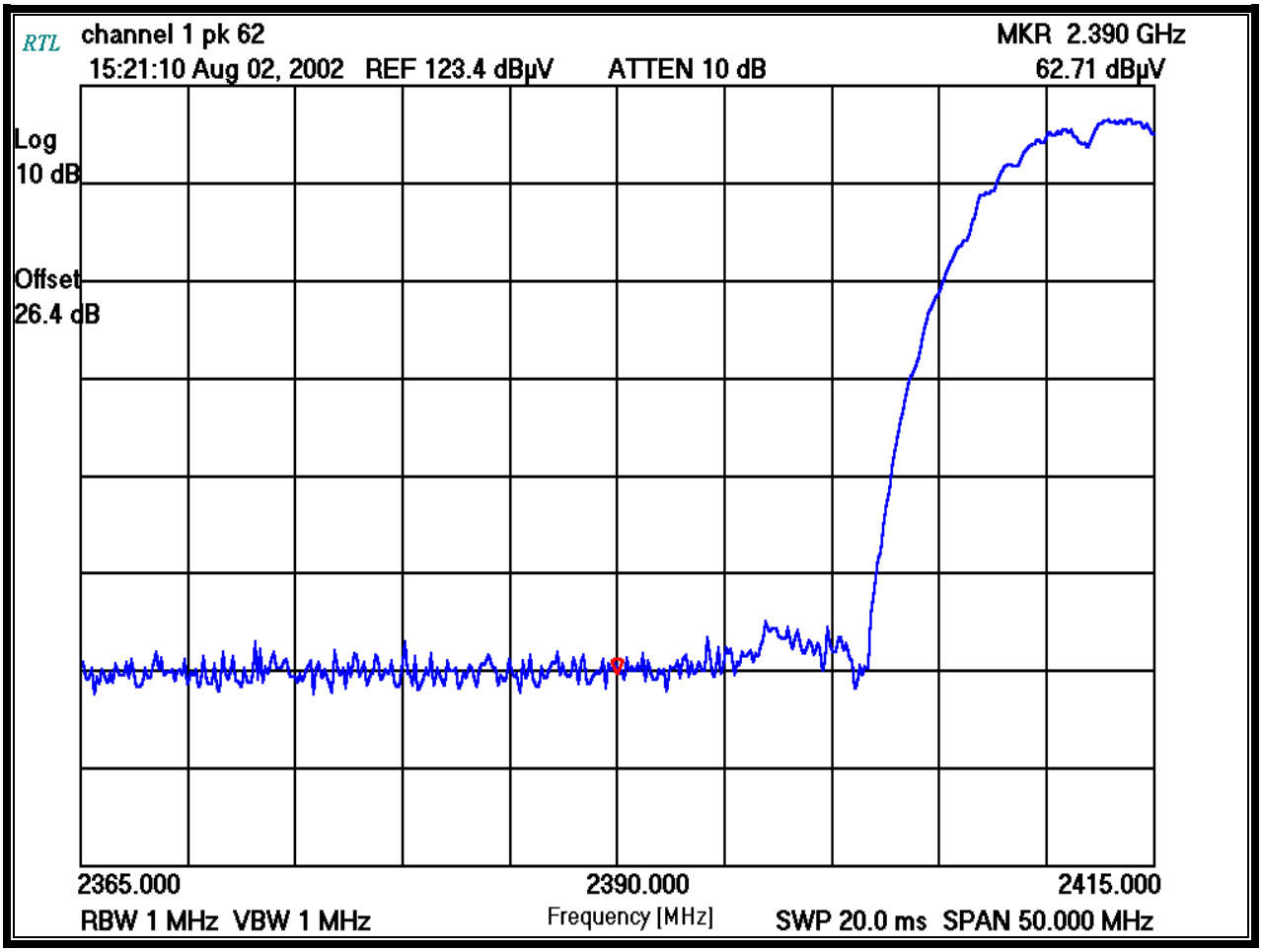


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	2
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-18: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 1 AT 2MBPS

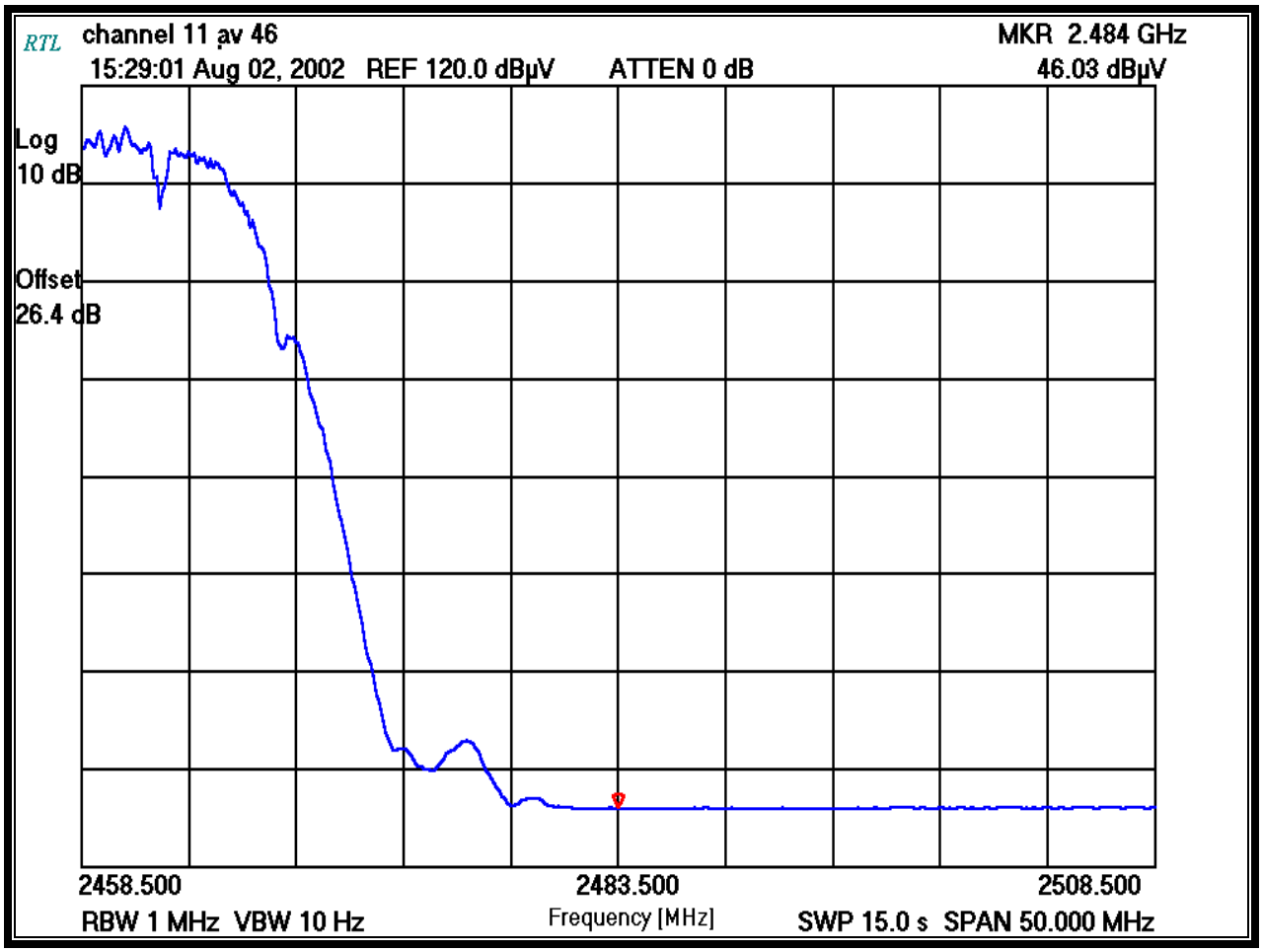


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	2
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-19: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 11 AT 2MBPS

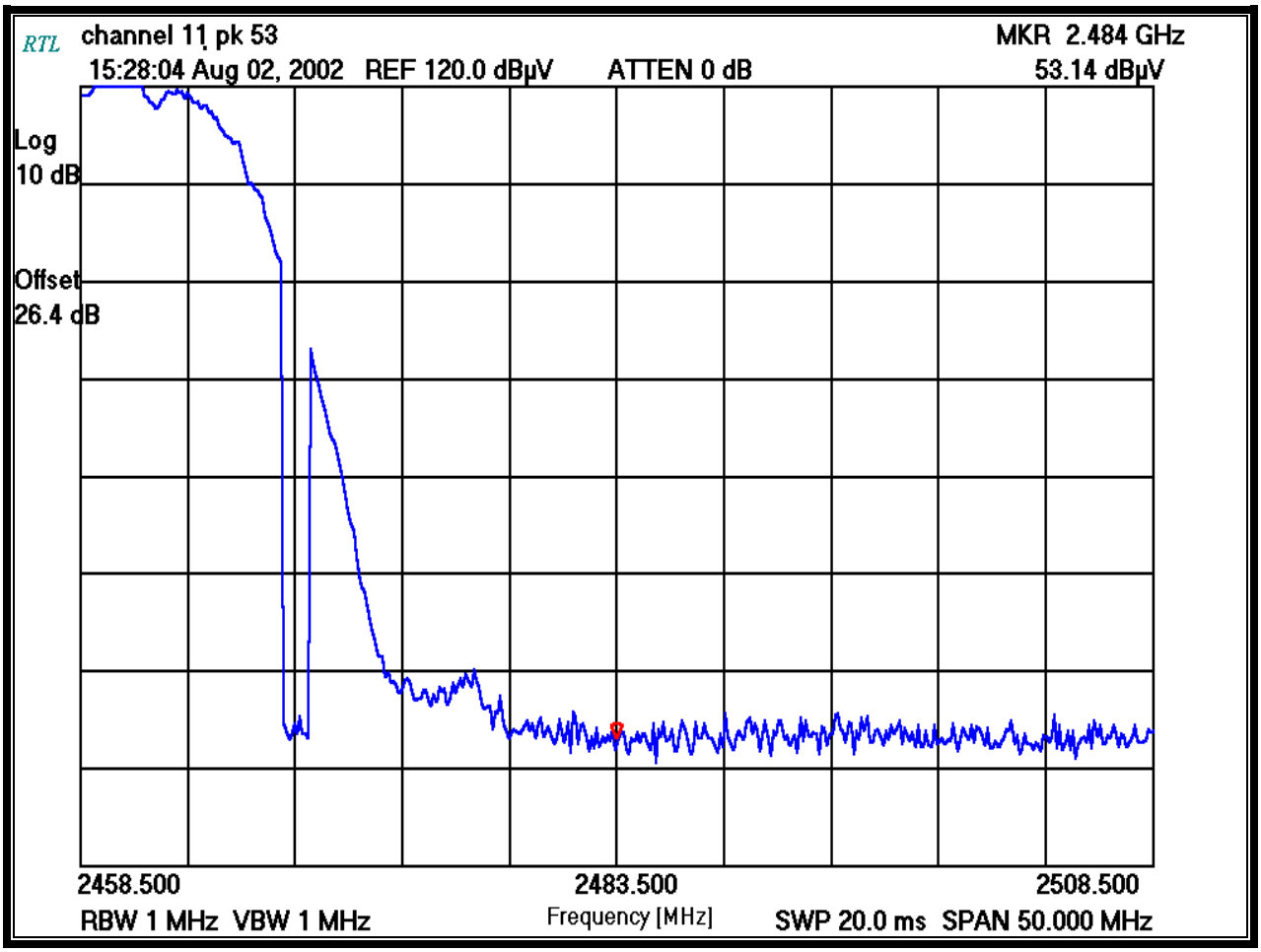


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	2
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-20: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 11 AT 2MBPS

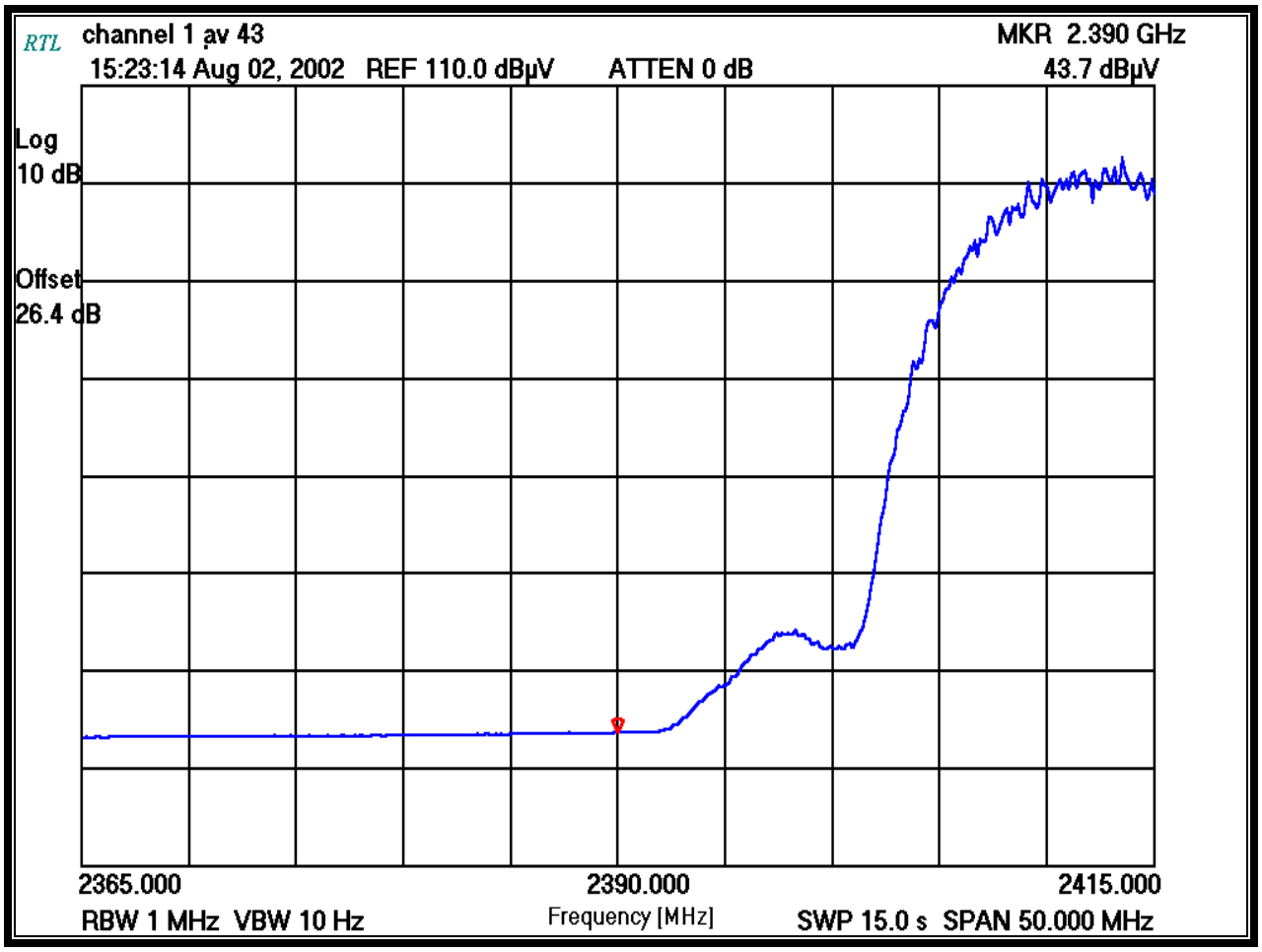


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	11
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-21: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 1 AT 11MBPS

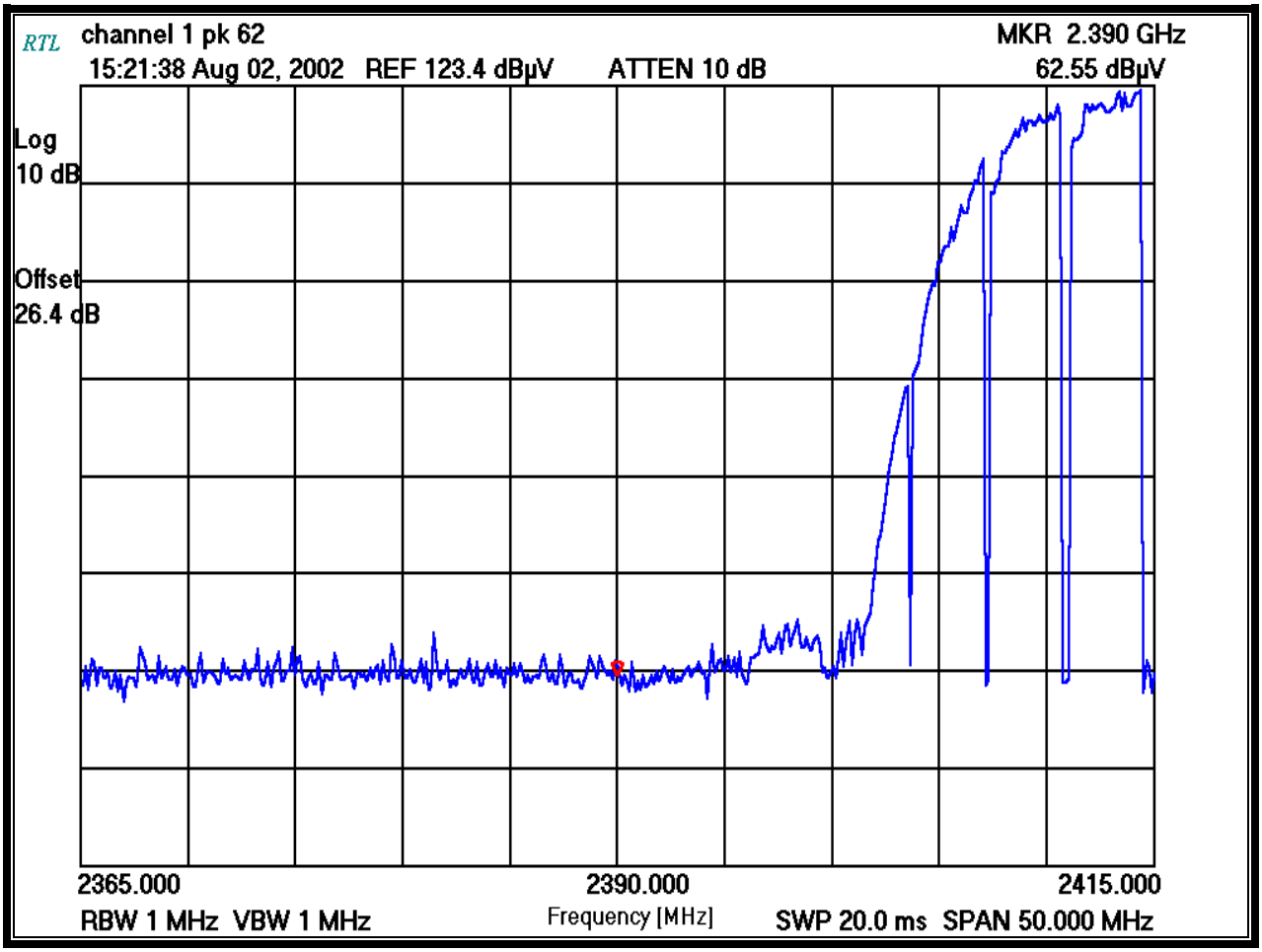


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	11
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-22: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 1 AT 11MBPS

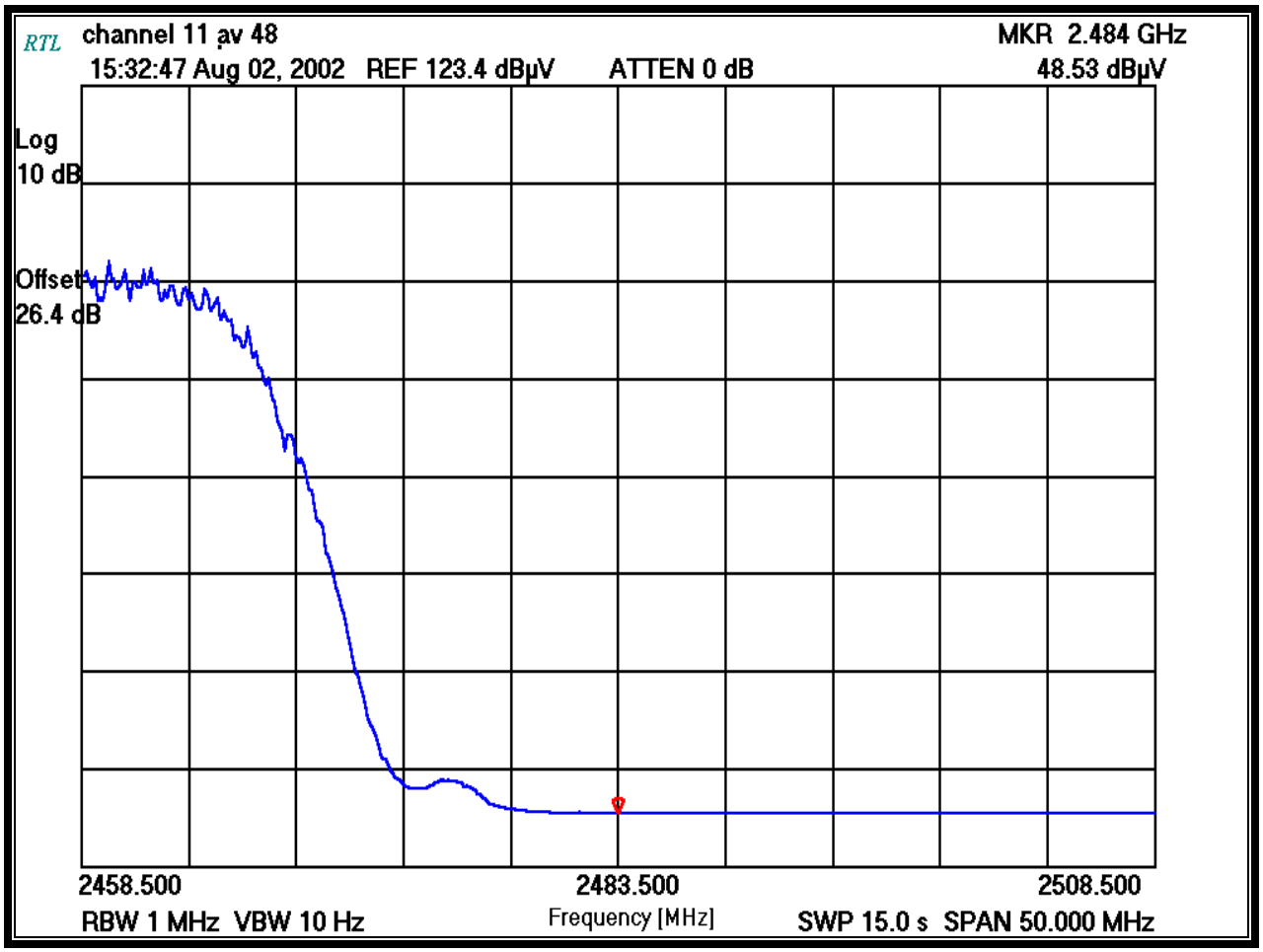


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	11
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-23: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 11 AT 11MBPS

