Engineering and Testing for EMC and Safety Compliance

APPLICATION FOR FCC CERTIFICATION

UNLICENSED LOW POWER TRANSMITTER

Telean Technology LTD.
1603, 16/F., Fo Tan Industrial Centre, 26-28 Au Pui Wan St,
Fo Tan, Shatin, NT., Hong Kong
(852) 2693 2773

MODEL: FM-08-TX
FCC ID: MQ5FM-08-TX

October 4, 2000

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 1999	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
PART 15: 1999	RADIO FREQUENCY DEVICES
ANSI C63.4-1992	STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS

Frequency Range MHz	Output Power (W)	Freq. Tolerance	Emission Designator
48.9, 49.4, 49.9	.0001		

REPORT PREPARED BY:

Test Engineer: Franck Schuppius

Rhein Tech Laboratories, Inc.

Document Number: 2001268

360 Herndon Parkway, Suite 1400
Herndon, VA 20170
Phone: 703-689-0368; Fax: 703-689-2056; Metro: 703-471-6441

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APPENDIX LISTING

1 GENERAL INFORMATION

The following Application for Certification for a transmitter is prepared on behalf of ***Telean Technology Ltd*** in accordance with Federal Communications Commissions Rules and Regulations. The Equipment Under Test (EUT) was the ***Mode: FM-08-TX; FCC ID: MQ5FM-08-TX***. The test results reported in this document relate only to the item that was tested. The digital portion of this transmitter was tested and found in compliance with Part 15 subpart B. A test report is available upon request.

All measurements contained in this Application were conducted in accordance with ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 1992, with Federal Communications Commissions Rules and Regulations Part 15.209, 1999. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Some accessories are used to increase sensitivity and prevent overloading of the measuring instrument. These are explained in the appendix of this report. Calibration checks are performed regularly on the instruments, and all accessories including the high pass filter, preamplifier and cables.

1.1 RELATED SUBMITTAL(S)/GRANT(S

This is an original certification application.

1.2 TEST METHODOLOGY

Radiated testing was performed according to the procedures in ANSI C63.4 1992. Radiated testing was performed at an antenna to EUT distance of one and three meters. The one meter test distance was used when there were strong ambient signals or extremely low spurious emissions that inhibited measuring at three meters per FCC 15.31 *f* (2). Section 3.1 contains other clocks and oscillators measured. FCC 15.227 average limit was used to determine the transmitter carrier amplitude. FCC 15.31 *f* (2) the square of an inverse linear distance extrapolation factor was used to extrapolate the new limit whenever an EUT to antenna distance other than the given FCC test distance for frequencies below 30 MHz per FCC 15.209 general radiation emission limit. Conducted emission testing was not performed on the host computer power line since the EUT does not have a power supply. The EUT's DC power is provided by an external 12V DC source.

1.3 TEST FACILITY

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

2 SYSTEM TEST CONFIGURATION

2.1 JUSTIFICATION

The EUT is battery powered; the conducted emissions measurement was not needed. The EUT was also tested in two orthogonal planes, namely vertical and horizontal. The following local oscillators, crystals and IF were investigated and measured:

		Unit	Nominal	Limit
1. Transmission Frequency	CH. 1	MHz	48.9 & 49.4 ± 0.03	± 0.05
	CH. 2	MHz	48.9 & 49.9 ± 0.03	± 0.05
	CH. 3	MHz	49.4 & 49.9 ± 0.03	± 0.05
2. Crystal Frequencies		MHz	10.080; 10.185; 10.287	

2.2 EUT EXERCISE SOFTWARE

The EUT was powered with an external 12V power supply.

2.3 SPECIAL ACCESSORIES

N/A

2.4 TEST SYSTEM DETAILS

Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test.