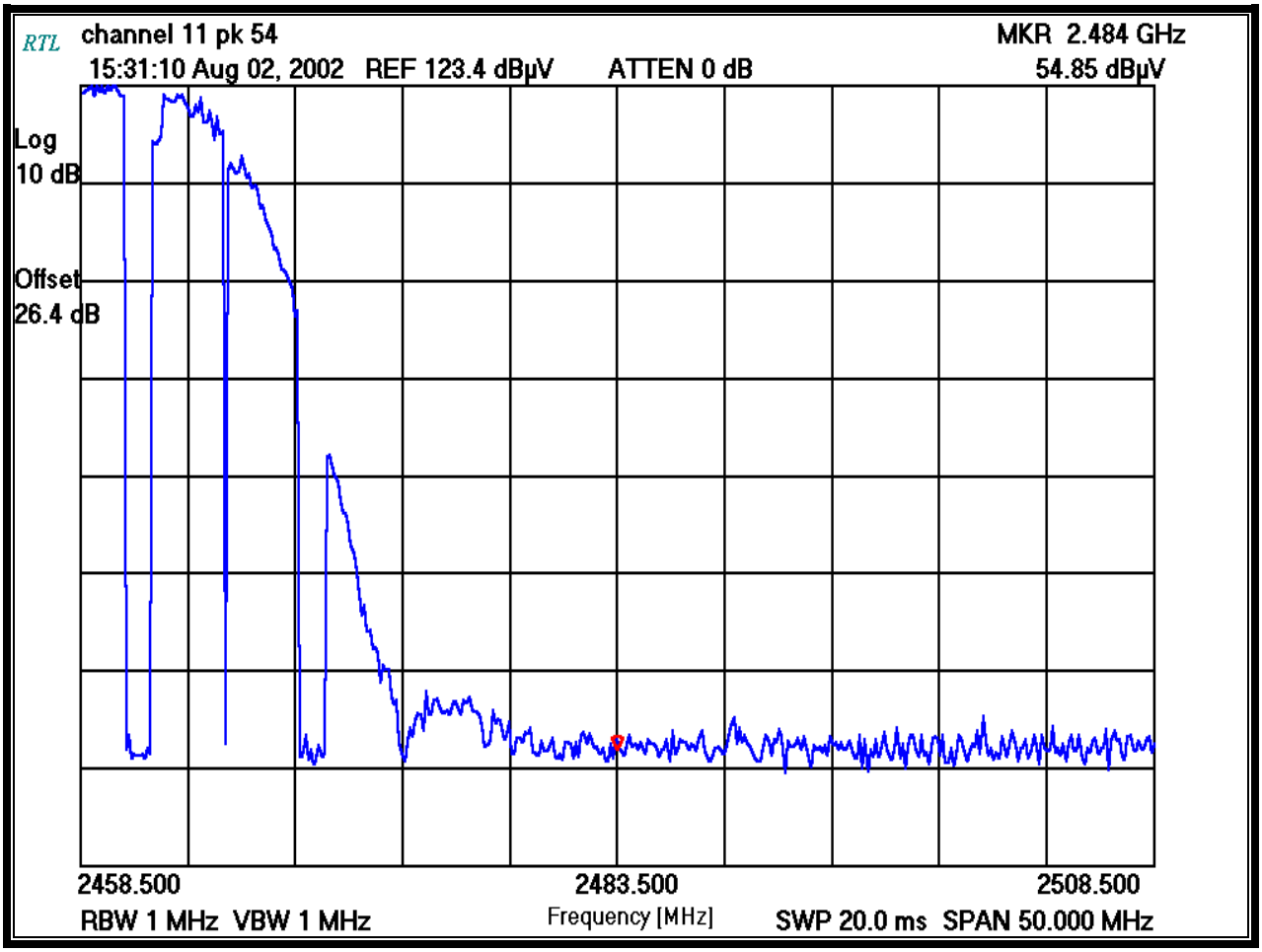


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	11
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-24: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 11 AT 11MBPS



TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

3.4 COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA IN MAX POSITIVE STEERING MODE

Operating Frequency (MHz): 2412-2462
Channel: 1 & 11
Distance (m): 3
Limit (dBuV/m): 54

TABLE 3-7: COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA (1 MBPS)

Channel Set to	Frequency tested MHz	Detector	Field Strength Level (dBµV/m)	Level Corrected (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)
1	2390.0	Absolute measurement	23	49.1	54.0	-4.9
11	2483.5	Absolute measurement	22.1	48.5	54.0	-5.5

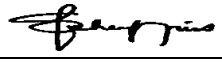
TABLE 3-8: COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA (2 MBPS)

Channel Set to	Frequency tested MHz	Detector	Field Strength Level (dBµV/m)	Level Corrected (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)
1	2390.0	Absolute measurement	23	49.1	54.0	-4.9
11	2483.5	Absolute measurement	22	48.4	54.0	-5.6

TABLE 3-9: COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA (11 MBPS)

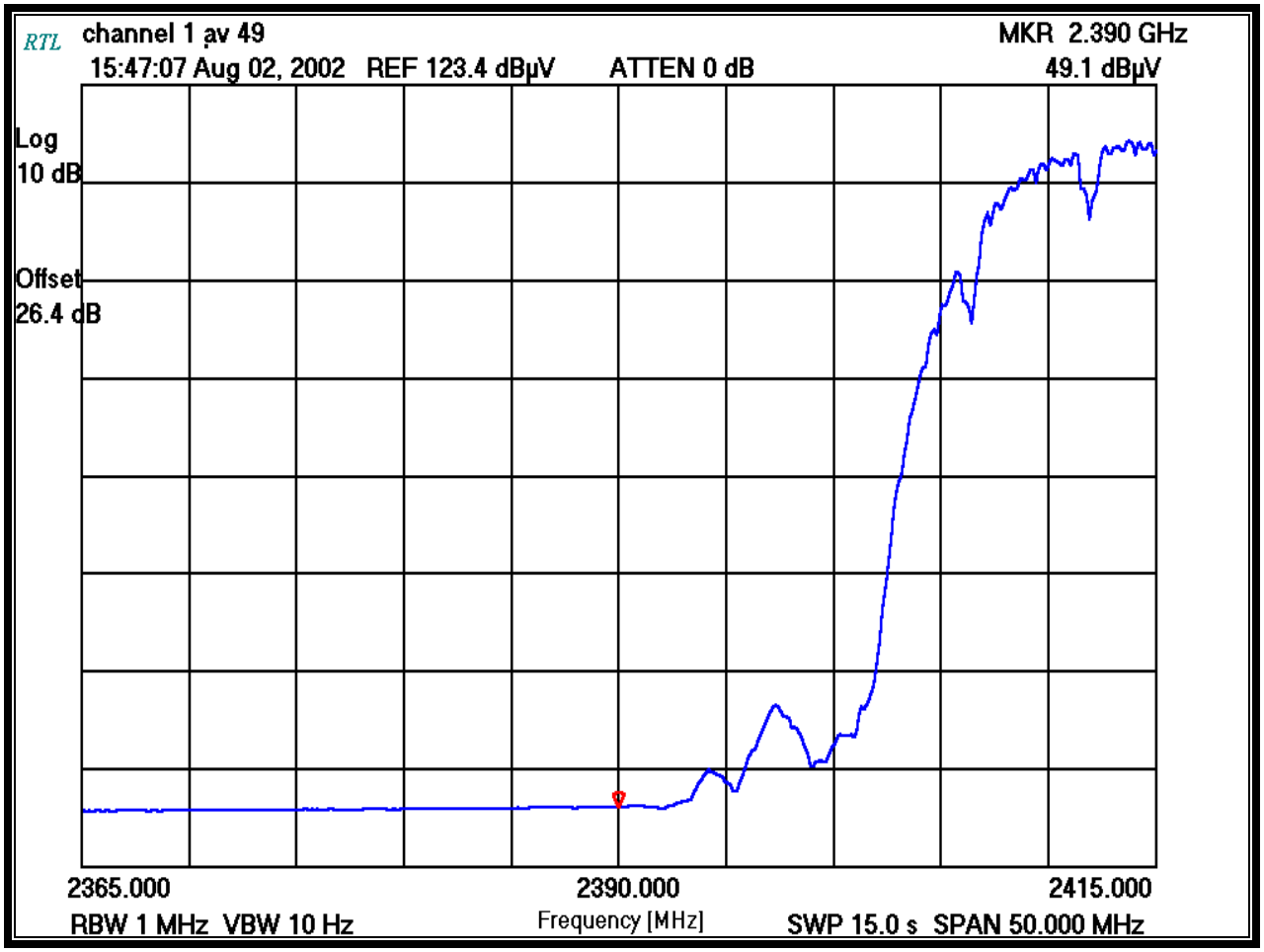
Channel Set to	Frequency tested MHz	Detector	Field Strength Level (dBµV/m)	Level Corrected (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)
1	2390.0	Absolute measurement	19	45.1	54.0	-8.9
11	2483.5	Absolute measurement	22.1	48.5	54.0	-5.5

TEST PERSONNEL:

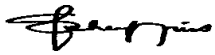
Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	1
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-25: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 1 AT 1MBPS

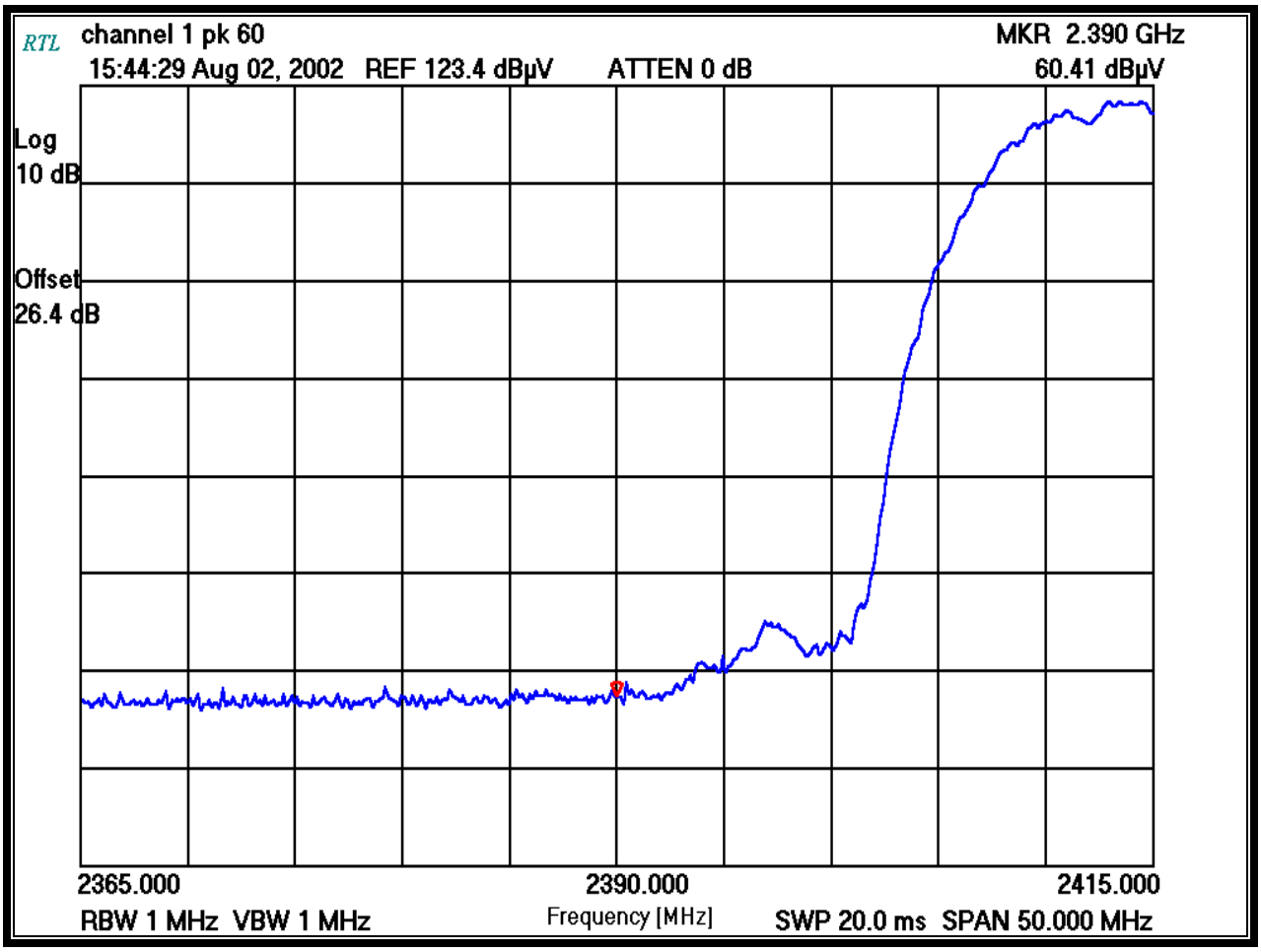


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	1
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-26: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 1 AT 1MBPS

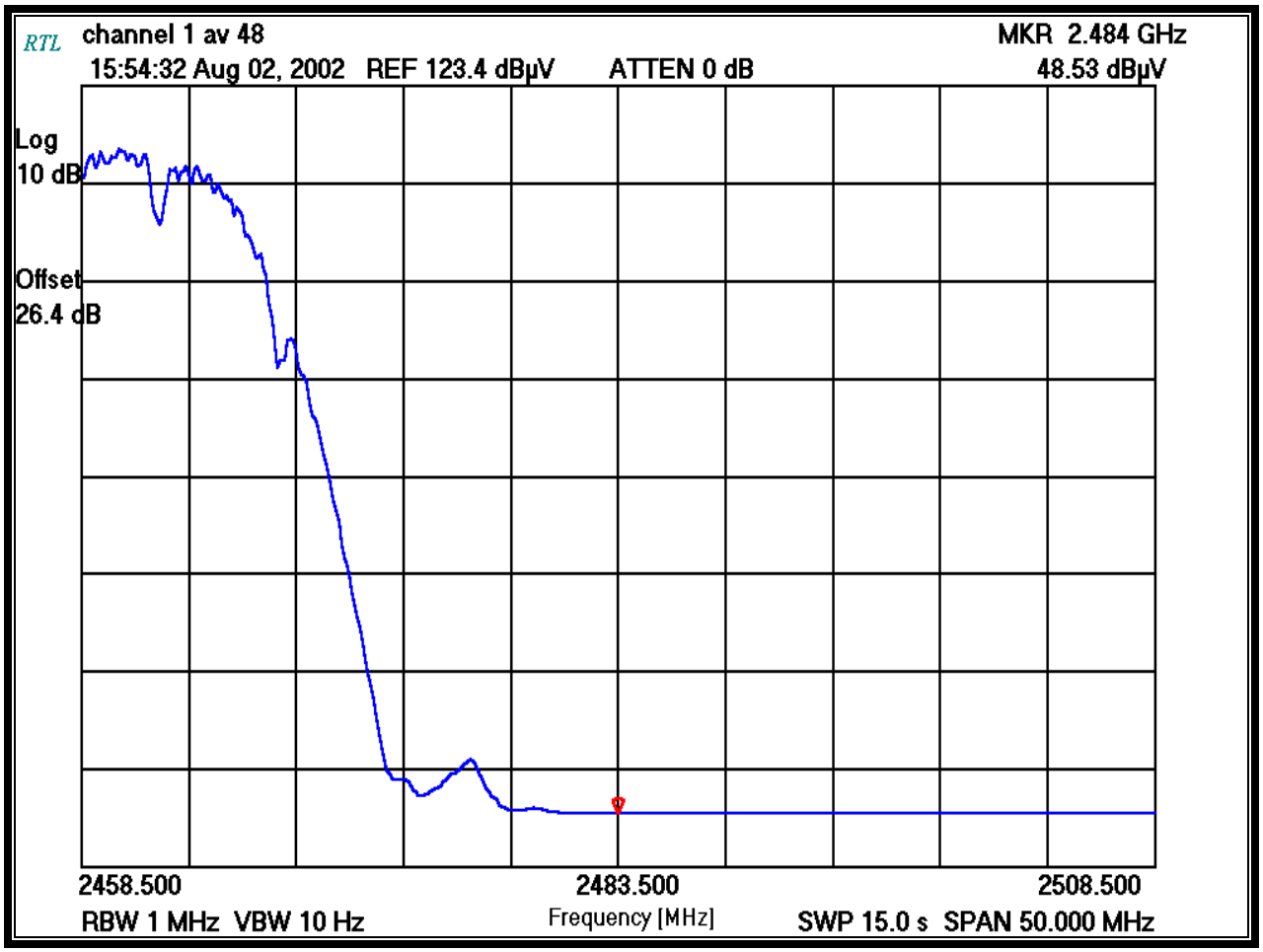


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	1
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-27: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 11 AT 1MBPS

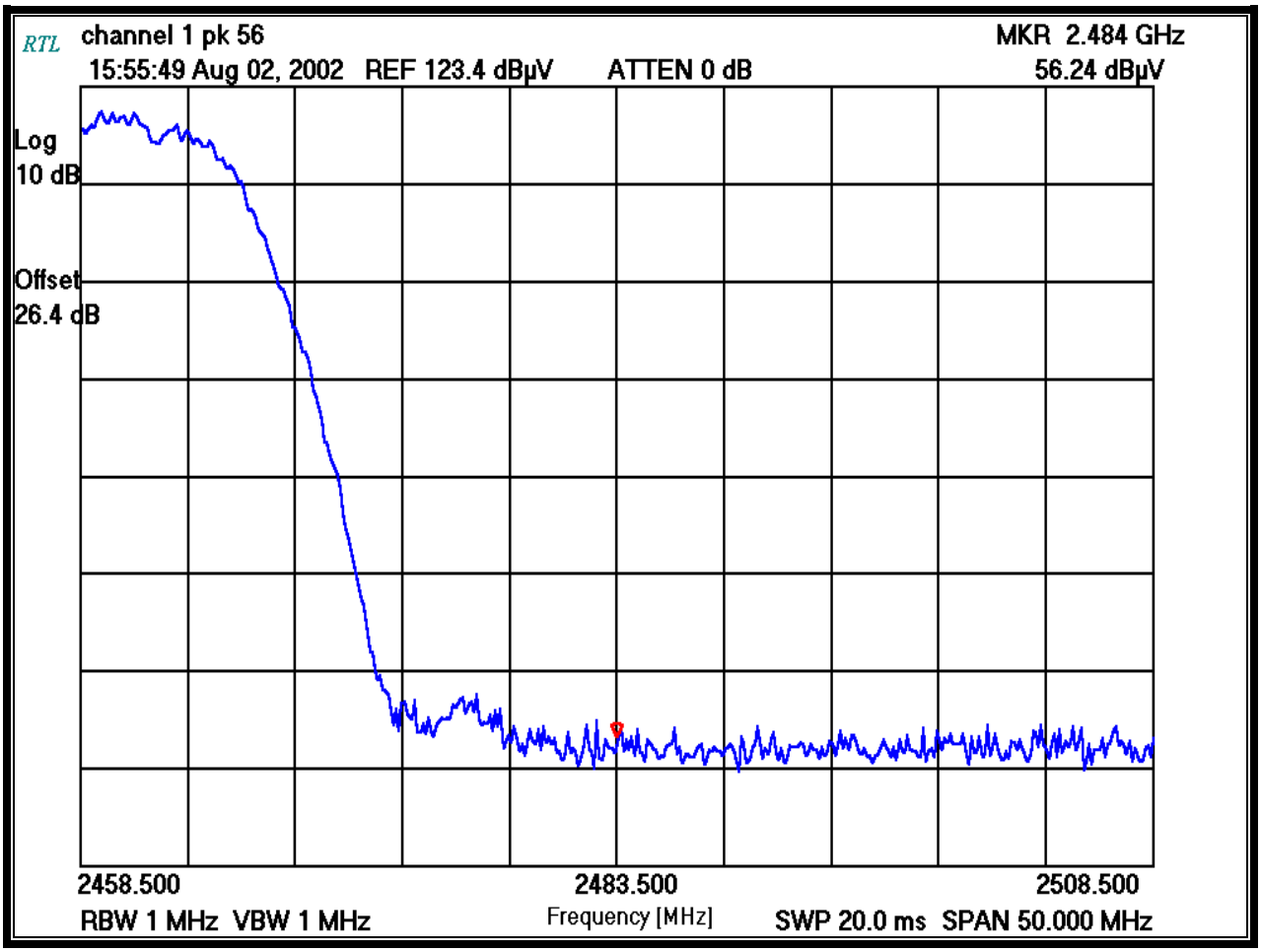


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	1
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-28: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 11 AT 1MBPS

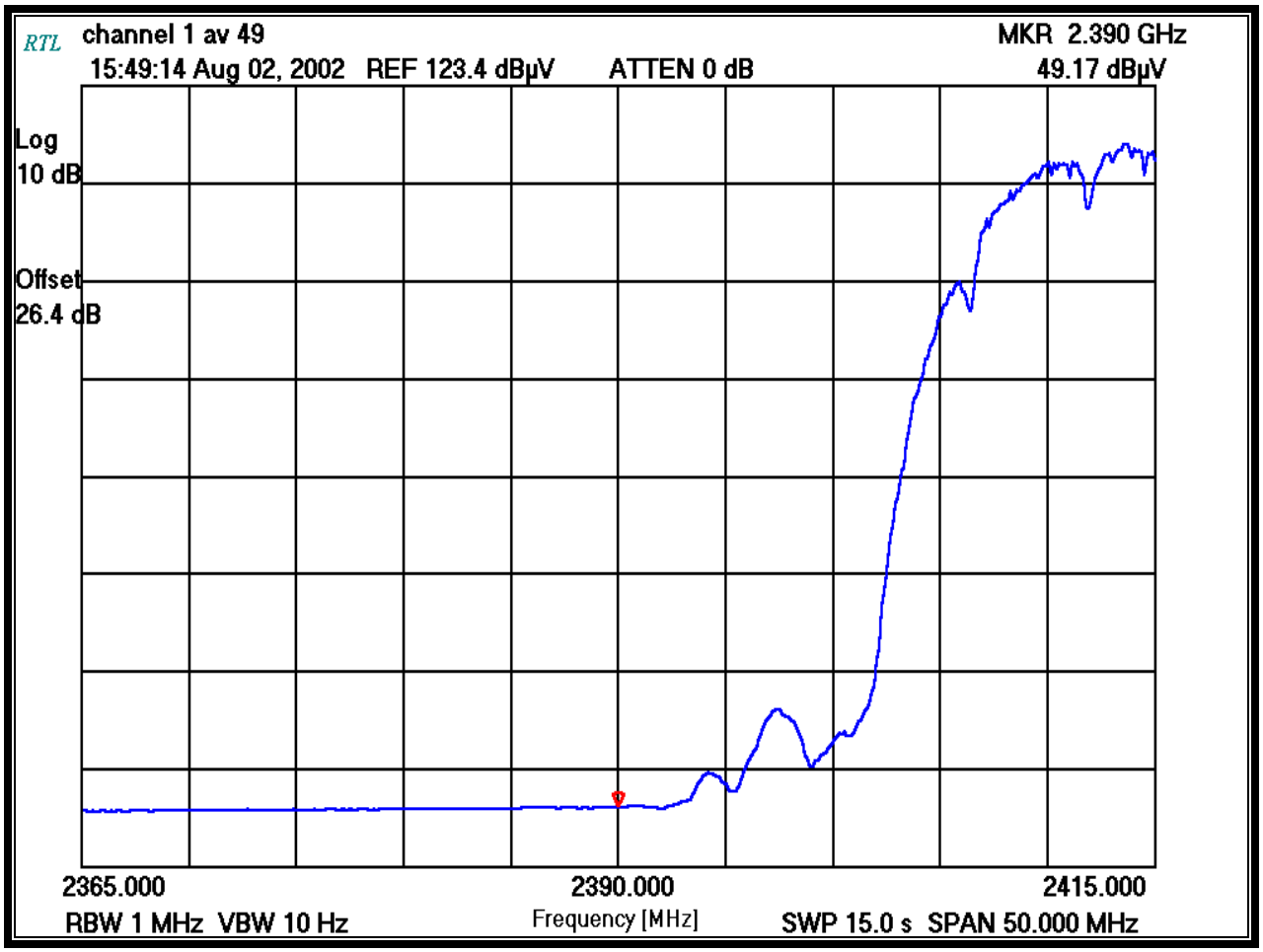


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MhHz):	2412
Data Rate (Mbps):	2
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-29: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 1 AT 2MBPS