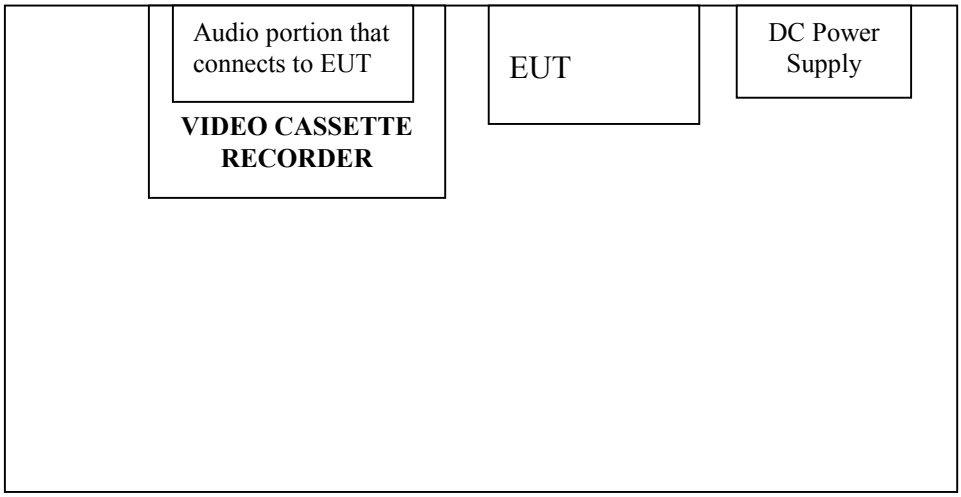
TABLE 2-1: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
TRANSMITTER	TELEAN TECHNOLOGY LTD	FM-08-TX	TTL-ES109118	N/A	UNSHIELDED I/O UNSHIELDED POWER	013693

TABLE 2-2: EXTERNAL EQUIPMENT USED IN TEST CONFIGURATION

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
POWER SUPPLY	HEWLETT PACKARD	6291	1928A05385	N/A	UNSHIELDED POWER	900773
VIDEO CASSETTE RECORDER	JVC	HR-S5100U	15920318	N/A	UNSHIELDED I/O UNSHIELDED POWER	900161

FIGURE 2-1: CONFIGURATION OF TESTED SYSTEM



3 FIELD STRENGTH CALCULATION

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

FI(dBuV/m) = SAR(dBuV) + SCF(dB/m)
FI = Field Intensity
SAR = Spectrum Analyzer Reading
SCF = Site Correction Factor

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

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

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

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

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

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

49.3 dBuV - 11.5 dB = 37.8 dBuV/m

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

4 CONFORMANCE STATEMENT

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 1999	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
PART 15: 1999	RADIO FREQUENCY DEVICES
ANSI C63.4-1992	STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS

Frequency Range MHz	Output Power (W)	Freq. Tolerance	Emission Designator
48.9, 49.4, 49.9	.0001		

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described above. No modifications were made during testing to the equipment in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to or exclusions from the ANSI C63.4 test methodology.

REPORT PREPARED BY:

Supervising Engineer: **Bruno Clavier**

Test Engineer: **K. Franck Schuppius**

Signature: _____ Date: October 4, 2001

Typed/Printed Name: Desmond A. Fraser Position: President
(NVLAP Signatory)

NVLAP *Accredited by the National Voluntary Accreditation Program for the specific scope of accreditation under Lab Code 20061-0.*

Note: This report may not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

5 RADIATED EMISSION DATA

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

The following data lists the significant emission frequencies, measured levels, correction factor (includes cable and antenna corrections), the corrected reading, plus the limit.

TABLE 5-1: RADIATED EMISSIONS TRANSMITTER (CHANNEL 1)

Temperature: 63°F Humidity: 87%									
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)
48.900	Qp	V	90	1.0	59.1	-21.8	37.3	40.0	-2.7
49.400	Qp	V	45	1.0	60.1	-22.0	38.1	40.0	-1.9
146.700	Qp	V	145	1.0	42.4	-13.9	28.5	43.5	-15.0
148.200	Qp	V	145	1.0	47.8	-13.9	33.9	43.5	-9.6
195.600	Qp	V	225	1.0	41.8	-11.8	30.0	43.5	-13.5
197.600	Qp	V	90	1.0	48.2	-11.8	36.4	43.5	-7.1
244.500	Qp	V	225	1.0	35.9	-8.6	27.3	46.0	-18.7
247.000	Qp	V	245	1.0	45.3	-8.6	36.7	46.0	-9.3
296.400	Qp	V	225	1.0	40.8	-7.3	33.5	46.0	-12.5
345.800	Qp	V	145	1.0	37.2	-5.1	32.1	46.0	-13.9
395.200	Qp	V	90	1.0	37.7	-4.4	33.3	46.0	-12.7
444.600	Qp	V	145	1.0	36.3	-2.7	33.6	46.0	-12.4
494.000	Qp	V	225	1.0	36.7	-1.4	35.3	46.0	-10.7

TEST PERSONNEL:

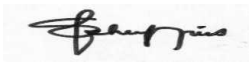
Signature:  Date: October 2, 2000

Typed/Printed Name: Franck Schuppius

TABLE 5-2: RADIATED EMISSIONS TRANSMITTER (CHANNEL 2)

Temperature: 63°F Humidity: 87%									
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)
48.900	Qp	V	320	1.0	61.0	-21.8	39.2	40.0	-0.8
49.900	Qp	V	145	1.0	58.5	-22.2	36.3	40.0	-3.7
146.700	Qp	V	90	1.0	49.4	-13.9	35.5	43.5	-8.0
149.700	Qp	V	225	1.0	39.6	-13.9	25.7	43.5	-17.8
195.600	Qp	V	90	1.0	46.2	-11.8	34.4	43.5	-9.1
199.600	Qp	V	145	1.0	37.4	-11.7	25.7	43.5	-17.8
244.500	Qp	V	180	1.0	42.3	-8.6	33.7	46.0	-12.3
249.500	Qp	V	145	1.0	33.5	-8.7	24.8	46.0	-21.2
293.400	Qp	V	225	1.0	39.2	-7.5	31.7	46.0	-14.3
342.300	Qp	V	145	1.0	37.3	-5.4	31.9	46.0	-14.1
391.200	Qp	V	245	1.0	35.9	-4.3	31.6	46.0	-14.4
440.100	Qp	V	145	1.0	34.6	-2.9	31.7	46.0	-14.3
537.900	Qp	V	225	1.0	36.1	0.1	36.2	46.0	-9.8
586.800	Qp	V	360	1.0	34.5	1.2	35.7	46.0	-10.3
635.700	Qp	V	225	1.0	33.5	2.4	35.9	46.0	-10.1

TEST PERSONNEL:

Signature:  Date: October 2, 2000

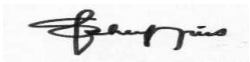
Typed/Printed Name: Franck Schuppius

TABLE 5-3: RADIATED EMISSIONS TRANSMITTER (CHANNEL 3)

Temperature: 63°F Humidity: 87%									
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)
49.400	Qp	V	0	1.0	58.6	-22.0	36.6	40.0	-3.4
49.900	Qp	V	225	1.0	59.3	-22.2	37.1	40.0	-2.9
148.200	Qp	V	90	1.0	40.8	-13.9	26.9	43.5	-16.6
148.200	Qp	V	245	1.0	40.4	-13.9	26.5	43.5	-17.0
149.700	Qp	V	145	1.0	46.7	-13.9	32.8	43.5	-10.7
197.600	Qp	V	225	1.0	37.9	-11.8	26.1	43.5	-17.4
197.600	Qp	V	145	1.0	39.5	-11.8	27.7	43.5	-15.8
199.600	Qp	V	225	1.0	43.0	-11.7	31.3	43.5	-12.2
249.500	Qp	V	225	1.0	47.4	-8.7	38.7	46.0	-7.3
299.400	Qp	V	180	1.0	38.4	-7.1	31.3	46.0	-14.7
449.100	Qp	V	225	1.0	36.2	-2.5	33.7	46.0	-12.3
499.000	Qp	V	180	1.0	34.8	-1.4	33.4	46.0	-12.6
548.900	Qp	V	180	1.0	36.8	-0.2	36.6	46.0	-9.4
598.800	Qp	V	280	1.0	37.2	1.3	38.5	46.0	-7.5

See Appendix B for Radiated Test Methodology.

TEST PERSONNEL:

Signature:  Date: October 2, 2000

Typed/Printed Name: Franck Schuppius

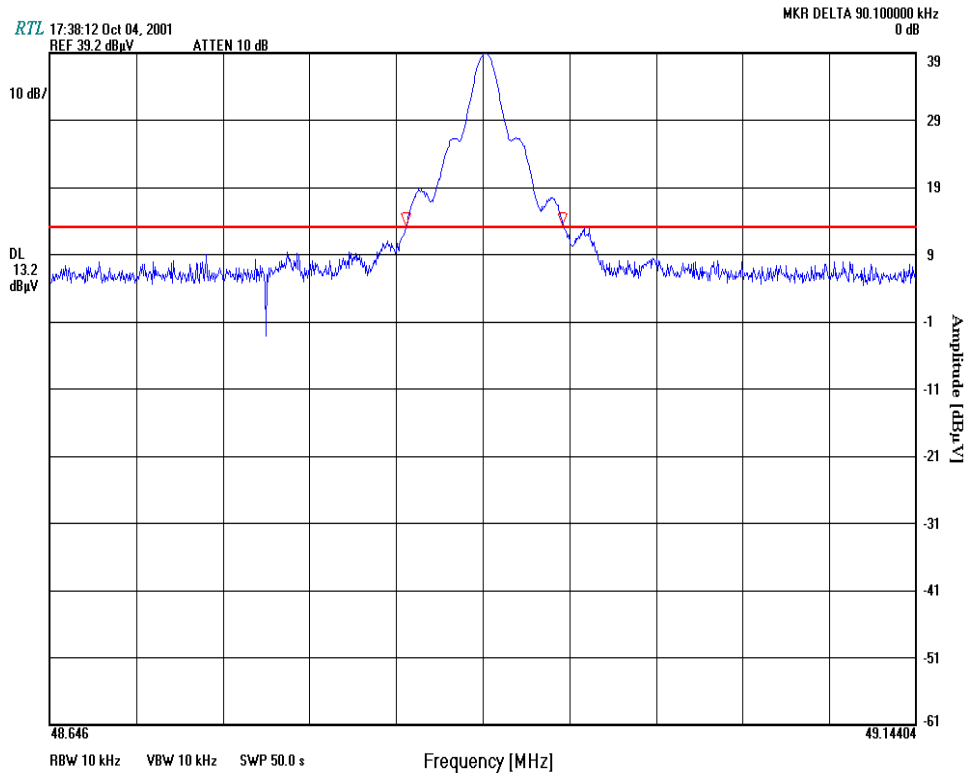
TABLE 5-4: TEST EQUIPMENT FOR RADIATED EMISSIONS

Radiated Emissions				
RTL Asset #	Manufacturer	Model	Part Type	Serial Number
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771
900999	HP	8596EM Analyzer	Spectrum Analyzer (9KHz - 12.5GHz)	3826A00144
901053	Schaffner@Chase	CBL6112B	Bilog antenna (20 MHz - 2 GHz)	2648
900321	EMCO	3161-03	Horn Antennas (4-8,2GHz)	9508-1020
900323	EMCO	3161-03	Horn Antennas (4-8,2GHz)	9508-1020
900772	Electro Metrics	RGA 60	Horn Antenna	2310
900889	HP	85685A	RF Preselector for HP 8566B or 8568B (20Hz-2GHz)	3146A01309
900800	EMCO	3301B	Active monopole antenna (30 Hz – 50 MHz)	9809-4071

6 OCCUPIED BANDWIDTH AND SPURIOUS NOISE

The EUT was set up as per section 1.4 and the transmitter carrier measured at each channel 1, 2, and 3 per ANSI 63.4 occupied bandwidth measurement. The resolution bandwidth was set at 10 KHz. The sweeptime was set so that the receiver filters were properly charged. Since the antenna is an integral antenna a radiated measurement was used.

PLOT 6-1: OCCUPIED BANDWIDTH CHANNEL 1 (48.9 MHZ)