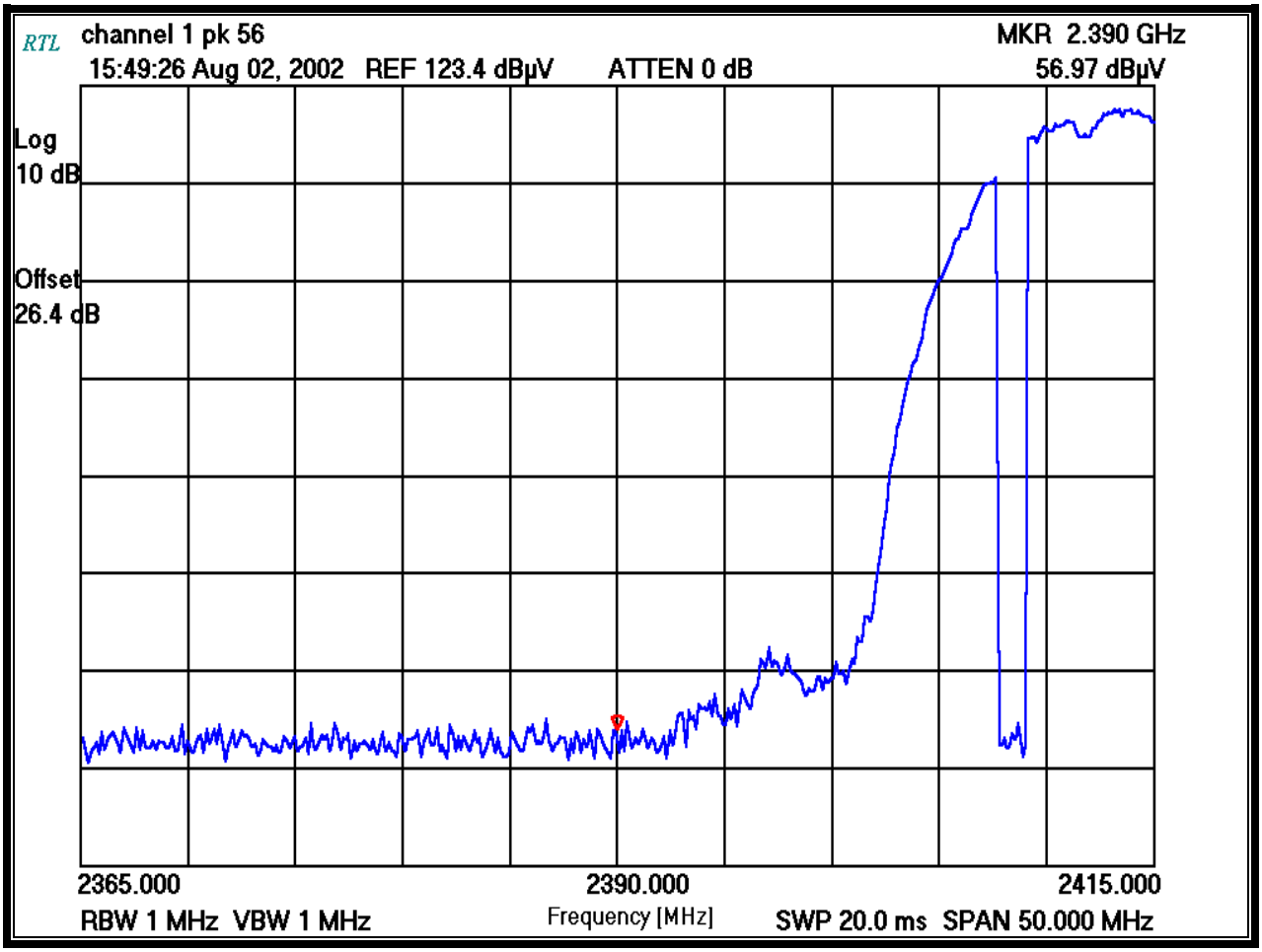


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	2
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-30: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 1 AT 2MBPS

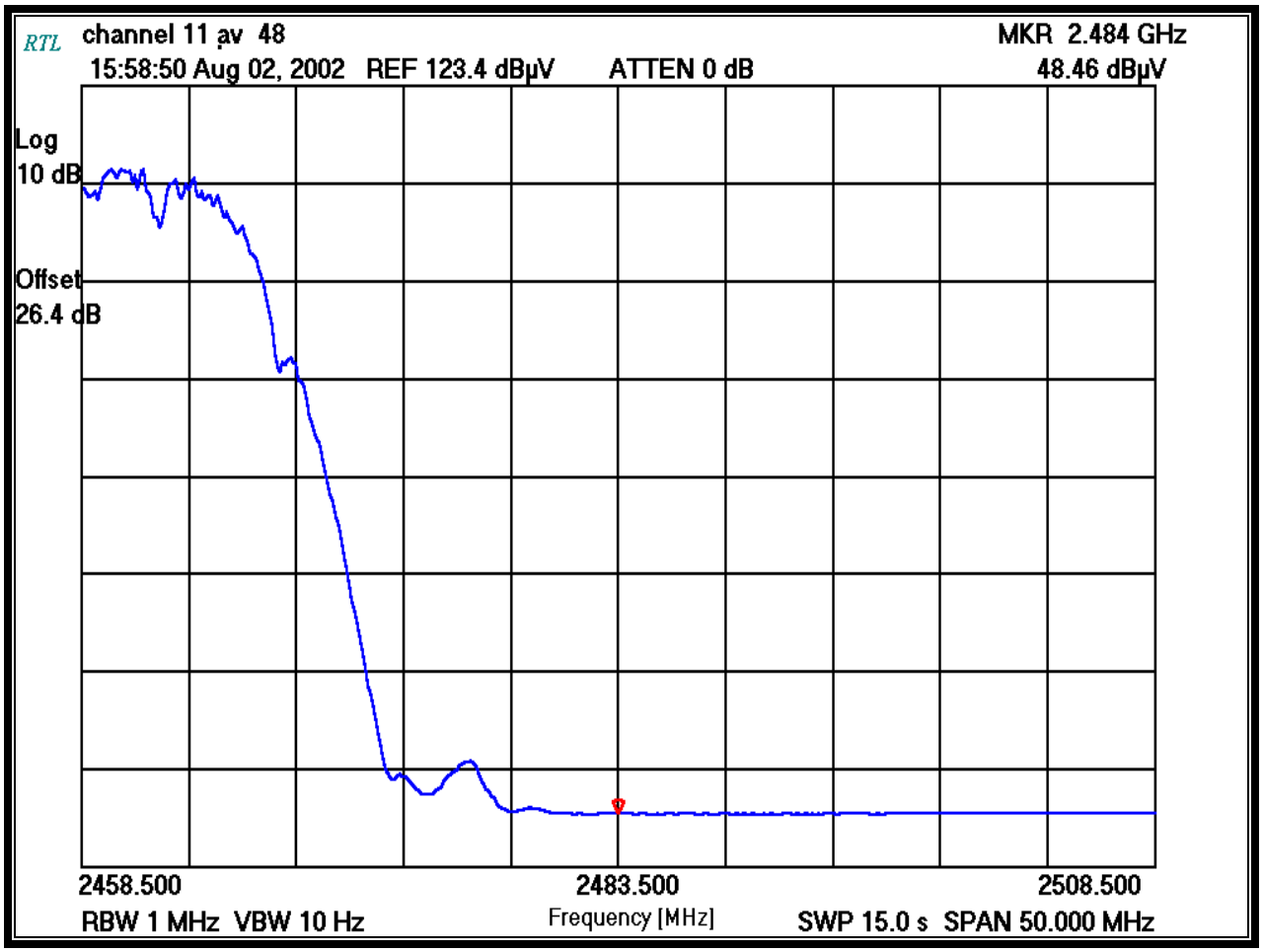


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	2
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-31: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 11 AT 2MBPS

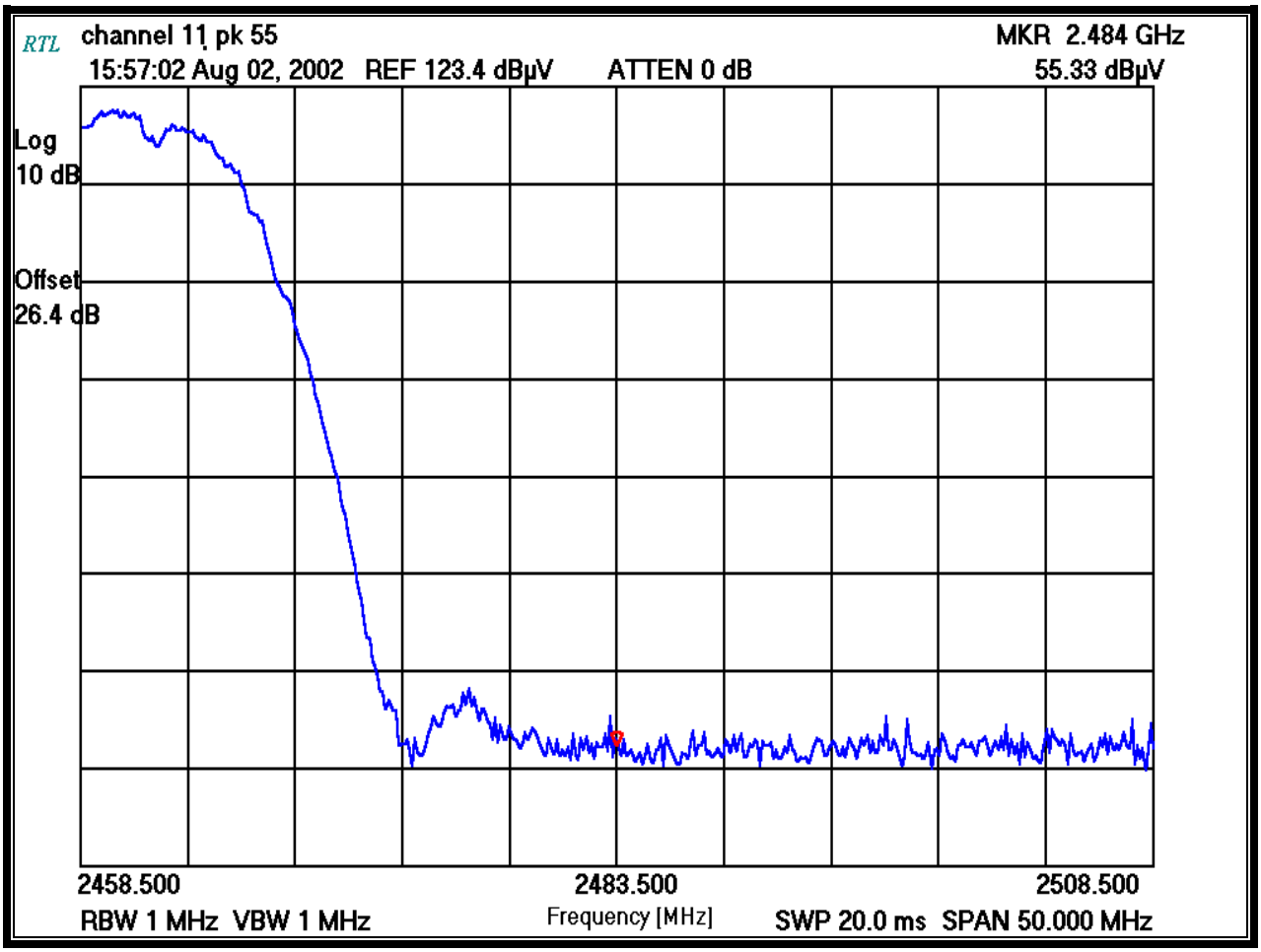


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	2
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-32: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 11 AT 2MBPS

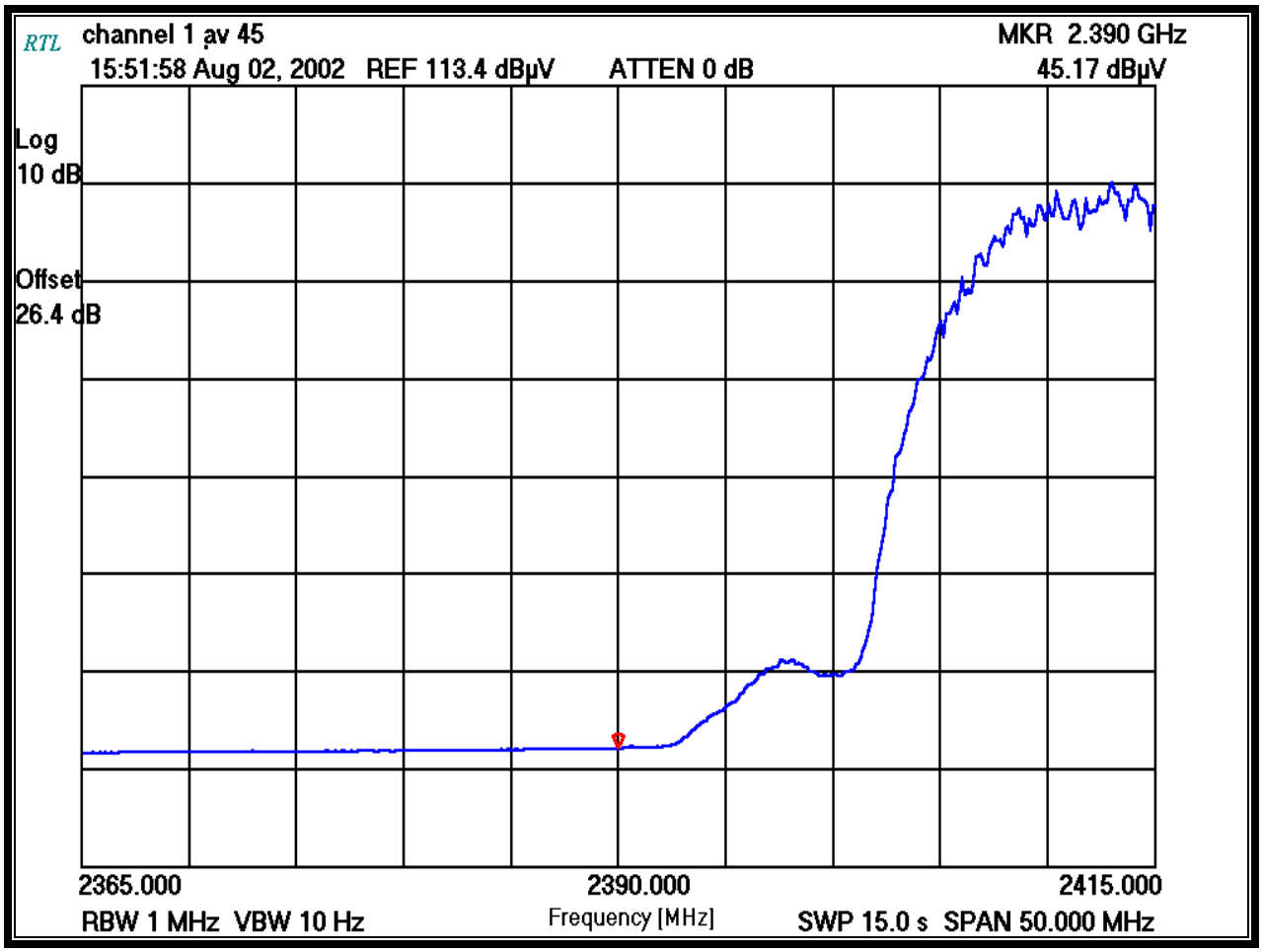


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	11
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-33: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 1 AT 11MBPS

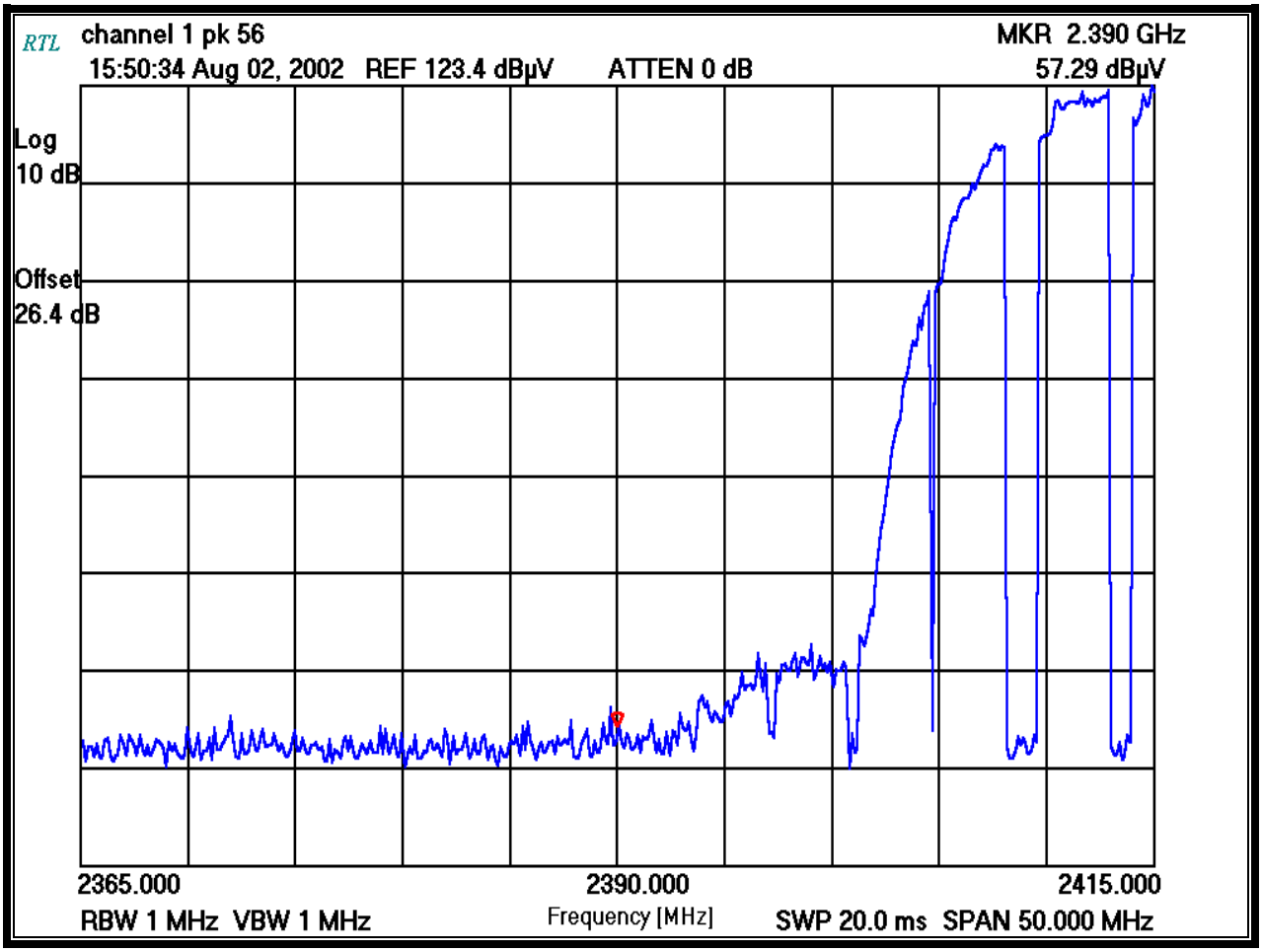


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	1
Frequency (MHz):	2412
Data Rate (Mbps):	11
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-34: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 1 AT 11MBPS