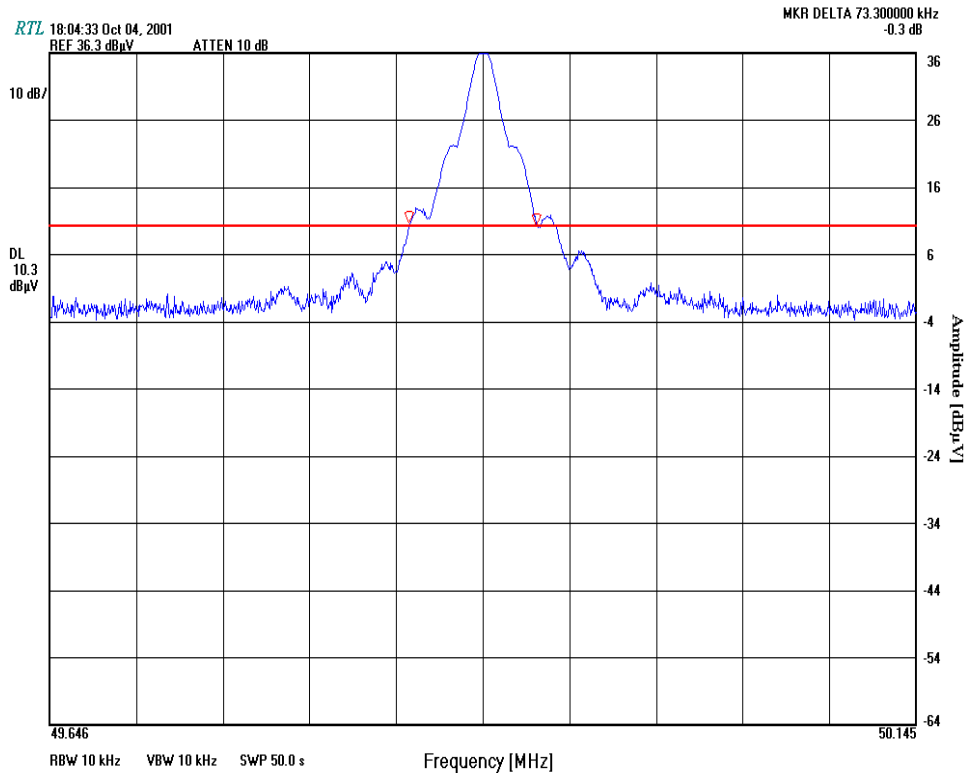


TEST PERSONNEL:

Signature:_____ Date: October 2, 2000

Typed/Printed Name: Franck Schuppius

PLOT 6-2: OCCUPIED BANDWIDTH CHANNEL 1 (49.9 MHZ)



TEST PERSONNEL:

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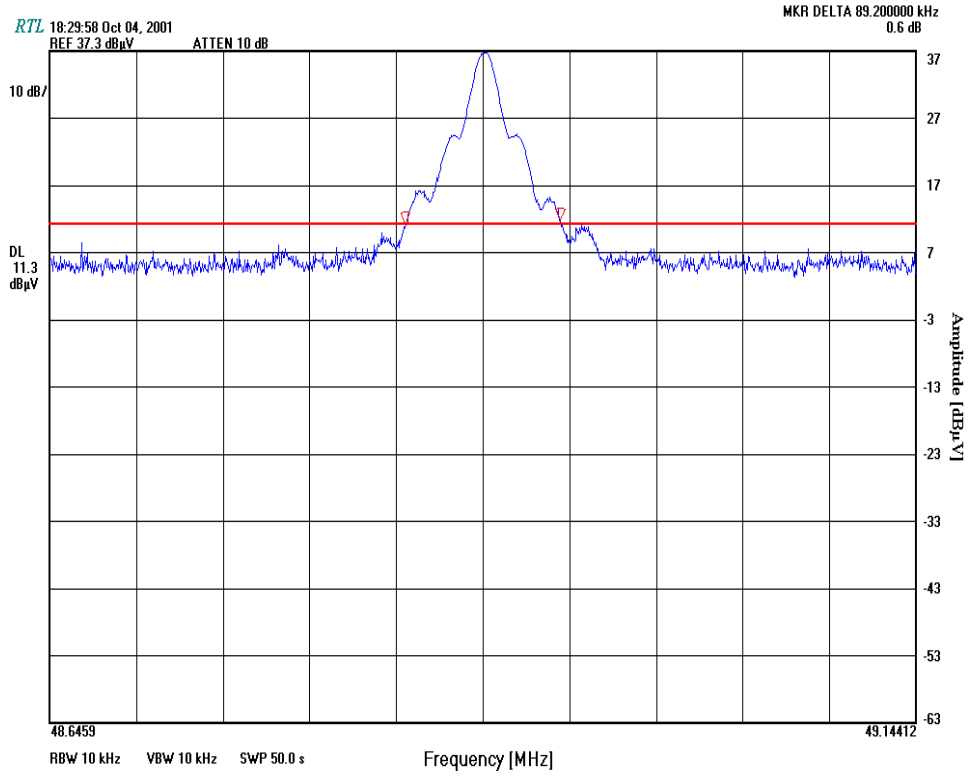
PLOT 6-3: OCCUPIED BANDWIDTH CHANNEL 2 (48.9 MHZ)



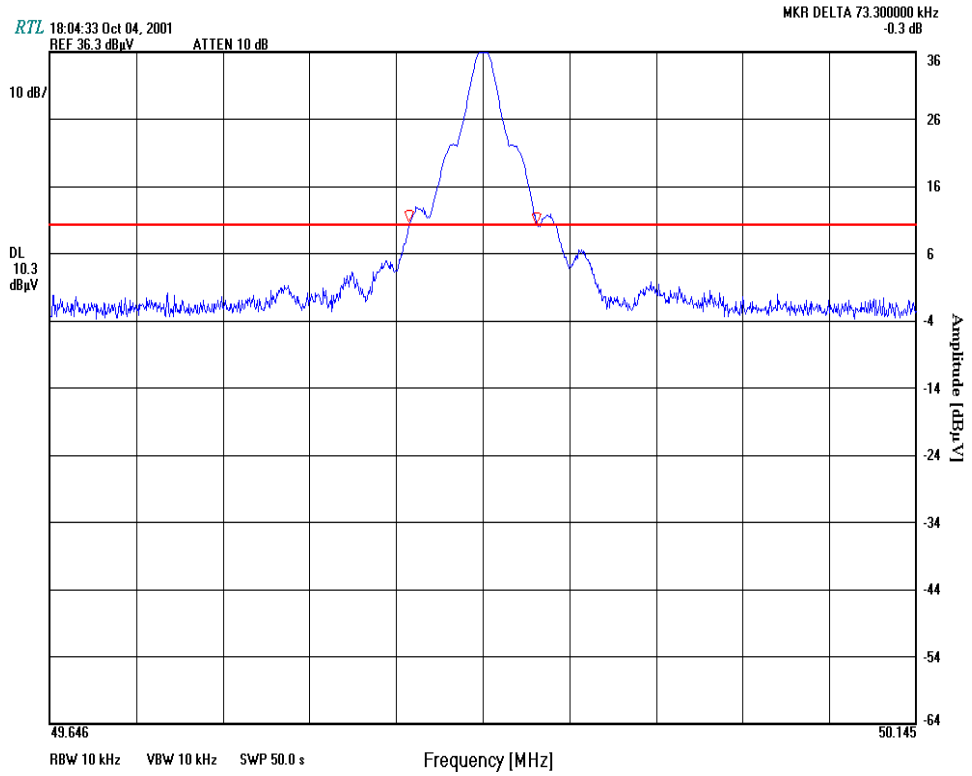
TEST PERSONNEL:

Signature:_____ Date: October 2, 2000

Typed/Printed Name: Franck Schuppius

360 Herndon Parkway
Suite 1400
Herndon, VA 20170
http://www.rheintech.com

PLOT 6-4: OCCUPIED BANDWIDTH CHANNEL 2 (49.9 MHZ)



TEST PERSONNEL:

Signature:_____ Date: October 2, 2000

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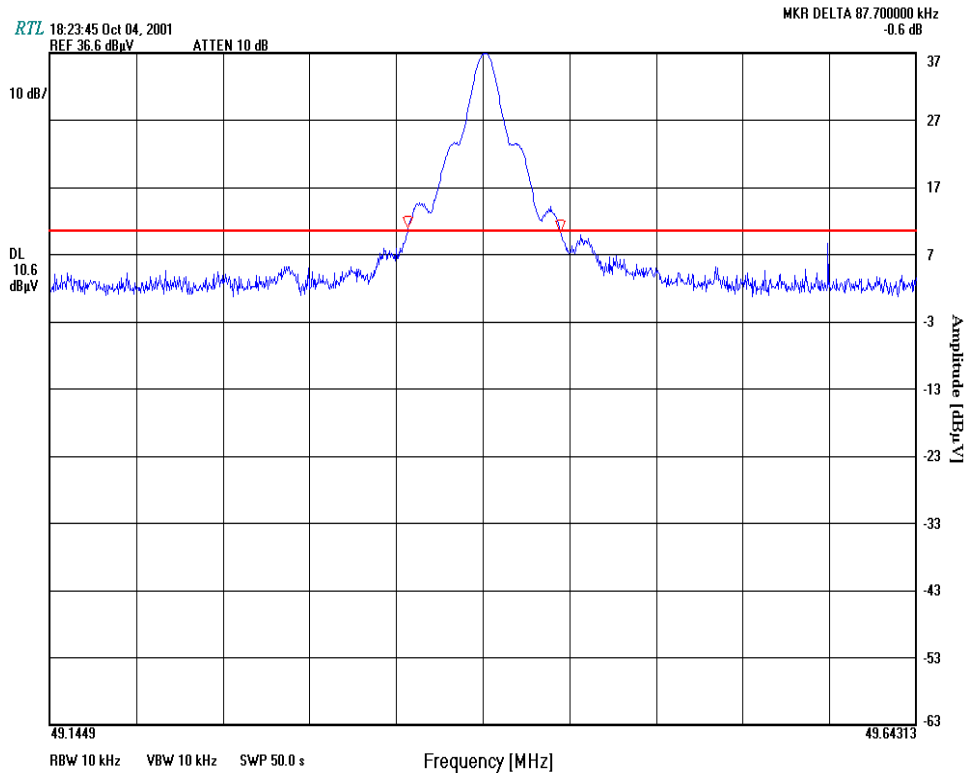
PLOT 6-5: OCCUPIED BANDWIDTH CHANNEL 3 (49.4 MHZ)