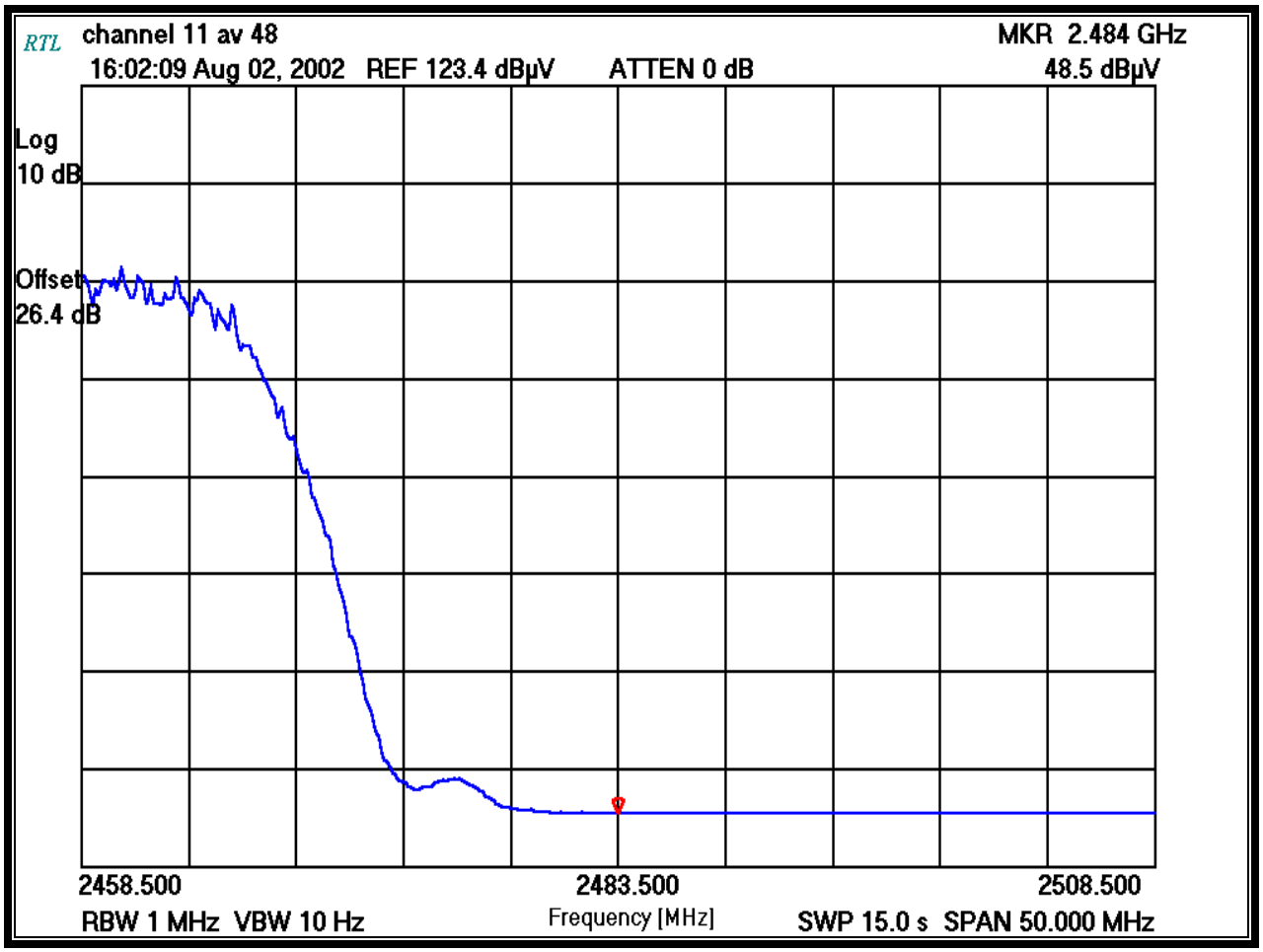


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (Mbps):	11
Resolution Bandwidth (MHz):	1
Video Bandwidth (Hz):	10
Sweep Time (s):	15.0

PLOT 3-35: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 11 AT 11MBPS

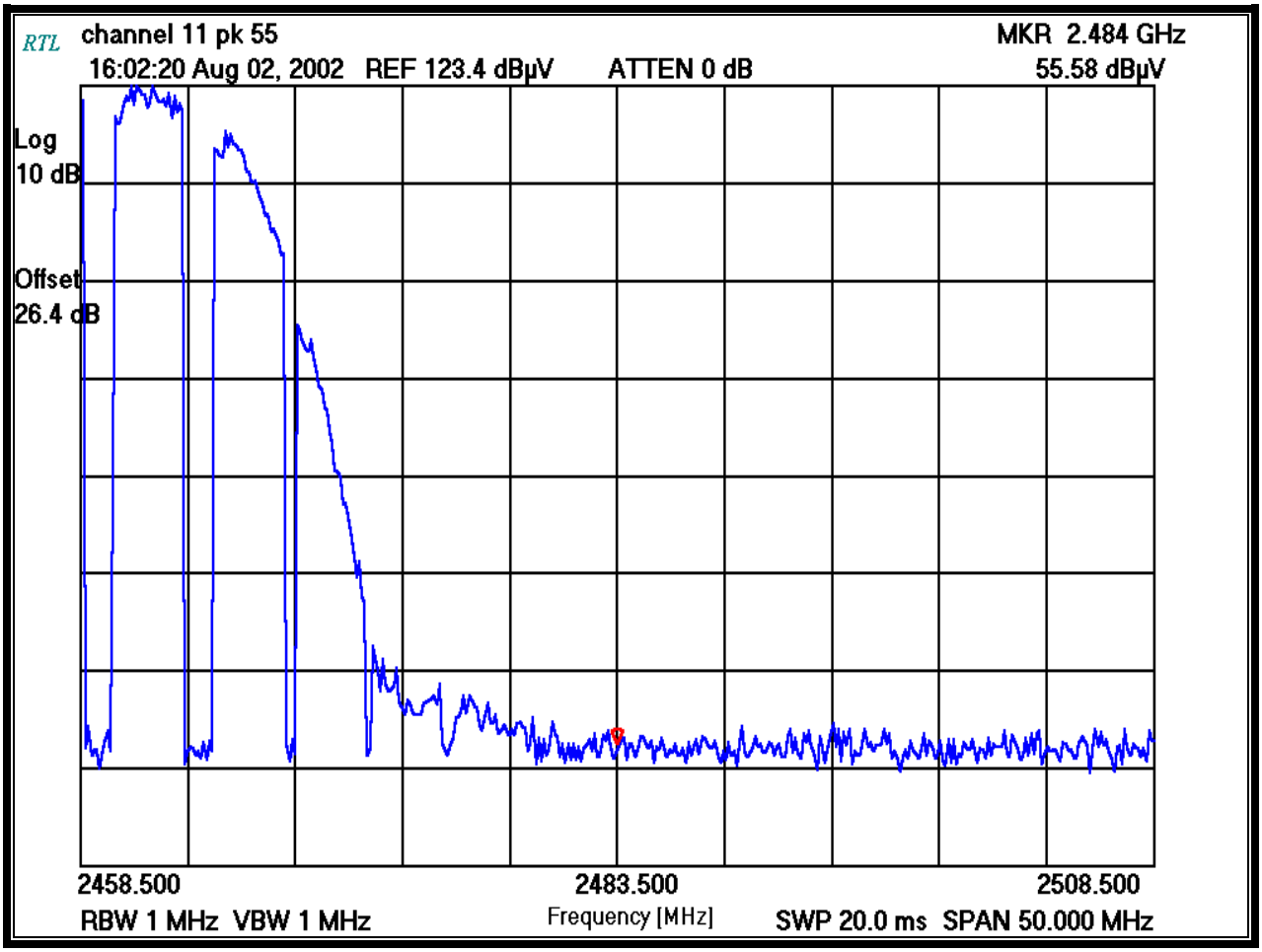


TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

Channel Number:	11
Frequency (MHz):	2462
Data Rate (mbps):	11
Resolution Bandwidth (MHz):	1
Video Bandwidth (MHz):	1
Sweep Time (ms):	20.0

PLOT 3-36: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 11 AT 11MBPS



TEST PERSONNEL:

Franck Schuppius		08/02/02
Test Technician/Engineer	Signature	Date Of Test

4 CONDUCTED LIMITS - §15.207

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 set in its own metallic frame to be positioned 0.8 meters above the ground plane. 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 400 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 400 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 (150/450) 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 450 kHz to 30 MHz on the NEUTRAL SIDE and PHASE SIDE. The EUT was investigated and tested in channels 1, 6, and 11 namely for worst case conducted data in both transmitting and receiving modes. Test data is provided for channel 1, 6, and 11 in 1 MBPS, 2 MBPS and 11 MBPS in the 0 steering mode, i.e. 0 degree phase angle mode. The other steering modes, namely -48 degree steering mode and +48 degree steering mode, 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
900931	HP	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771
900070	Solar		LISN	

TABLE 4-2: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 1 AT 1MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.453	Pk	33.3	0.8	34.1	48.0	-13.9
4.584	Pk	21.8	1.5	23.3	48.0	-24.7
6.385	Pk	27.1	1.8	28.9	48.0	-19.1
12.495	Pk	26.4	2.5	28.9	48.0	-19.1
19.720	Pk	26.0	3.1	29.1	48.0	-18.9
24.999	Pk	29.2	3.4	32.6	48.0	-15.4

TABLE 4-3: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 1 AT 1MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.454	Pk	32.8	0.8	33.6	48.0	-14.4
4.912	Pk	22.2	1.7	23.9	48.0	-24.1
6.320	Pk	26.3	1.8	28.1	48.0	-19.9
12.495	Pk	24.9	2.5	27.4	48.0	-20.6
16.225	Pk	26.1	2.8	28.9	48.0	-19.1
24.990	Pk	28.7	3.4	32.1	48.0	-15.9

TEST PERSONNEL:

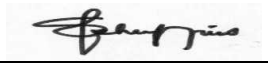
Franck Schuppius		08/05/02
Test Technician/Engineer	Signature	Date Of Test

TABLE 4-4: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 6 AT 1MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.451	Pk	37.8	0.8	38.6	48.0	-9.4
4.768	Pk	20.8	1.5	22.3	48.0	-25.7
6.660	Pk	26.6	1.8	28.4	48.0	-19.6
12.495	Pk	25.3	2.5	27.8	48.0	-20.2
16.225	Pk	26.2	2.8	29.0	48.0	-19.0
24.990	Pk	28.3	3.4	31.7	48.0	-16.3

TABLE 4-5: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 6 AT 1MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.454	Pk	36.4	0.8	37.2	48.0	-10.8
4.756	Pk	21.5	1.6	23.1	48.0	-24.9
6.390	Pk	26.3	1.8	28.1	48.0	-19.9
10.225	Pk	24.5	1.5	26.0	48.0	-22.0
16.165	Pk	26.0	2.8	28.8	48.0	-19.2
24.990	Pk	28.6	3.4	32.0	48.0	-16.0

TEST PERSONNEL:

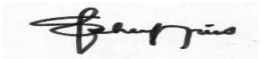
Franck Schuppius		08/05/02
Test Technician/Engineer	Signature	Date Of Test

TABLE 4-6: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 11 AT 1MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.457	Pk	36.7	0.8	37.5	48.0	-10.5
4.760	Pk	22.4	1.5	23.9	48.0	-24.1
6.380	Pk	27.3	1.8	29.1	48.0	-18.9
12.495	Pk	25.0	2.5	27.5	48.0	-20.5
19.720	Pk	26.0	3.1	29.1	48.0	-18.9
24.990	Pk	28.3	3.4	31.7	48.0	-16.3

TABLE 4-7: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 11 AT 1MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.452	Pk	37.7	0.8	38.5	48.0	-9.5
1.812	Pk	18.3	1.1	19.4	48.0	-28.6
7.495	Pk	25.2	2.0	27.2	48.0	-20.8
12.495	Pk	24.9	2.5	27.4	48.0	-20.6
18.310	Pk	25.7	3.0	28.7	48.0	-19.3
24.990	Pk	28.2	3.4	31.6	48.0	-16.4

TEST PERSONNEL:

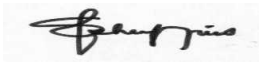
Franck Schuppius		08/05/02
Test Technician/Engineer	Signature	Date Of Test

TABLE 4-8: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 1 AT 2MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.453	Pk	36.8	0.8	37.6	48.0	-10.4
4.768	Pk	21.9	1.5	23.4	48.0	-24.6
6.385	Pk	26.2	1.8	28.0	48.0	-20.0
12.490	Pk	25.4	2.5	27.9	48.0	-20.1
18.370	Pk	25.4	3.0	28.4	48.0	-19.6
24.990	Pk	27.8	3.4	31.2	48.0	-16.8

TABLE 4-9: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 1 AT 2MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.454	Pk	38.2	0.8	39.0	48.0	-9.0
4.924	Pk	21.4	1.7	23.1	48.0	-24.9
6.385	Pk	26.0	1.8	27.8	48.0	-20.2
12.495	Pk	25.2	2.5	27.7	48.0	-20.3
18.250	Pk	26.0	3.0	29.0	48.0	-19.0
24.990	Pk	28.2	3.4	31.6	48.0	-16.4

TEST PERSONNEL:

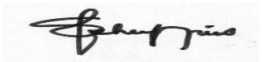
Franck Schuppius		08/05/02
Test Technician/Engineer	Signature	Date Of Test

TABLE 4-10: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 6 AT 2MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.453	Pk	38.4	0.8	39.2	48.0	-8.8
6.400	Pk	26.7	1.8	28.5	48.0	-19.5
10.225	Pk	24.9	2.1	27.0	48.0	-21.0
12.490	Pk	25.5	2.5	28.0	48.0	-20.0
16.225	Pk	25.3	2.8	28.1	48.0	-19.9
18.245	Pk	26.9	3.0	29.9	48.0	-18.1
24.990	Pk	28.8	3.4	32.2	48.0	-15.8

TABLE 4-11: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 6 AT 2MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.452	Pk	38.0	0.8	38.8	48.0	-9.2
4.632	Pk	21.4	1.6	23.0	48.0	-25.0
6.385	Pk	26.4	1.8	28.2	48.0	-19.8
12.490	Pk	24.7	2.5	27.2	48.0	-20.8
16.165	Pk	25.4	2.8	28.2	48.0	-19.8
18.250	Pk	26.2	3.0	29.2	48.0	-18.8
24.990	Pk	28.9	3.4	32.3	48.0	-15.7

TEST PERSONNEL:

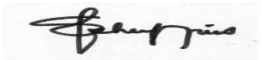
Franck Schuppius		08/05/02
Test Technician/Engineer	Signature	Date Of Test

TABLE 4-12: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 11 AT 2MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.456	Pk	39.4	0.8	40.2	48.0	-7.8
4.744	Pk	21.9	1.5	23.4	48.0	-24.6
6.385	Pk	25.6	1.8	27.4	48.0	-20.6
12.490	Pk	25.7	2.5	28.2	48.0	-19.8
17.695	Pk	26.2	2.9	29.1	48.0	-18.9
24.990	Pk	28.9	3.4	32.3	48.0	-15.7

TABLE 4-13: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 11 AT 2MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.451	Pk	35.8	0.8	36.6	48.0	-11.4
4.856	Pk	21.4	1.7	23.1	48.0	-24.9
6.180	Pk	26.0	1.8	27.8	48.0	-20.2
12.490	Pk	25.3	2.5	27.8	48.0	-20.2
17.695	Pk	25.2	2.9	28.1	48.0	-19.9
19.715	Pk	25.9	3.1	29.0	48.0	-19.0
24.990	Pk	28.6	3.4	32.0	48.0	-16.0

TEST PERSONNEL:

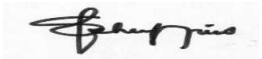
Franck Schuppius		08/05/02
Test Technician/Engineer	Signature	Date Of Test

TABLE 4-14: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 1 AT 11MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.454	Pk	35.2	0.8	36.0	48.0	-12.0
4.584	Pk	21.3	1.5	22.8	48.0	-25.2
6.380	Pk	26.3	1.8	28.1	48.0	-19.9
11.575	Pk	25.0	2.4	27.4	48.0	-20.6
18.250	Pk	26.5	3.0	29.5	48.0	-18.5
24.990	Pk	29.1	3.4	32.5	48.0	-15.5

TABLE 4-15: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 1 AT 11MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.451	Pk	35.6	0.8	36.4	48.0	-11.6
4.876	Pk	22.8	1.7	24.5	48.0	-23.5
6.385	Pk	26.6	1.8	28.4	48.0	-19.6
10.230	Pk	25.1	1.5	26.6	48.0	-21.4
13.955	Pk	25.7	1.6	27.3	48.0	-20.7
24.990	Pk	28.7	3.4	32.1	48.0	-15.9

TEST PERSONNEL:

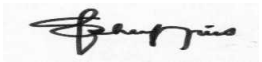
Franck Schuppius		08/05/02
Test Technician/Engineer	Signature	Date Of Test

TABLE 4-16: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 6 AT 11MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.458	Pk	41.1	0.8	41.9	48.0	-6.1
4.652	Pk	22.8	1.5	24.3	48.0	-23.7
6.455	Pk	26.6	1.8	28.4	48.0	-19.6
10.775	Pk	26.5	2.2	28.7	48.0	-19.3
18.245	Pk	27.0	3.0	30.0	48.0	-18.0
19.720	Pk	27.6	3.1	30.7	48.0	-17.3
24.990	Pk	28.6	3.4	32.0	48.0	-16.0

TABLE 4-17: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 6 AT 11MBPS RATE

Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B QP Limit (dBuV)**	**FCC B QP Margin (dBuV)**
0.452	Pk	39.0	0.8	39.8	48.0	-8.2
4.680	Pk	22.4	1.6	24.0	48.0	-24.0
6.250	Pk	26.8	1.8	28.6	48.0	-19.4
10.780	Pk	25.3	2.1	27.4	48.0	-20.6
18.250	Pk	26.5	3.0	29.5	48.0	-18.5
24.990	Pk	29.0	3.4	32.4	48.0	-15.6

TEST PERSONNEL:

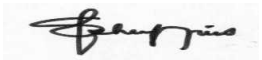
Franck Schuppius		08/05/02
Test Technician/Engineer	Signature	Date Of Test

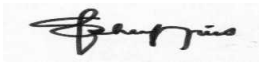
TABLE 4-18: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 11 AT 11MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.453	Pk	41.2	0.8	42.0	48.0	-6.0
4.740	Pk	22.7	1.5	24.2	48.0	-23.8
6.320	Pk	26.7	1.8	28.5	48.0	-19.5
6.590	Pk	25.7	1.8	27.5	48.0	-20.5
18.240	Pk	26.8	3.0	29.8	48.0	-18.2
24.990	Pk	28.6	3.4	32.0	48.0	-16.0

TABLE 4-19: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 11 AT 11MBPS RATE

Temperature: 75°F Humidity: 45%						
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC B Limit (dBuV)**	**FCC B Margin (dBuV)**
0.452	Pk	36.9	0.8	37.7	48.0	-10.3
4.748	Pk	20.8	1.6	22.4	48.0	-25.6
6.255	Pk	25.4	1.8	27.2	48.0	-20.8
18.300	Pk	25.1	3.0	28.1	48.0	-19.9
20.250	Pk	24.5	3.1	27.6	48.0	-20.4
24.990	Pk	28.4	3.4	31.8	48.0	-16.2

TEST PERSONNEL:

Franck Schuppius		08/05/02
Test Technician/Engineer	Signature	Date Of Test

5 RADIATED EMISSION LIMITS RECEIVER/DIGITAL INTERFACE - §15.209

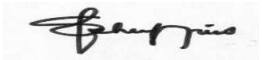
5.1 RADIATED EMISSION LIMITS TEST PROCEDURE

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 and tested in all steering modes and data rate for channels 1, 6, and 11 at more than 75 percent duty cycle while the EUT was configured in the receiving/digital mode. The -48 degree and + 48 degree steering mode including 1 MBPS and 2 MBPS data rates were tested and investigated between 10kHz and 1GHz. The worst – case test results for channels 1, 6, and 11 in the 0 degree steering mode at 11 MBPS is presented in the table below.

5.2 RADIATED EMISSION LIMITS TEST DATA RECEIVER/DIGITAL MODE CH1

Temperature: 82°F Humidity: 45%									
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)**
110.000	Qp	V	0	1.0	38.2	-11.0	27.2	43.5	-16.3
132.000	Qp	V	0	1.0	39.7	-10.8	28.9	43.5	-14.6
220.000	Qp	V	0	1.0	38.3	-10.2	28.1	46.0	-17.9
229.068	Qp	V	85	1.0	46.4	-10.1	36.3	46.0	-9.7
266.000	Qp	V	0	1.0	39.3	-9.9	29.4	46.0	-16.6
275.060	Qp	V	0	1.0	39.2	-9.8	29.4	46.0	-16.6
300.060	Qp	V	0	1.0	39.9	-9.6	30.3	46.0	-15.7
333.000	Qp	V	0	1.0	38.3	-9.4	28.9	46.0	-17.1
798.690	Qp	V	0	1.0	39.2	-5.9	33.3	46.0	-12.7

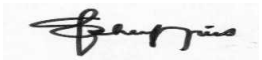
TEST PERSONNEL:

Franck Schuppius		08/06/02
Test Technician/Engineer	Signature	Date Of Test

5.3 RADIATED EMISSION LIMITS TEST DATA TX/DIGITAL MODE CH6

Temperature: 82°F Humidity: 45%									
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)**
110.000	Qp	V	0	1.0	38.4	-11.0	27.4	43.5	-16.1
132.000	Qp	V	0	1.0	38.8	-10.8	28.0	43.5	-15.5
200.000	Qp	V	0	1.0	39.5	-10.3	29.2	43.5	-14.3
220.000	Qp	V	0	1.0	39.4	-10.2	29.2	46.0	-16.8
250.000	Qp	V	0	1.0	37.5	-10.0	27.5	46.0	-18.5
300.000	Qp	V	10	1.0	40.0	-9.6	30.4	46.0	-15.6
333.000	Qp	V	0	1.0	36.6	-9.4	27.2	46.0	-18.8
798.690	Qp	V	145	1.0	37.1	-5.9	31.2	46.0	-14.8

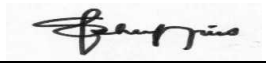
TEST PERSONNEL:

Franck Schuppius		08/06/02
Test Technician/Engineer	Signature	Date Of Test

5.4 RADIATED EMISSION LIMITS TEST DATA TX/DIGITAL MODE CH11

Temperature: 82°F Humidity: 45%									
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)**
110.000	Qp	V	0	1.0	38.2	-11.0	27.2	43.5	-16.3
132.000	Qp	V	0	1.0	39.7	-10.8	28.9	43.5	-14.6
220.000	Qp	V	0	1.0	38.3	-10.2	28.1	46.0	-17.9
229.068	Qp	V	85	1.0	46.4	-10.1	36.3	46.0	-9.7
266.000	Qp	V	0	1.0	39.3	-9.9	29.4	46.0	-16.6
275.060	Qp	V	0	1.0	39.2	-9.8	29.4	46.0	-16.6
300.060	Qp	V	0	1.0	39.9	-9.6	30.3	46.0	-15.7
333.000	Qp	V	0	1.0	38.3	-9.4	28.9	46.0	-17.1
798.690	Qp	V	0	1.0	39.2	-5.9	33.3	46.0	-12.7

TEST PERSONNEL:

Franck Schuppius		08/06/02
Test Technician/Engineer	Signature	Date Of Test

6 RADIATED EMISSION LIMITS RADIATED HARMONICS - §15.247

6.1 RADIATED 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 its typical configuration in the Y-Z plane from 10 KHz to the 10th harmonic of the carrier at channels 1, 6, and 11 in 0 degree steering mode at 1, 2, and 11 MBPS data rates. The test result table below represents the worst case configuration.

6.2 RADIATED EMISSION LIMITS TEST DATA

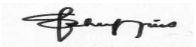
Operating Frequency (MHz): 2412
Channel: 1
Data Rate (Mbps): 1

TABLE 6-1: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 1) 1MBPS

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Readings (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
4824.158	Av	V	20	1.3	32.1	13.3	45.4	54
4824.408	Pk	V	20	1.3	42.1	13.3	55.4	
7238.438	Av	V	20	1.3	29.9	11.8	41.7	54
7236.035	Pk	V	20	1.2	40.4	11.8	52.2	
9647.8	Av	V	20	1.2	34.5	16.9	51.4	54
9648.11	Pk	V	20	1.2	45.1	16.9	62.0	
12060.06	Av	V	20	1.2	33.6	19.7	53.3	54
12060.28	Pk	V	20	1.3	44.2	19.7	63.9	

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppius		08/06/02
Test Technician/Engineer	Signature	Date Of Test

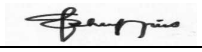
Operating Frequency (MHz): 2412
Channel: 1
Data Rate (Mbps): 2

TABLE 6-2: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 1) 2MBPS

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Readings (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
4832.92	Av	V	20	1.3	29.7	13.3	43.0	54
4832.18	Pk	V	20	1.3	41	13.3	54.3	
7234.75	Av	V	20	1.3	30.3	11.8	42.1	54
7234.69	Pk	V	20	1.2	39.6	11.8	51.4	
9650.9	Av	V	20	1.2	34.9	16.9	51.8	54
9648	Pk	V	20	1.2	44.2	16.9	61.1	
12060.03	Av	V	20	1.2	33.5	19.7	53.2	54
12060.97	Pk	V	20	1.3	44.5	19.7	64.2	

AVERAGE: RES. =1 MHZ, VID= 10Hz; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppius		08/06/02
Test Technician/Engineer	Signature	Date Of Test

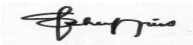
Operating Frequency (MHz): 2412
Channel: 1
Data Rate (Mbps): 11

TABLE 6-3: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 1) 11MBPS

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Readings (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
4823.94	Av	V	20	1.3	29.3	13.3	42.6	54
4823.89	Pk	V	20	1.3	40	13.3	53.3	
7239.51	Av	V	20	1.3	30.5	11.8	42.3	54
7239.18	Pk	V	20	1.2	41	11.8	52.8	
9647.94	Av	V	20	1.2	34.2	16.9	51.1	54
9647.49	Pk	V	20	1.2	45.8	16.9	62.7	
12063.03	Av	V	20	1.2	33	19.7	52.7	54
12062.15	Pk	V	20	1.3	45.3	19.7	65.0	

AVERAGE: RES. =1 MHz, VID= 10Hz; NF = NOISE FLOOR; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppius		08/06/02
Test Technician/Engineer	Signature	Date Of Test

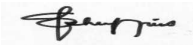
Operating Frequency (MHz): 2437
Channel: 6
Data Rate (Mbps): 1

TABLE 6-4: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 6) 1MBPS

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Readings (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
4874.17	Av	V	20	1.3	32.7	13.9	46.6	54
4874.51	Pk	V	20	1.3	41.4	13.9	55.3	
7309.86	Av	V	20	1.3	32.3	11.8	44.1	54
7309.28	Pk	V	20	1.2	42.8	11.8	54.6	
9747.26	Av	V	20	1.2	30.6	16.7	47.3	54
9747.2	Pk	V	20	1.2	40.4	16.7	57.1	
12185.06	Av	V	20	1.2	29.3	18.2	47.5	54
12185.34	Pk	V	20	1.3	42.4	18.2	60.6	

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppius		08/06/02
Test Technician/Engineer	Signature	Date Of Test

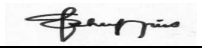
Operating Frequency (MHz): 2437
Channel: 6
Data Rate (Mbps): 2

TABLE 6-5: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 6) 2MBPS

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Readings (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
4874.06	Av	V	20	1.3	30.8	13.9	44.7	54
4874.11	Pk	V	20	1.3	41.5	13.9	55.4	
7309.97	Av	V	20	1.3	33.6	11.8	45.4	54
7309.86	Pk	V	20	1.2	43.9	11.8	55.7	
9748	Av	V	20	1.2	30.6	16.7	47.3	54
9747.15	Pk	V	20	1.2	42.1	16.7	58.8	
12184.89	Av	V	20	1.2	29	18.2	47.2	54
12184.72	Pk	V	20	1.3	41	18.2	59.2	

AVERAGE: RES. =1 MHZ, VID= 10Hz; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppius		08/06/02
Test Technician/Engineer	Signature	Date Of Test

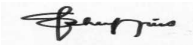
Operating Frequency (MHz): 2437
Channel: 6
Data Rate (Mbps): 11

TABLE 6-6: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 6) 11 MBPS

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Readings (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
4874	Av	V	20	1.3	32.5	13.9	46.4	54
4874	Pk	V	20	1.3	45.0	13.9	58.9	
7311	Av	V	20	1.3	33.1	11.8	44.9	54
7311	Pk	V	20	1.2	43.4	11.8	55.2	
9748	Av	V	20	1.2	30.6	16.7	47.3	54
9748	Pk	V	20	1.2	41.1	16.7	57.8	
12185	Av	V	20	1.2	30.2	18.2	48.4	54
12185	Pk	V	20	1.3	41.5	18.2	59.7	

AVERAGE: RES. =1 MHz, VID= 10Hz; NF = NOISE FLOOR; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppius		08/06/02
Test Technician/Engineer	Signature	Date Of Test

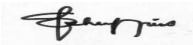
Operating Frequency (MHz): 2462
Channel: 11
Data Rate (Mbps): 1

TABLE 6-7: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 11) 1MBPS

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Readings (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
4924.05	Av	V	20	1.3	31.2	13.8	45.0	54
4924.21	Pk	V	20	1.3	43.4	13.8	57.2	
7384.02	Av	V	20	1.3	35.7	12.0	47.7	54
7383.95	Pk	V	20	1.2	45.8	12.0	57.8	
9848.06	Av	V	20	1.2	35.3	16.4	51.7	54
9848.45	Pk	V	20	1.2	44.3	16.4	60.7	
12309.89	Av	V	20	1.2	30.6	18.5	49.1	54
12308.97	Pk	V	20	1.3	41.1	18.5	59.6	

PEAK: RES. =1 MHZ, VID= 1MHZ; AVERAGE: RES. =1 MHZ, VID= 10HZ; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppius		08/06/02
Test Technician/Engineer	Signature	Date Of Test

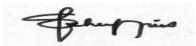
Operating Frequency (MHz): 2462
Channel: 11
Data Rate (Mbps): 2

TABLE 6-8: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 11) 2MBPS

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Readings (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
4924.05	Av	V	20	1.3	31.6	13.8	45.4	54
4924.23	Pk	V	20	1.3	41.7	13.8	55.5	
7383.9	Av	V	20	1.3	35.5	12.0	47.5	54
7384.18	Pk	V	20	1.2	45.4	12.0	57.4	
9848.06	Av	V	20	1.2	32.7	16.4	49.1	54
9848.06	Pk	V	20	1.2	43.4	16.4	59.8	
12309.83	Av	V	20	1.2	30.1	18.5	48.6	54
12310.57	Pk	V	20	1.3	42	18.5	60.5	

AVERAGE: RES. =1 MHZ, VID= 10Hz; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppius		08/06/02
Test Technician/Engineer	Signature	Date Of Test

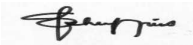
Operating Frequency (MHz): 2462
Channel: 11
Data Rate (Mbps): 11

TABLE 6-9: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 11) 11MBPS

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Readings (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
4924.05	Av	V	20	1.3	34.7	13.8	48.5	54
4924.23	Pk	V	20	1.3	42.1	13.8	55.9	
7383.942	Av	V	20	1.3	27.5	12.0	39.5	54
7383.139	Pk	V	20	1.2	39.5	12.0	51.5	
9848.11	Av	V	20	1.2	32.1	16.4	48.5	54
9847.31	Pk	V	20	1.2	42.4	16.4	58.8	
12310.06	Av	V	20	1.2	30.3	18.5	48.8	54
12308.47	Pk	V	20	1.3	41.7	18.5	60.2	

AVERAGE: RES. =1 MHz, VID= 10Hz; NF = NOISE FLOOR; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppius		08/06/02
Test Technician/Engineer	Signature	Date Of Test

6.3 TEST EQUIPMENT USED FOR TESTING

TABLE 6-10: RADIATED SPURIOUS EMISSIONS TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771
900772	EMCO	3161-02	Horn ANTENNA (2-4 GHz)	900772
900321	EMCO	3161-03	Horn Antennas (4-8,2GHz)	9508-1020
900323	EMCO	3160-7	Horn Antennas (8,2-12,4 GHz)	9605-1054
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051
900356	EMCO	3160-8	Horn Antennas (12.4 - 18 GHz)	9607-1044
900723	Miteq	NA	AMP 100MHz-26GHz	NA
900791	Schaffner-Chase	CBL6112	Antenna (25 MHz - 2 GHz)	2099

7 MODULATED BANDWIDTH - §15.247(A)(2)

7.1 MODULATED BANDWIDTH TEST PROCEDURE

The minimum 6 dB bandwidth per FCC 15.247 (a)(2) was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz. The 0 degree steering mode, the -48 degree steering mode and the +48 degree steering mode were investigated and tested. The worst case bandwidth plots for Channels 1, 6 and 11 in the 1 MBPS, 2 MBPS and 11 MBPS modes are included for 0 degree steering mode at duty cycle higher than 75 percent. The test equipment used for this testing is listed in the table below.

TABLE 7-1: TEST EQUIPMENT USED FOR TESTING (MODULATED BANDWIDTH)

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771

7.2 MODULATED BANDWIDTH TEST DATA

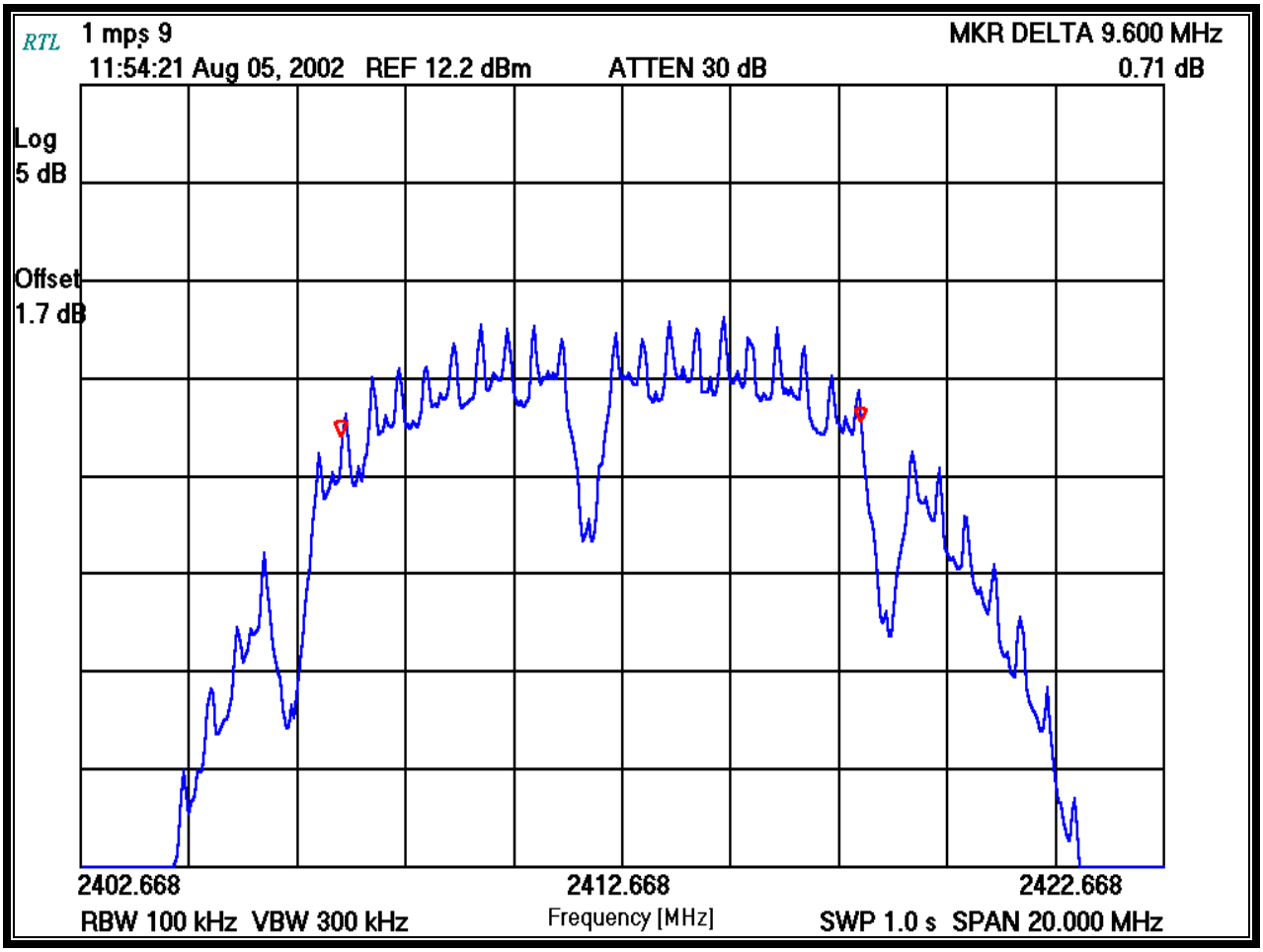
TABLE 7-2: MINIMUM 6 DB MODULATED BANDWIDTHS CHANNEL 1

CHANNEL 1	6 dB BANDWIDTH (MHz)
1 MBPS	9.60
2 MBPS	9.35
11 MBPS	9.75

7.3 MODULATED BANDWIDTH TEST PLOTS

Operating Frequency (MHz): 2412
Channel: 1
Data Rate (Mbps): 1

PLOT 7-1: 6DB BANDWIDTH: CHANNEL 1 SET FOR 1MBPS

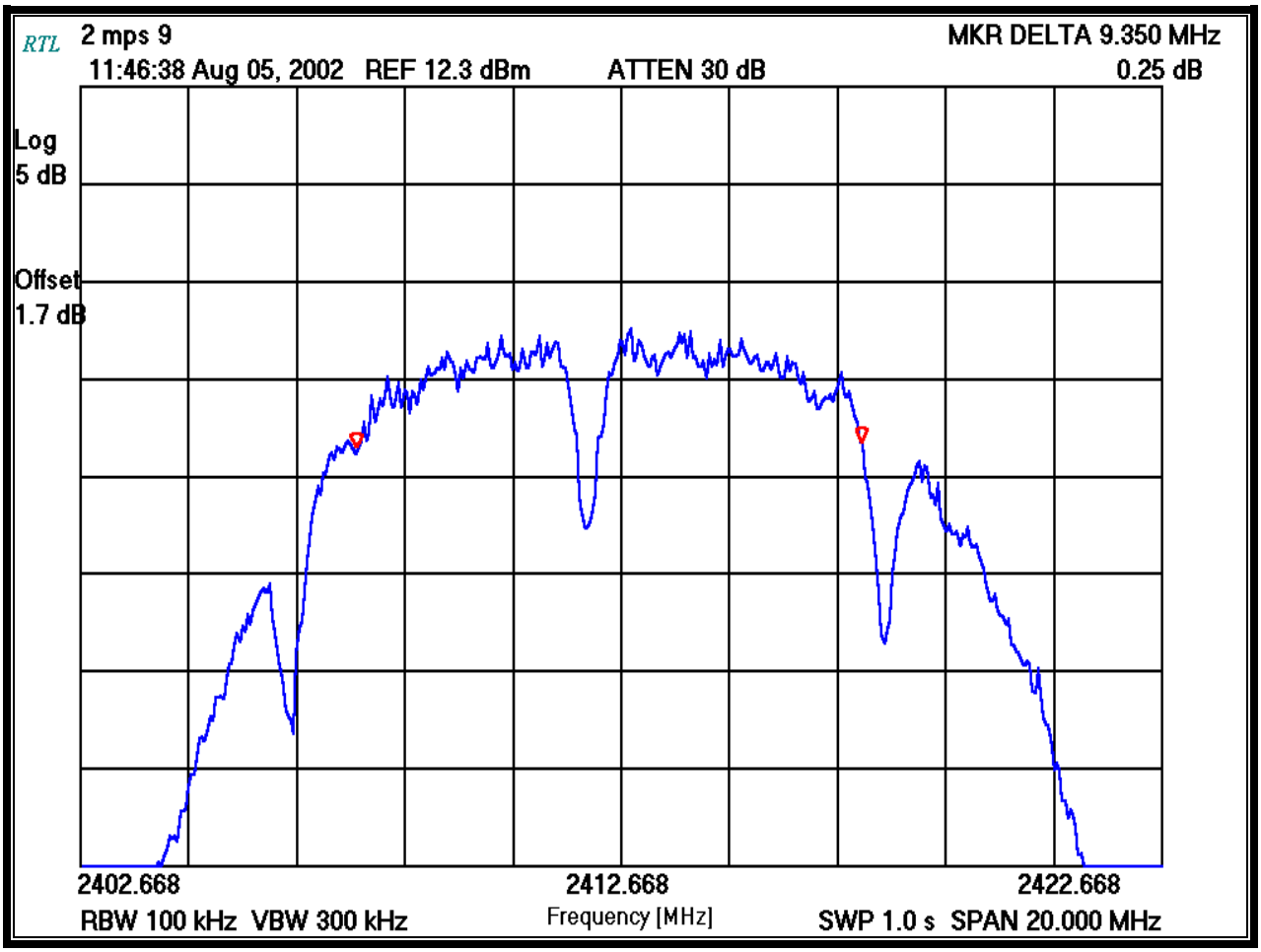


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz): 2412
Channel: 1
Data Rate (Mbps): 2

PLOT 7-2: 6DB BANDWIDTH: CHANNEL 1 SET FOR 2MBPS

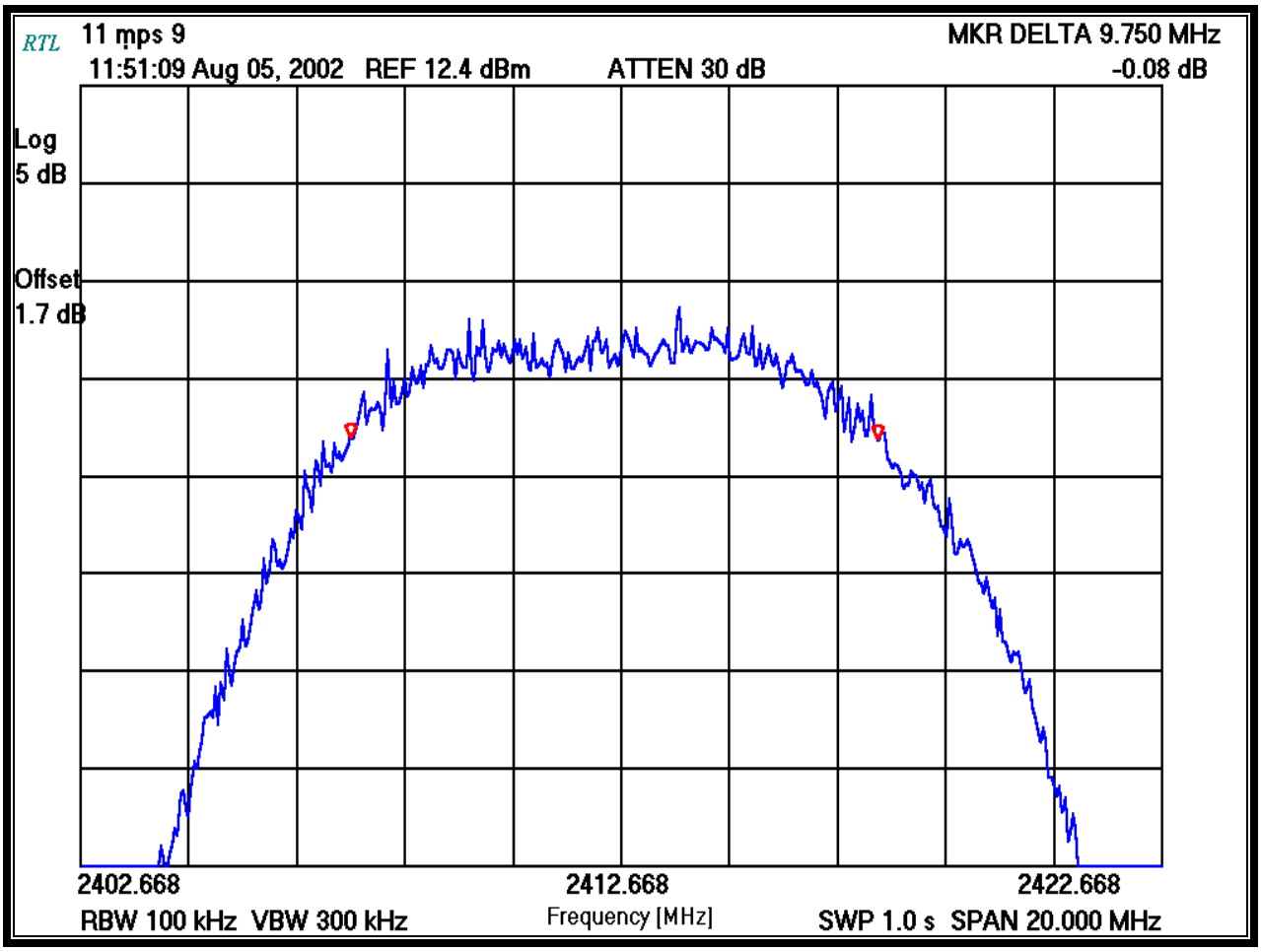


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz): 2412
Channel: 1
Data Rate (Mbps): 11

PLOT 7-3: 6DB BANDWIDTH: CHANNEL 1 SET FOR 11MBPS



TEST PERSONNEL:

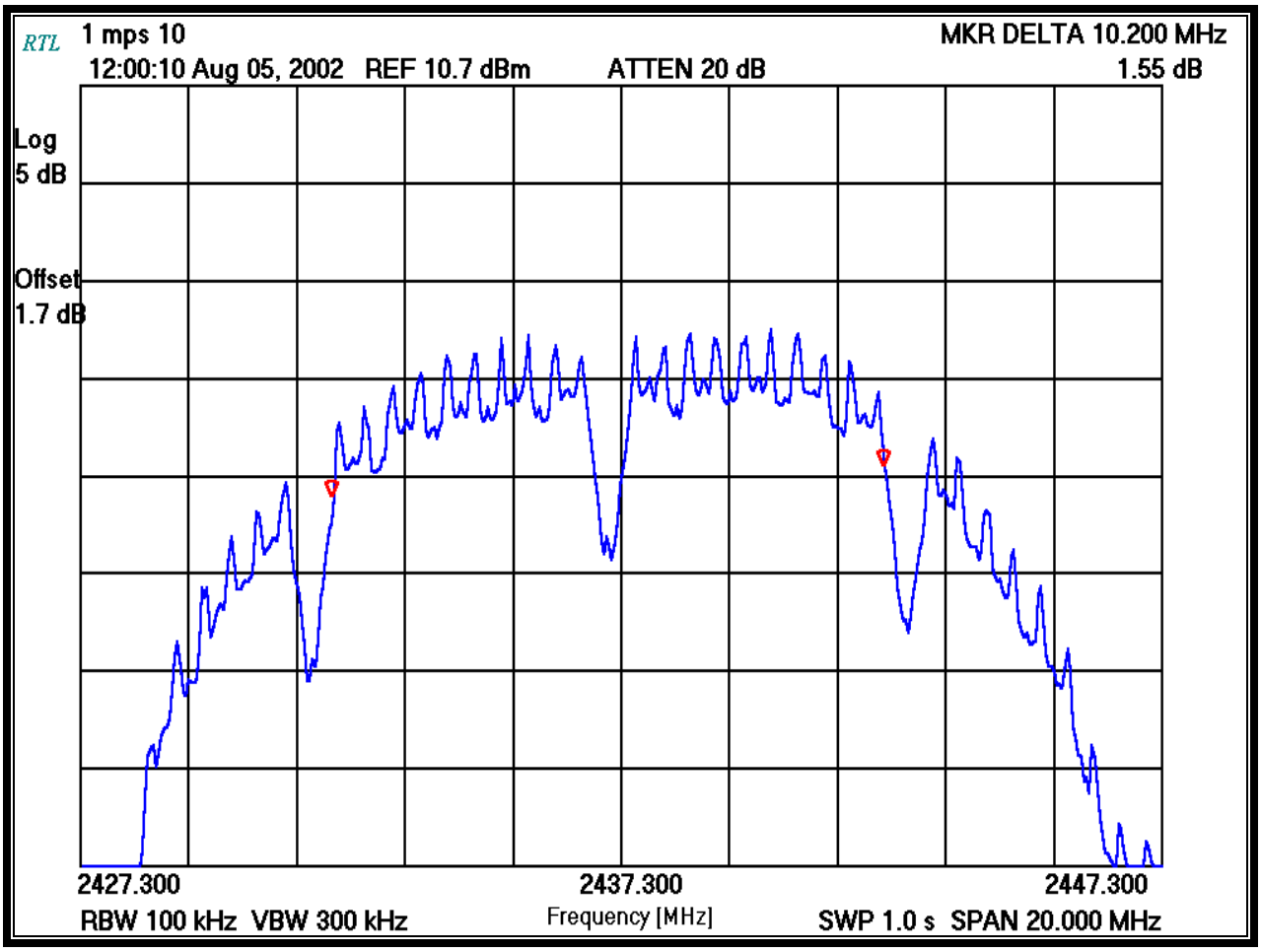
Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

TABLE 7-3: MINIMUM 6 DB MODULATED BANDWIDTHS CHANNEL 6

CHANNEL 6	6 dB BANDWIDTH (MHz)
1 MBPS	10.20
2 MBPS	10.20
11 MBPS	9.65

Operating Frequency (MHz): 2437
Channel: 6
Data Rate (Mbps): 1

PLOT 7-4: 6DB BANDWIDTH: CHANNEL 6 SET FOR 1MBPS

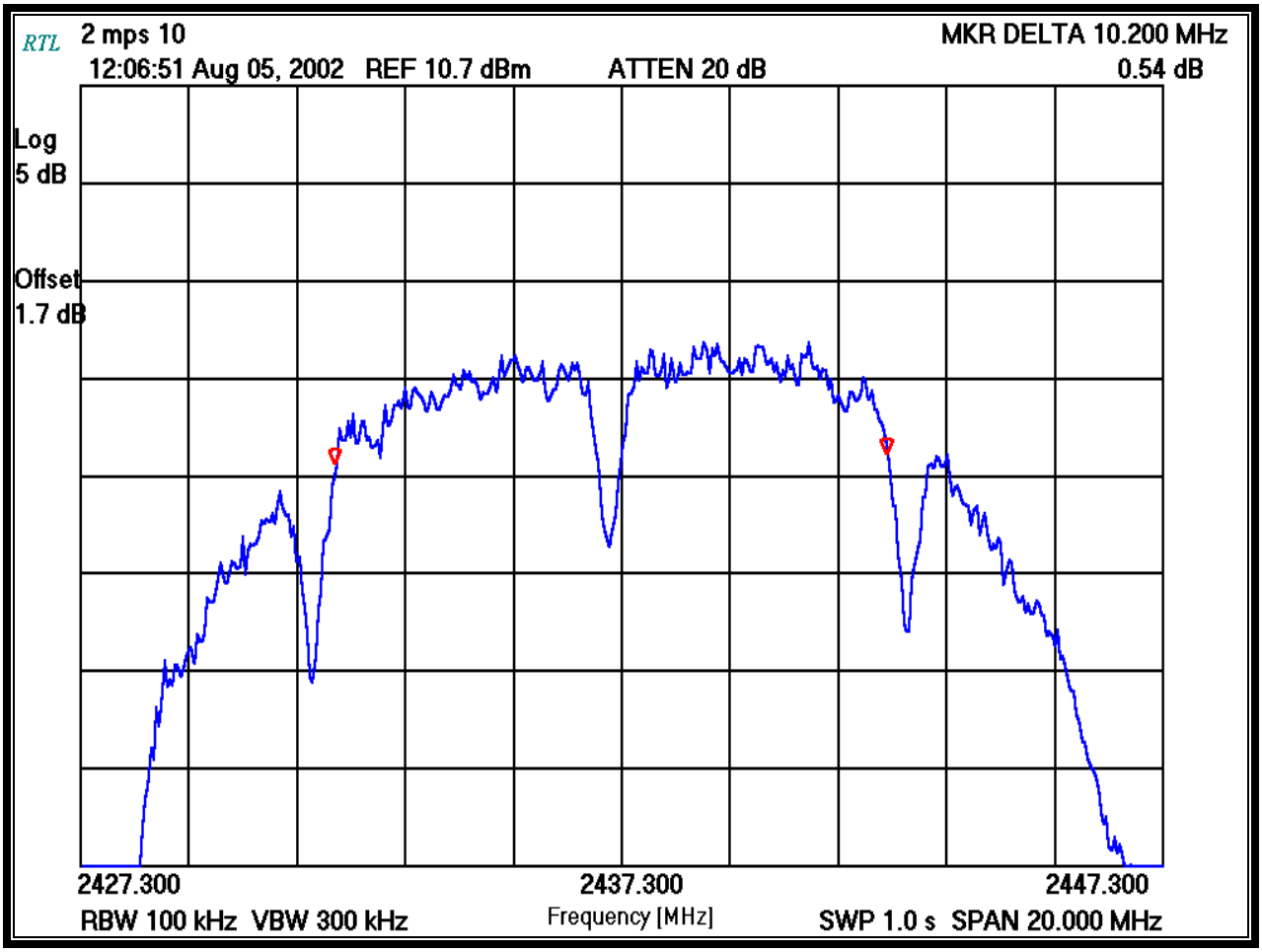


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz): 2437
Channel: 6
Data Rate (Mbps): 2

PLOT 7-5: 6DB BANDWIDTH: CHANNEL 6 SET FOR 2MBPS

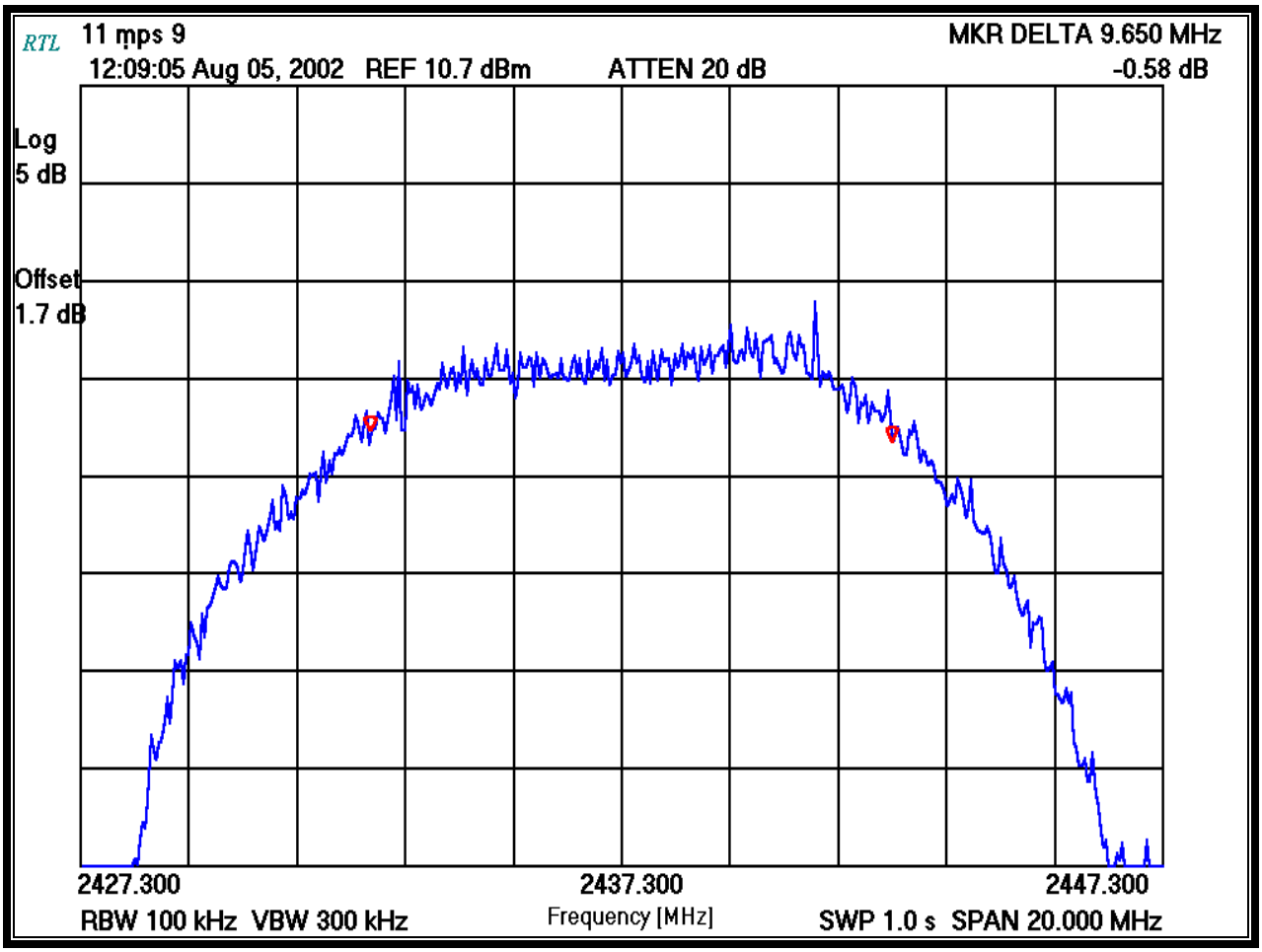


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz): 2437
Channel: 6
Data Rate (Mbps): 11

PLOT 7-6: 6DB BANDWIDTH: CHANNEL 6 SET FOR 11MBPS



TEST PERSONNEL:

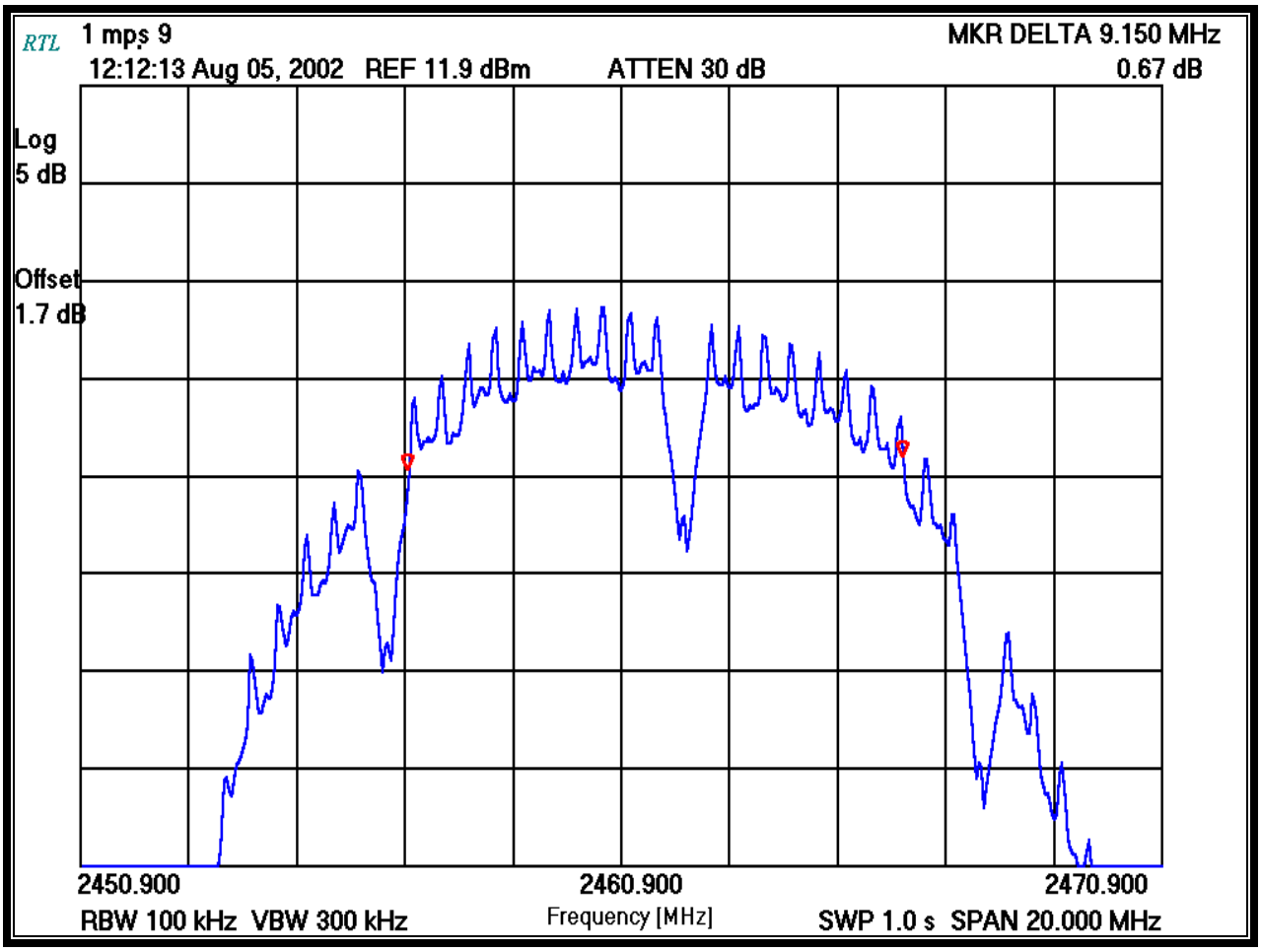
Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

TABLE 7-4: MINIMUM 6 DB MODULATED BANDWIDTHS CHANNEL 11

CHANNEL 11	6 dB BANDWIDTH (MHz)
1 MBPS	9.15
2 MBPS	9.10
11 MBPS	9.05

Operating Frequency (MHz): 2464
Channel: 11
Data Rate (Mbps): 1

PLOT 7-7: 6DB BANDWIDTH: CHANNEL 11 SET FOR 1MBPS

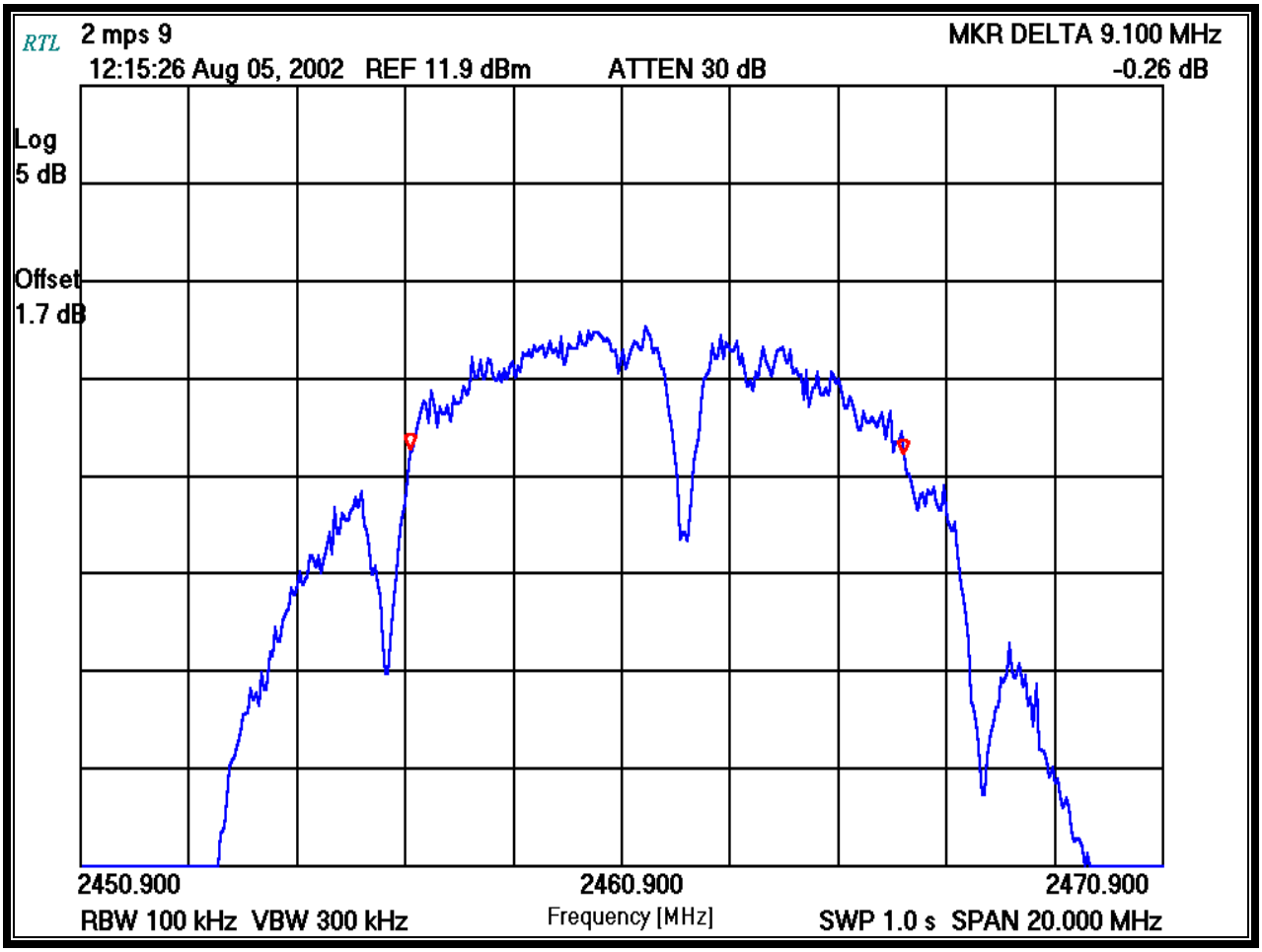


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz): 2464
Channel: 11
Data Rate (Mbps): 2

PLOT 7-8: 6DB BANDWIDTH: CHANNEL 11 SET FOR 2MBPS

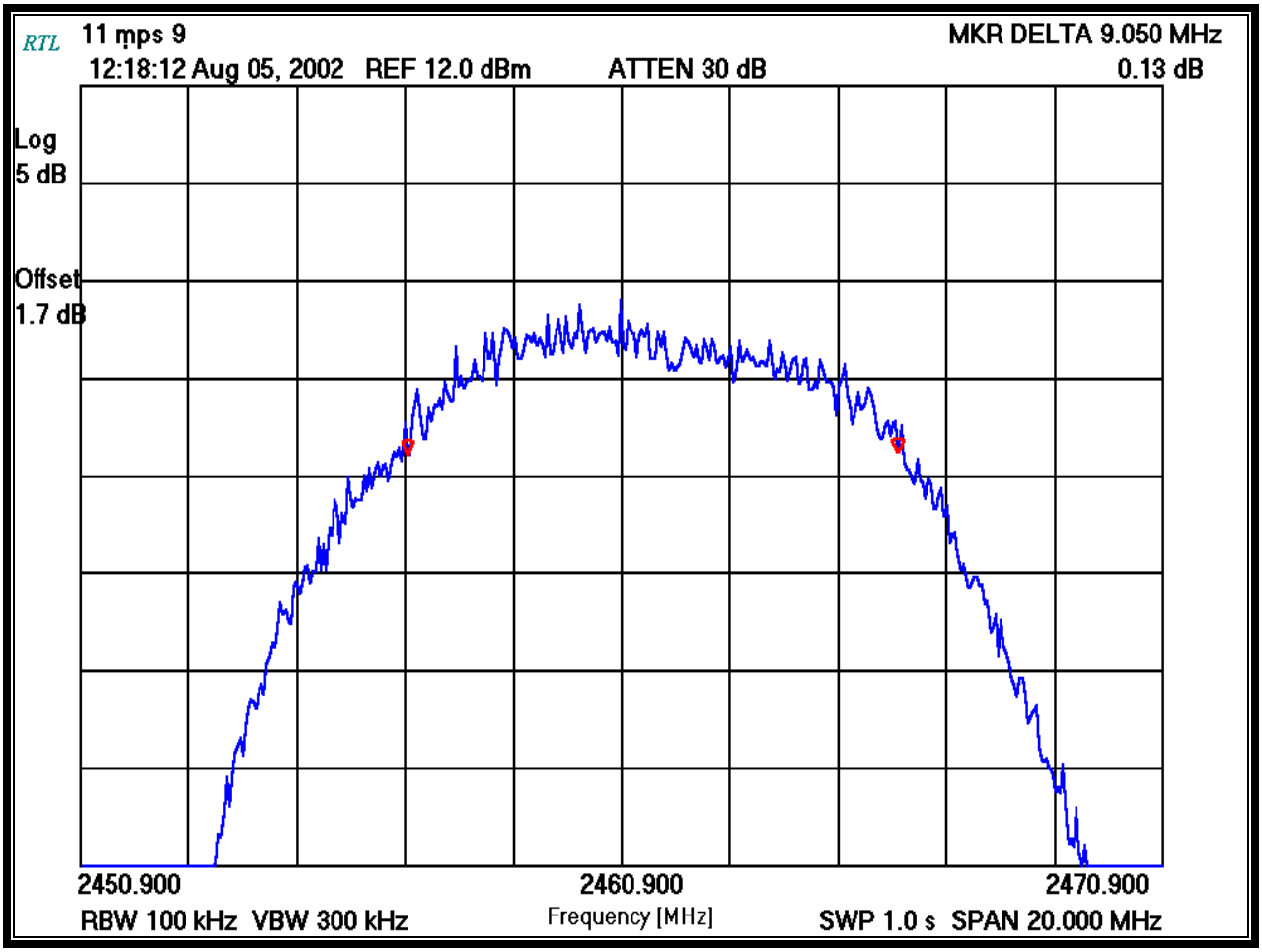


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz): 2464
Channel: 11
Data Rate (Mbps): 11

PLOT 7-9: 6DB BANDWIDTH: CHANNEL 11 SET FOR 11MBPS



TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

8 POWER OUTPUT - §15.247(B)

8.1 POWER OUTPUT TEST PROCEDURE

The peak conducted output power of the EUT was measured using an Agilent 4416A EPM-P Series Power Meter with an E9323A Peak and Average Power Sensor). The 0 degree steering mode, -48 degree steering mode and +48 degree steering modes were investigated and tested. The worst case power values for Channels 1, 6 and 11 in the 1 MBPS, 2 MBPS, 5.5 MBPS and 11 MBPS are included for 0 degree steering mode at a duty cycle higher than 75 percent Test Equipment used for testing is listed in the table below.