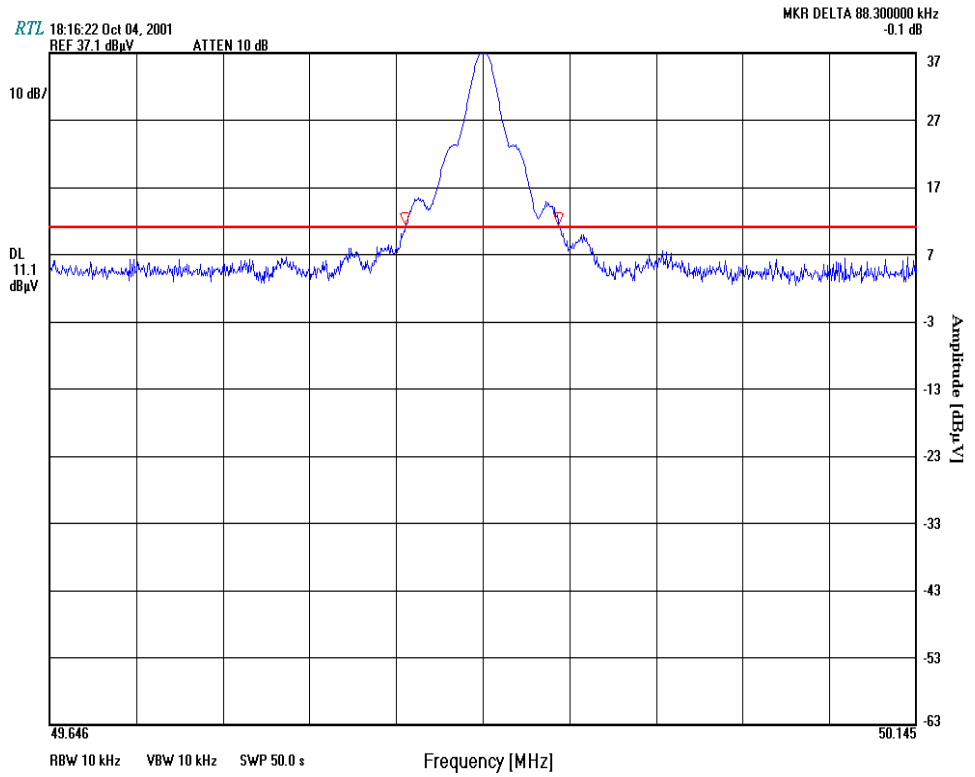


TEST PERSONNEL:

Signature:_____ Date: October 2, 2000

Typed/Printed Name: Franck Schuppius

PLOT 6-6: OCCUPIED BANDWIDTH CHANNEL 3 (49.9 MHZ)



TEST PERSONNEL:

Signature:_____ Date: October 2, 2000

Typed/Printed Name: Franck Schuppius

TABLE 6-1: TEST EQUIPMENT FOR OCCUPIED BANDWIDTH

Occupied Bandwidth				
RTL Asset #	**Manufacturer**	**Model**	**Part Type**	**Serial Number**
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719