8.2 TEST EQUIPMENT USED FOR TESTING

TABLE 8-1: TEST EQUIPMENT USED FOR TESTING (RADIATED RF OUTPUT – EIRP)

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER
901186	Agilent Technologies	E9323A (50MHz-6GHz)	Peak & Avg. Power Sensor	US40410380
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771

8.3 POWER OUTPUT TEST DATA

TABLE 8-2: POWER OUTPUT TEST DATA

Operating Frequency (MHz): 2412, 2437, 2462
Channel: 1, 6 & 11
Measured Cond. Pwr. (dBm): See below

TABLE 8-3: POWER OUTPUT TEST DATA

Data Rate MBPS	Power Conducted Output (dBm)		
	Ch 1	Ch 6	Ch 11
1	12.2	10.7	11.9
2	12.3	10.7	11.9
5.5	12.3	10.7	11.8
11	12.4	10.7	12.0

Measurement accuracy is +/- 1.5 dB

TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

9 ANTENNA CONDUCTED SPURIOUS EMISSIONS - §15.247(C)

9.1 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST PROCEDURES

Antenna conducted 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 2.412GHz for Channel 1, 2.437GHz for Channel 6, and 2.462GHz for Channel 11. No other harmonics or spurs were found within 20 dB of the carrier level, and from 9kHz to the carriers 10th harmonic. The 0 degree steering mode, -48 degree steering mode and +48 degree steering mode were investigated and tested. The worst case antenna conducted spurious data tables for Channels 1, 6 and 11 in the 1 MBPS, 2 MBPS and 11 MBPS modes are included for 0 degree steering mode at a duty cycle higher than 75 percent. Test results for antenna conducted spurious noise are listed in the table below.

9.2 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA WITH CHANNEL 1 SET AT 1MBPS

Operating Frequency (MHz): 2412
Channel: 1
Peak (dBm): -1.9
Limit (dBm): -21.9

TABLE 9-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 1 SET AT 1MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
4824.3	-61.6	0.7	5.0	-55.9	-21.9	34.0
7236.9	-68.4	3.0	5.3	-60.1	-21.9	38.2
9648.4	-68.6	9.2	4.6	-54.8	-21.9	32.9
12059.2	-64.7	4.7	8.0	-52.0	-21.9	30.1
14471.2	-64.9	3.9	9.2	-51.8	-21.9	29.9

TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

9.3 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA WITH CHANNEL 6 SET AT 1MBPS

Operating Frequency (MHz): 2437
Channel: 6
Peak (dBm): -1.3
Limit (dBm): -21.3

TABLE 9-2: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 6 SET AT 1MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
4874.5	-71.3	1.1	3.4	-66.8	-21.3	45.5
7310.9	-82.1	3.4	7.1	-71.6	-21.3	50.3
9748.7	-75.8	9.1	4.7	-62.0	-21.3	40.7
12187.8	-82.7	5.5	7.9	-69.3	-21.3	48.0
14622.5	-77.7	4.1	9.0	-64.6	-21.3	43.3

TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

9.4 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA WITH CHANNEL 11 SET AT 1MBPS

Operating Frequency (MHz): 2462
Channel: 11
Peak (dBm): -2.0
Limit (dBm): -22.0

TABLE 9-3: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 11 SET AT 1MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
4924.0	-73.6	2.2	6.5	-64.9	-22.0	42.9
7384.0	-75.6	3.0	8.0	-64.6	-22.0	42.6
9848.6	-81.4	9.2	4.7	-67.5	-22.0	45.5
12307.9	-83.4	5.7	9.5	-68.2	-22.0	46.2
14782.5	-80.6	4.1	9.3	-67.2	-22.0	45.2

TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

9.5 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA WITH CHANNEL 1 SET AT 2MBPS

Operating Frequency (MHz): 2412
Channel: 1
Peak (dBm): -2.1
Limit: (dBm): -22.1

TABLE 9-4: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 1 SET AT 2MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
4823.9	-65.7	0.7	5.0	-60.0	-22.1	37.9
7235.9	-66.8	3.0	5.3	-58.5	-22.1	36.4
9648.5	-66.4	9.2	4.6	-52.6	-22.1	30.5
12060.1	-66.0	4.7	8.0	-53.3	-22.1	31.2
4823.9	-65.7	0.7	5.0	-60.0	-22.1	37.9

TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

9.6 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA WITH CHANNEL 6 SET AT 2MBPS

Operating Frequency (MHz): 2437
Channel: 6
Peak (dBm): -3.2
Limit (dBm): -23.2

TABLE 9-5: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 6 SET AT 2MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
7312.7	-82.1	3.4	7.1	-71.6	-23.2	48.4
9748.5	-76.0	9.1	4.7	-62.2	-23.2	39.0
12186.4	-83.0	5.5	7.9	-69.6	-23.2	46.4
14622.5	-80.6	4.1	9.0	-67.5	-23.2	44.3

TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

9.7 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA WITH CHANNEL 11 SET AT 2MBPS

Operating Frequency (MHz): 2462
Channel: 11
Peak (dBm): -2.0
Limit (dBm): -22.0

TABLE 9-6: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 11

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
4923.9	-76.7	2.2	6.5	-68.0	-22.0	46.0
7384.0	-75.4	3.0	8.0	-64.4	-22.0	42.4
9848.5	-81.3	9.2	4.7	-67.4	-22.0	45.4
12318.4	-84.1	5.7	9.5	-68.9	-22.0	46.9
14771.6	-83.0	4.1	9.3	-69.6	-22.0	47.6

TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

9.8 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA WITH CHANNEL 1 SET AT 11MBPS

Operating Frequency (MHz): 2412
Channel: 1
Peak (dBm): -1.7
Limit (dBm): -21.7

TABLE 9-7: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 1

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
4829.8	-80.8	0.7	5.0	-75.1	-21.7	53.4
7238.2	-81.0	3.0	5.3	-72.7	-21.7	51.0
9648.5	-79.0	9.2	4.6	-65.2	-21.7	43.5
12058.7	-78.6	4.7	8.0	-65.9	-21.7	44.2

TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

9.9 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA WITH CHANNEL 6 SET AT 11MBPS

Operating Frequency (MHz): 2437
Channel: 6
Peak (dBm): -2.7
Limit (dBm): -22.7

TABLE 9-8: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 6

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
4868.3	-77.1	1.1	3.4	-72.6	-22.7	49.9
7309.1	-82.3	3.4	7.1	-71.8	-22.7	49.1
9748.4	-76.4	9.1	4.7	-62.6	-22.7	39.9
12188.0	-81.5	5.5	7.9	-68.1	-22.7	45.4

TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

9.10 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA WITH CHANNEL 11 SET AT 11MBPS

Operating Frequency (MHz): 2462
Channel: 11
Peak (dBm): -2.1
Limit (dBm): -22.1

TABLE 9-9: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 11

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
4924.1	-72.4	2.2	6.5	-63.7	-22.1	41.6
7382.6	-72.3	3.0	8.0	-61.3	-22.1	39.2
9848.1	-77.3	9.2	4.7	-63.4	-22.1	41.3
12311.7	-78.6	5.7	9.5	-63.4	-22.1	41.3
14772.8	-77.1	4.1	9.3	-63.7	-22.1	41.6

TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/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 spectral lines were resolved for the modulated carriers at 2.412GHz, 2.437GHz, and 2.462GHz respectively. These levels are well below the +8 dBm limit. The 0 degree steering mode, -48 degree steering mode and +48 degree steering mode were investigated and tested. The worst case power spectral density tables and plots for the Channels 1, 6 and 11 in the 1 MBPS, 2 MBPS and 11 MBPS modes are included for the 0 degree steering mode at a duty cycle higher than 75 percent. Test Equipment used for testing is listed in the table below.

10.2 TEST EQUIPMENT USED FOR TESTING

TABLE 10-1: TEST EQUIPMENT USED FOR TESTING (POWER SPECTRAL DENSITY)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771

10.3 POWER SPECTRAL DENSITY TEST DATA

Operating Frequency (MHz): 2412, 2437 & 2462
Channel: 1, 6 & 11
Limit (dBm): 8

TABLE 10-2: POWER SPECTRAL DENSITY TEST DATA

Channel	Power Spectral Density Limit = +8dBm		
	1MBPS	2MBPS	11MBPS
1	-0.63	-0.80	5.20
6	-1.80	-3.13	3.53
11	-0.80	-1.63	4.87

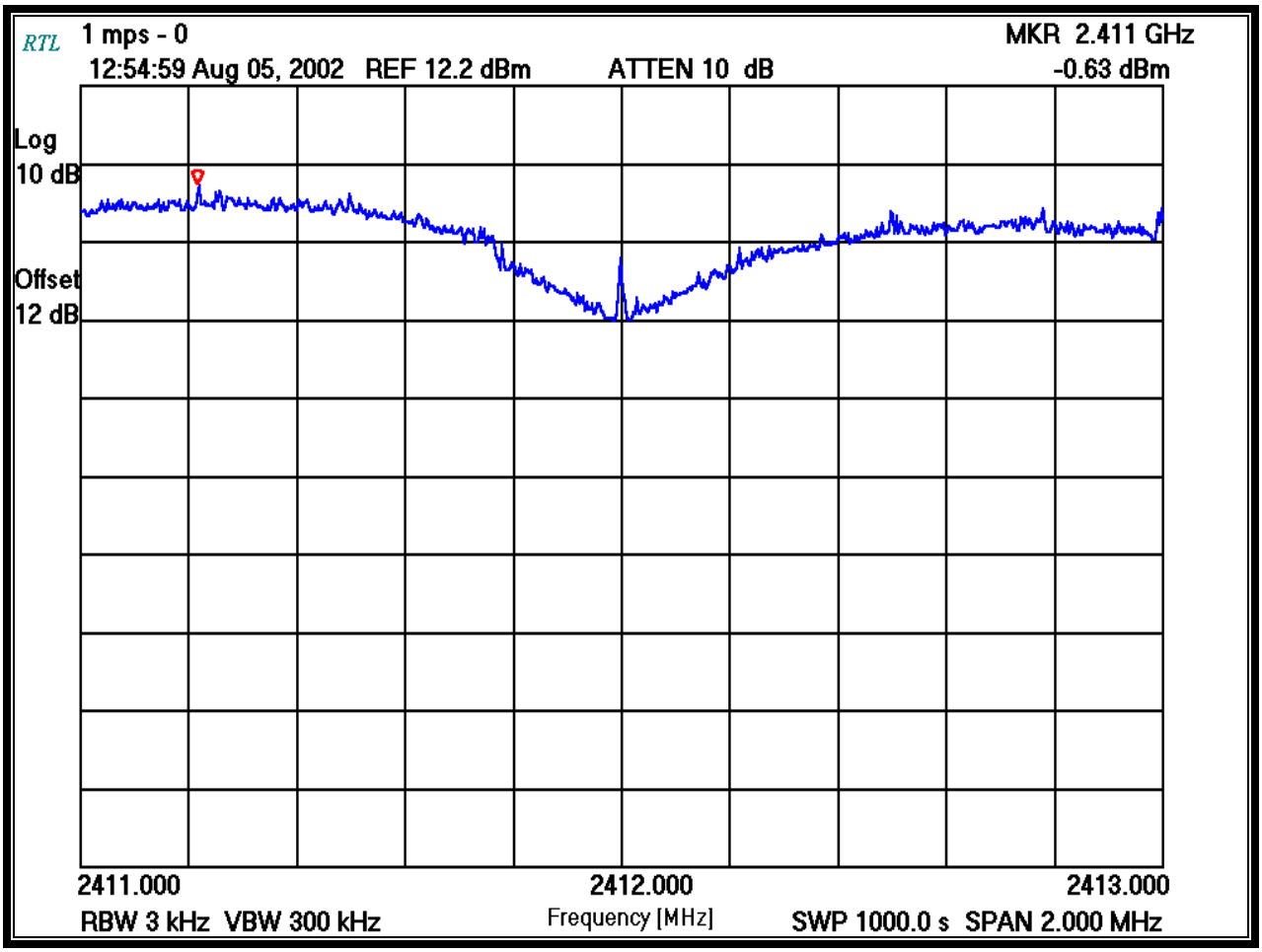
TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

10.4 POWER SPECTAL DENSITY TEST PLOTS

Operating Frequency (MHz):	2412
Channel:	1
Data Rate	1
Bandwidth Resolution (kHz):	3
Bandwidth Video (kHz):	300
Sweep Time (s):	1000.0

PLOT 10-1: POWER SPECTRAL DENSITY: CHANNEL 1 AT 1MBPS

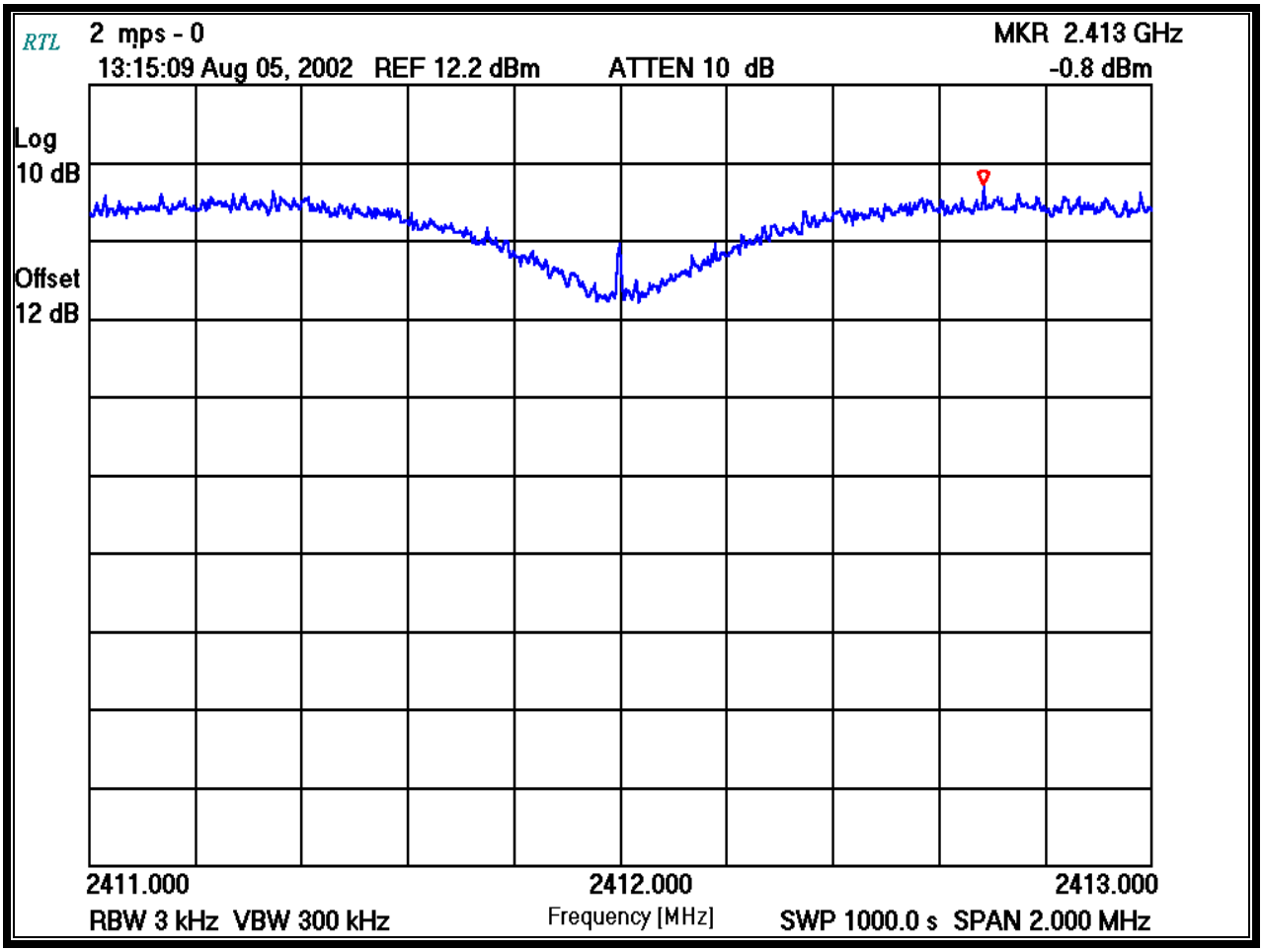


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz):	2412
Channel:	1
Data Rate	2
Bandwidth Resolution (kHz):	3
Bandwidth Video (kHz):	300
Sweep Time (s):	1000.0

PLOT 10-2: POWER SPECTRAL DENSITY: CHANNEL 1 AT 2MBPS

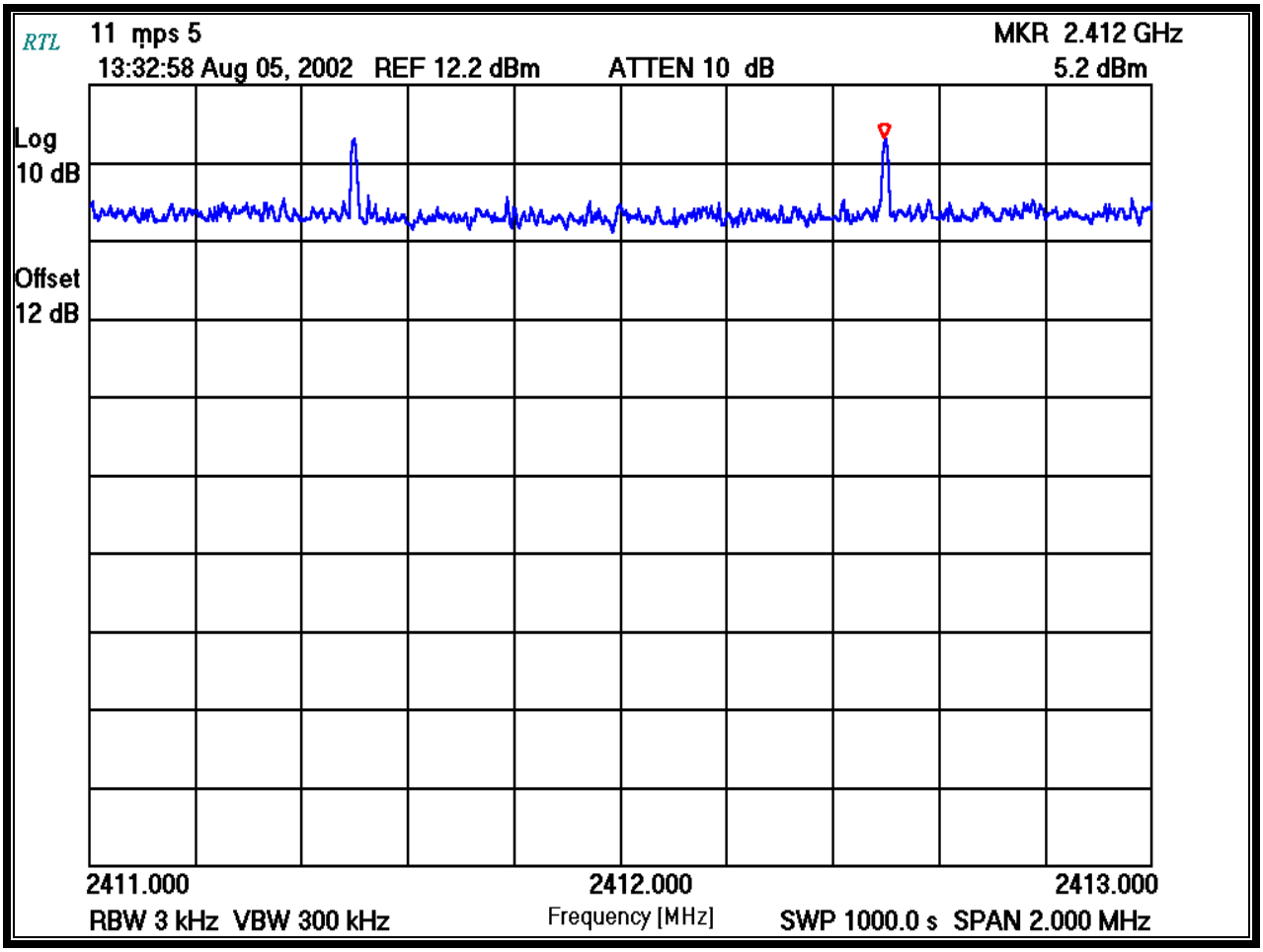


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz):	2412
Channel:	1
Data Rate	11
Bandwidth Resolution (kHz):	3
Bandwidth Video (kHz):	300
Sweep Time (s):	1000.0

PLOT 10-3: POWER SPECTRAL DENSITY: CHANNEL 1 AT 11MBPS

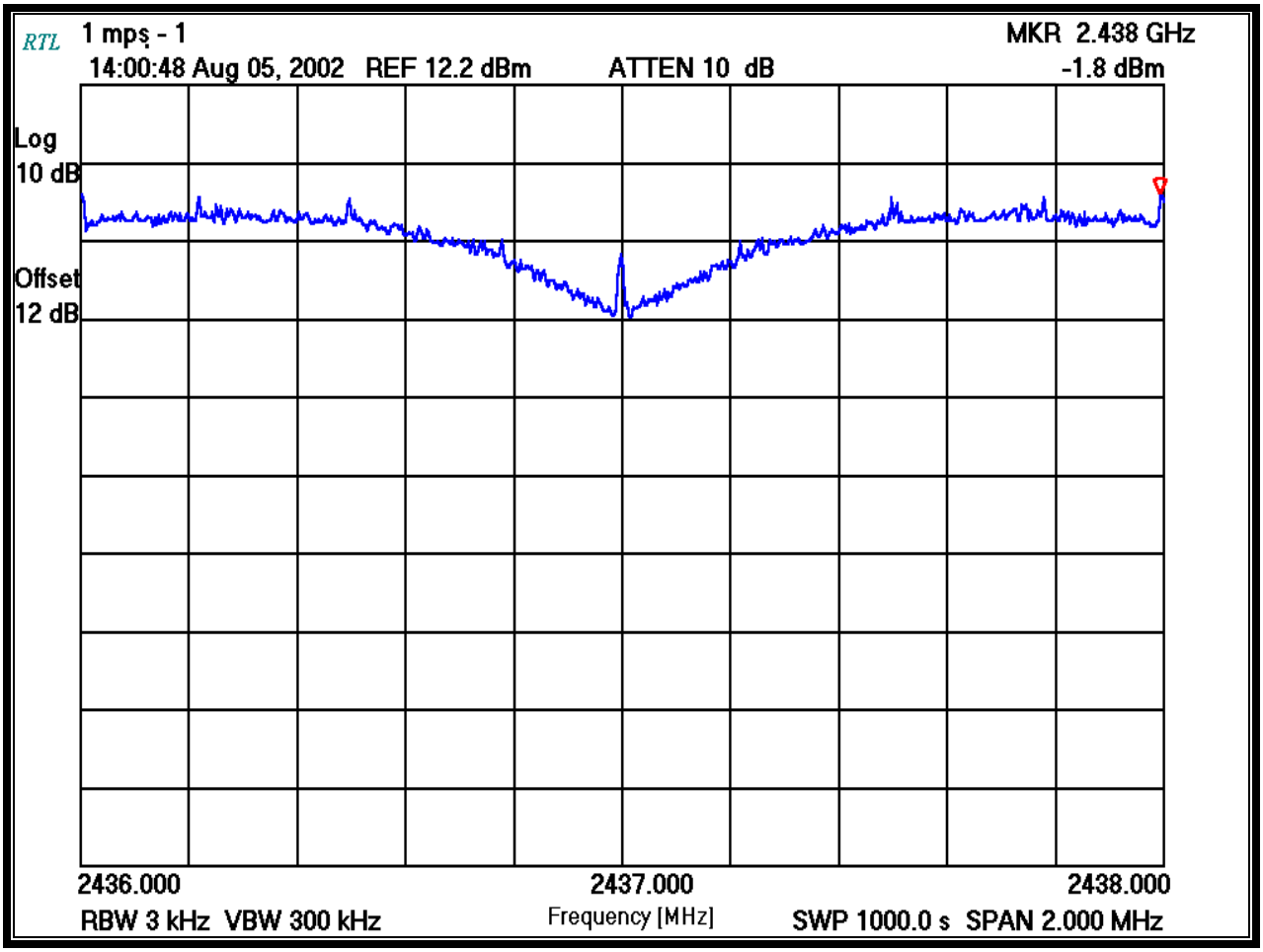


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz):	2437
Channel:	6
Data Rate	1
Bandwidth Resolution (kHz):	3kHz
Bandwidth Video (kHz):	300kHz
Sweep Time (s):	1000.0s

PLOT 10-4: POWER SPECTRAL DENSITY: CHANNEL 6 AT 1MBPS

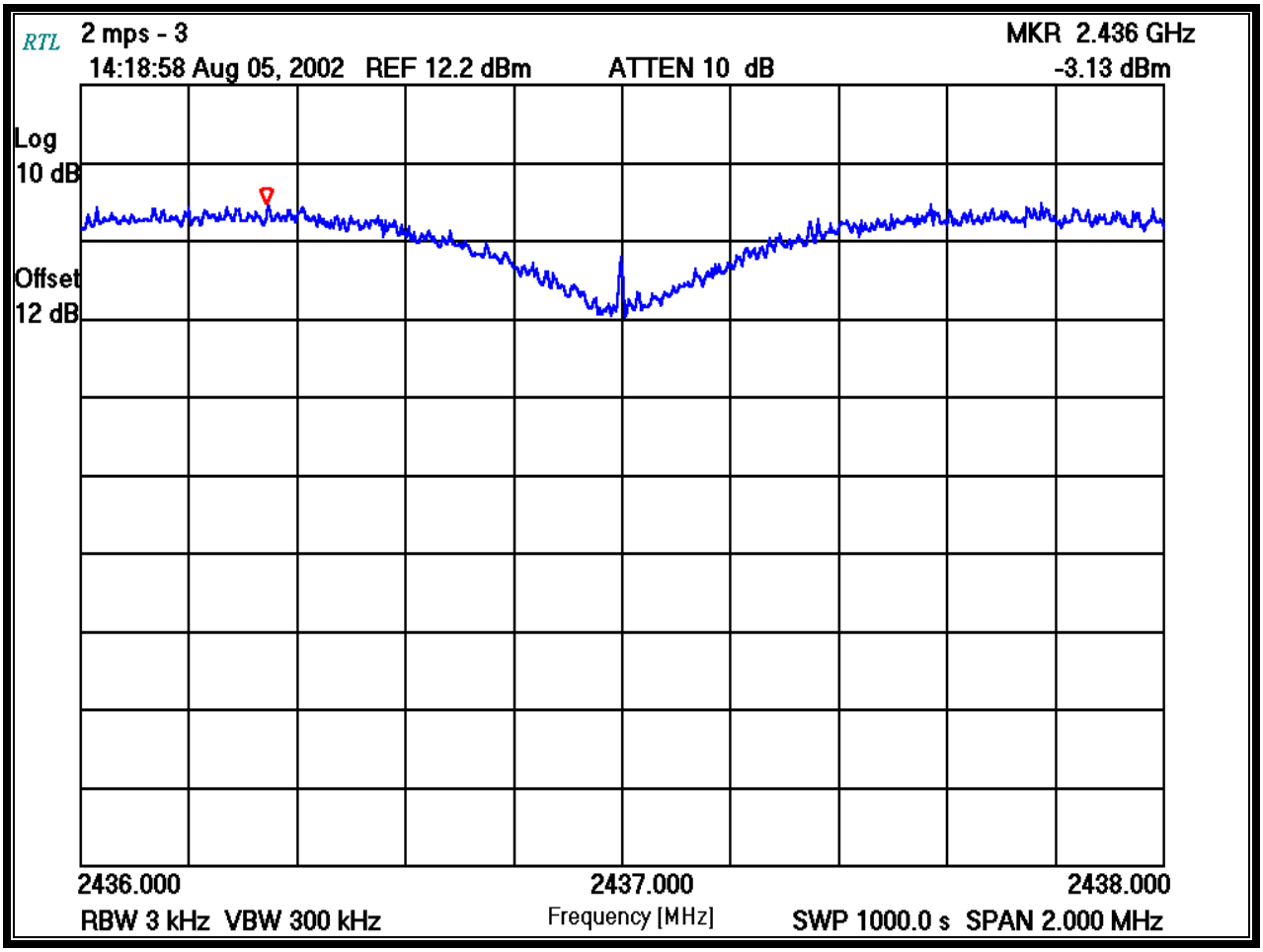


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz):	2437
Channel:	6
Data Rate	2
Bandwidth Resolution (kHz):	3
Bandwidth Video (kHz):	300
Sweep Time (s):	1000.0

PLOT 10-5: POWER SPECTRAL DENSITY: CHANNEL 6 AT 2MBPS

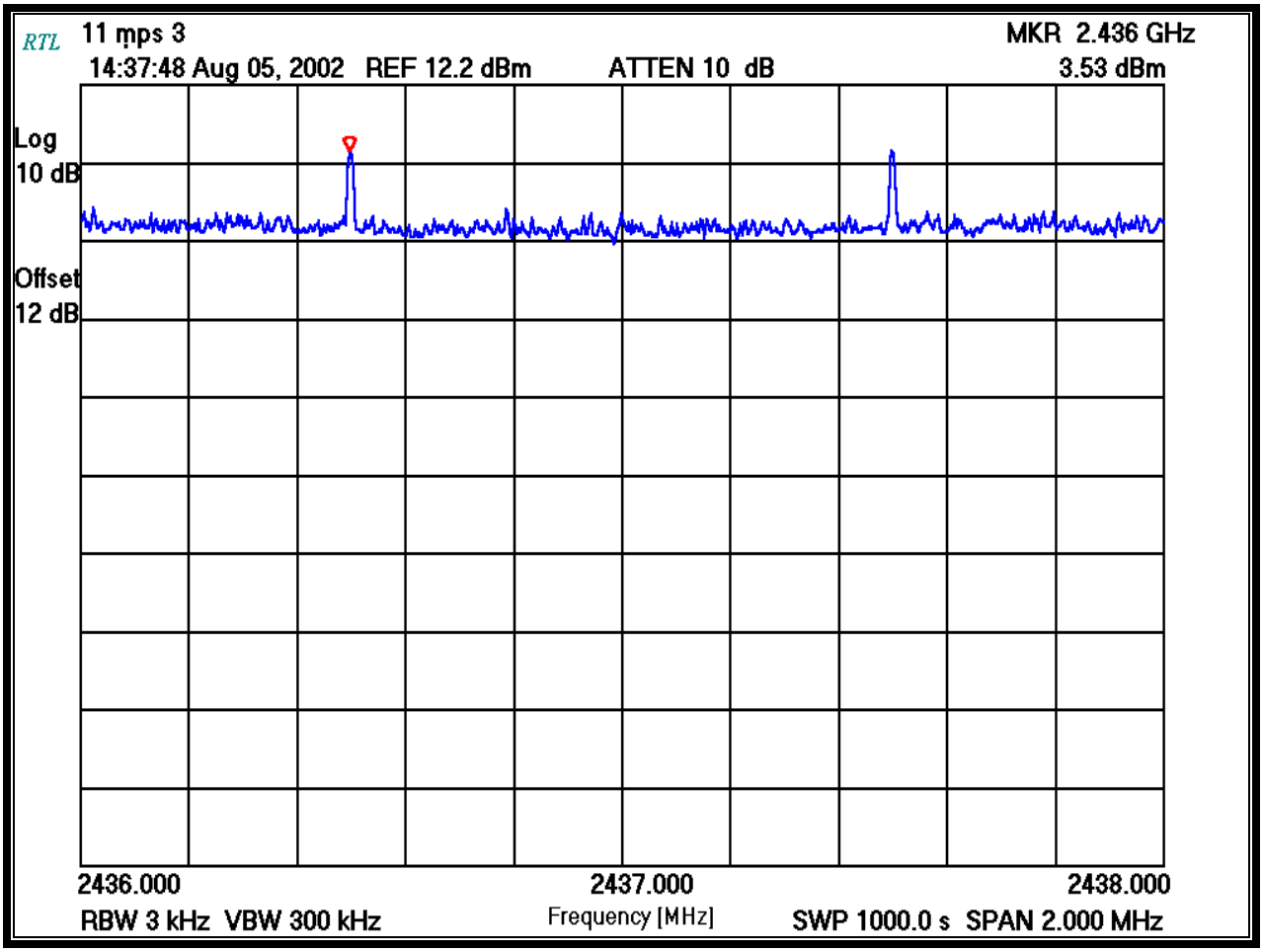


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz):	2437
Channel:	6
Data Rate	11
Bandwidth Resolution (kHz):	3
Bandwidth Video (kHz):	300
Sweep Time (s):	1000.0

PLOT 10-6: POWER SPECTRAL DENSITY: CHANNEL 6 AT 11MBPS

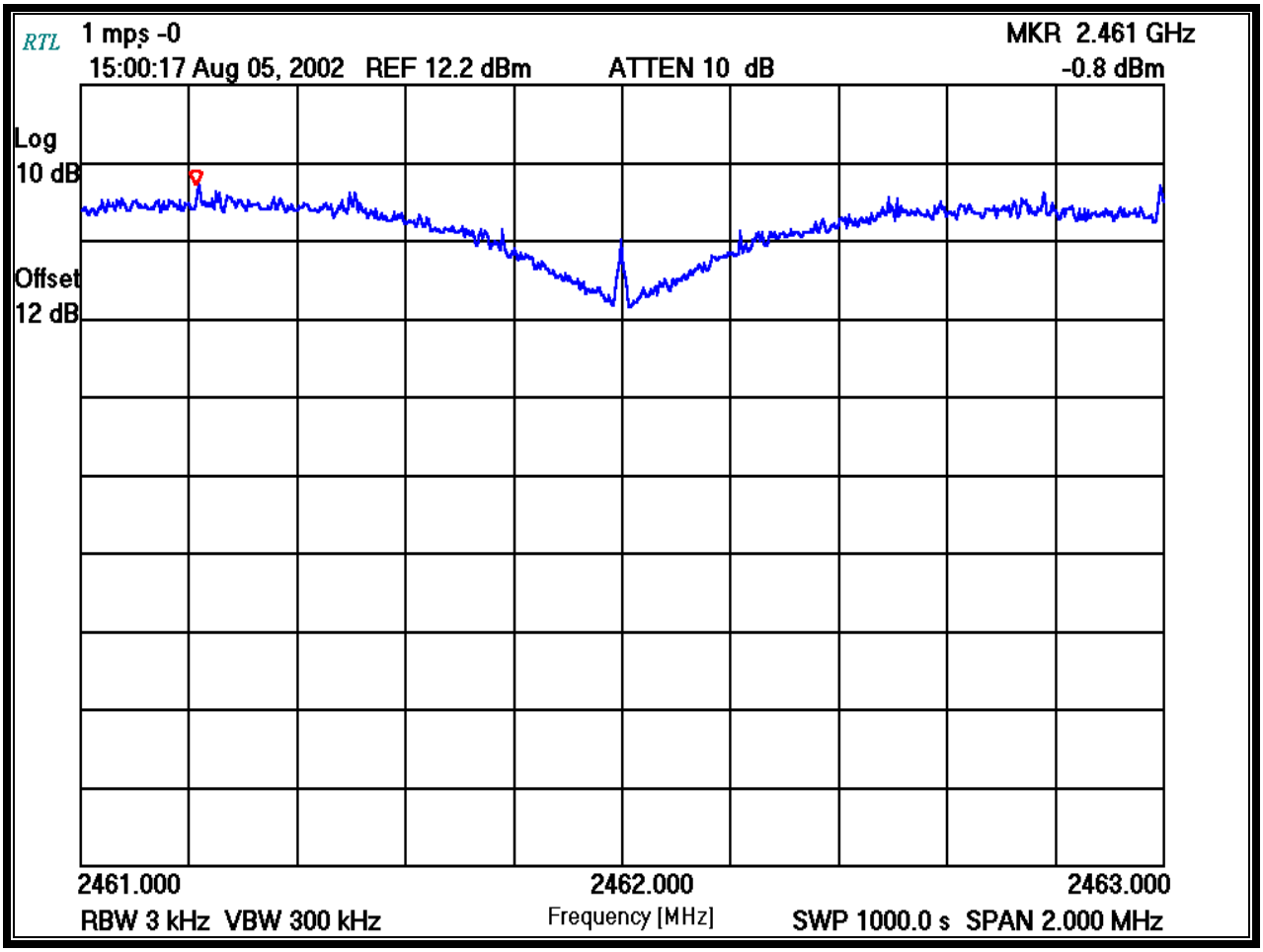


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz):	2462
Channel:	11
Data Rate	1
Bandwidth Resolution (kHz):	3
Bandwidth Video (kHz):	300
Sweep Time (s):	1000.0

PLOT 10-7: POWER SPECTRAL DENSITY: CHANNEL 11 AT 1MBPS

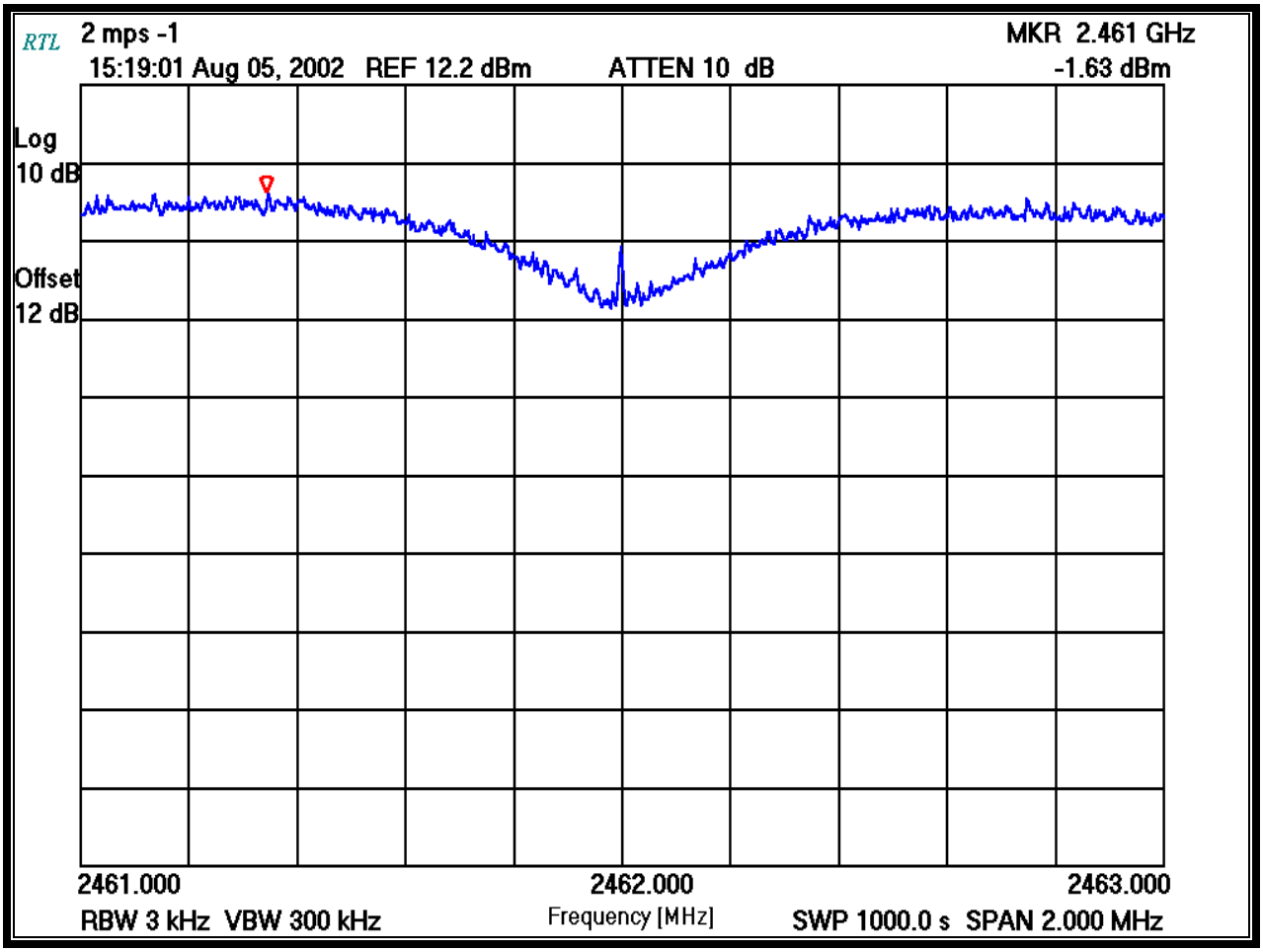


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz):	2462
Channel:	11
Data Rate	2
Bandwidth Resolution (kHz):	3
Bandwidth Video (kHz):	300
Sweep Time (s):	1000.0

PLOT 10-8: POWER SPECTRAL DENSITY: CHANNEL 11 AT 2MBPS

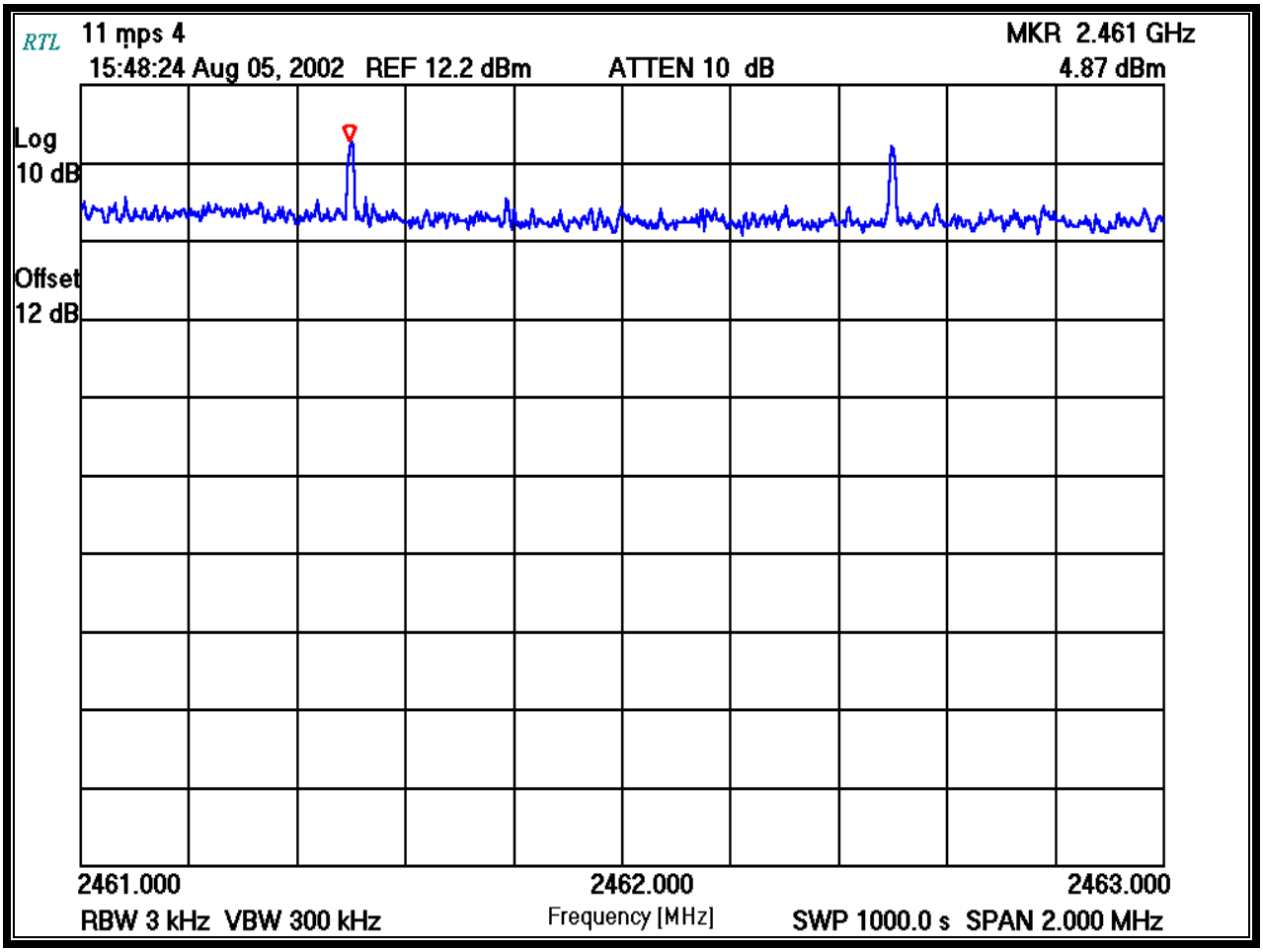


TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz):	2462
Channel:	11
Data Rate	11
Bandwidth Resolution:	3kHz
Bandwidth Video:	300kHz
Sweep Time:	1000.0s

PLOT 10-9: POWER SPECTRAL DENSITY: CHANNEL 11 AT 11MBPS



TEST PERSONNEL:

Rachid Sehb		08/05/02
Test Technician/Engineer	Signature	Date Of Test

11 CONCLUSION

The data in this measurement report shows that the Vivato, Inc., Wireless Packet Switch Multiple Point-to-Point Links, Model: DP2310 Wi-Fi Switch, FCC ID: QLN-DP2310P0001, complies with all the requirements of Parts 2 and 15 of the FCC Rules, and Industry Canada RSS-210.