ELECTRONICS TEST CENTRE
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Report for Emissions Testing of the Waverider EUM3003 wireless modem In accordance with FCC Part 15, Subpart C (2000) for Class 2 Permissive Change.

Test Personnel: David Raynes

Prepared for: Waverider Communications Inc.
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_____
Client Acceptance
Authorized Signatory

_____
David Raynes
Laboratory Supervisor
Electronics Test Centre (Airdrie)
Authorized Signatory

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1.0 INTRODUCTION

1.1 SCOPE

The purpose of this report is to present the findings and results of compliance testing performed in accordance with CFR Title 47 FCC Part 15, Subpart C, Intentional Radiators.

1.2 APPLICANT

This test report has been prepared for Waverider Communications Inc., located in Toronto, Ontario, Canada.

1.3 APPLICABILITY

All test procedures, limits, and results defined in this document apply to the Waverider Communications Inc. EUM3003 unit, referred to herein as the Equipment Under Test (EUT).

The results contained in this report relate only to the item tested.

This report does not imply product endorsement by A2LA, or the Canadian or US governments.

1.4 TEST SAMPLE DESCRIPTION

The test sample provided for testing was an EUM3003:

Product Type:	wireless modem
Model Number:	EUM3003
Serial Number:	n/a
Cables:	ethernet, power, RF to antenna
Power Requirements:	120 VAC 60 Hz to AC-DC power adapter
Peripheral Equipment:	Personal Computer

More detailed information is provided by Waverider Communications Inc. in Appendix A.

1.5 GENERAL TEST CONDITIONS AND ASSUMPTIONS

The EUT was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. All inputs and outputs to and from other equipment associated with the EUT were adequately simulated.

Where relevant, the EUT was only tested using the monitoring methods and test criteria defined in this report.

Environmental conditions are recorded for each test.

1.6 SCOPE OF TESTING

Testing was performed in accordance with FCC Part 15 Subpart C (2000), and ANSI C63.4 (1992).

1.6.1 VARIATIONS IN TEST METHODS

There were no variations from the test procedures outlined above.

1.6.2 MARGINAL EMISSIONS MEASUREMENTS

As noted in Section 4, some emissions were measured to be within -6 dB of the specified limit:

1.6.3 TEST SAMPLE MODIFICATIONS

The EUT, EUM3003, underwent the following equipment modifications during test performance:

A Ferrico™ p/n NF-65 clamp-on ferrite bead was installed on the LAN cable next to the connector.

2.0 ABBREVIATIONS

AP -Average Peak
CE -Conducted Emissions
E -Field - Electric Field
H -Field - Magnetic Field
N/T -Not Tested
N/A -Not Applicable
PK -Peak
QP -Quasi Peak
RE -Radiated Emissions

3.0 MEASUREMENT UNCERTAINTY

For Radiated E-Field Emissions and Conducted Emissions, the uncertainties in the measurements were calculated using the methods outlined in the NAMAS document, NIS81: May 1984.

Frequency	= ± 1 kHz
Amplitude (RE)	= ± 4.01 dB
Amplitude (CE)	= ± 3.25 dB

4.0 TEST CONCLUSION

The EUT was subjected to the following tests. Compliance status is indicated as **PASS** or **FAIL**.

The following table summarizes the test results in terms of the specification and class or level applied, the unique test sample identification, the EUT modification state, and configuration as applicable.

TEST CASE	TEST TYPE	SPECIFICATION	TEST SAMPLE	MOD. STATE	CONFIGURATION	RESULT
§4.1	Conducted Emissions	FCC Part 15.207 and 15.247	EUM3003	See § 1.6.3	Simulated Installation	**PASS**
§4.2	Radiated Emissions including Restricted Bands of Operation	FCC Part 15.209 and 15.205	EUM3003	See § 1.6.3	Simulated Installation	**PASS**

STATEMENT OF COMPLIANCE

The client equipment referred to in this report was found to comply with the requirements as stated above.

4.1 CONDUCTED EMISSIONS ON AC POWER LINES

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: n/a Test Date: n/a	Product: EUM3003
Test Result, EUM3003: **Not Applicable**	
Comments: There were no changes made to the power supply/distribution circuits.	

4.2 CONDUCTED EMISSIONS MEASURED AT ANTENNA PORT

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: David Raynes Test Date: 15 January 2003	Product: EUM3003
Test Result, EUM3003: **PASS**	
Objectives/Criteria The Conducted emissions produced by a system or sub-system shall not exceed the limits for the specifications as stated. Temperature = 19 °C Humidity = 27%	Specifications: FCC Part 15.247c **Emission levels should meet the requirements with a margin of 6dB**.

15.247(a): BW ≥ 500 kHz

Carrier Frequency [MHz]	Bandwidth [MHz]	Delta from limit [MHz]
905	> 2.54	> 2.04
915	> 2.57	> 2.07
925	> 2.34	> 1.84

15.247(b): 1 Watt (30 dBm)

Carrier Frequency [MHz]	RF Power [dBm]	Delta [dB from limit]
905	24.5	-5.5
915	24.4	-5.6
925	24.0	-6.0

15.247(c): -20 dB **f**c

Carrier Frequency [MHz]	RF Voltage [dBµV]	Limit [dBµV]
905	120.4	100.4
915.08	120.2	100.2
925.29	118.0	98.0

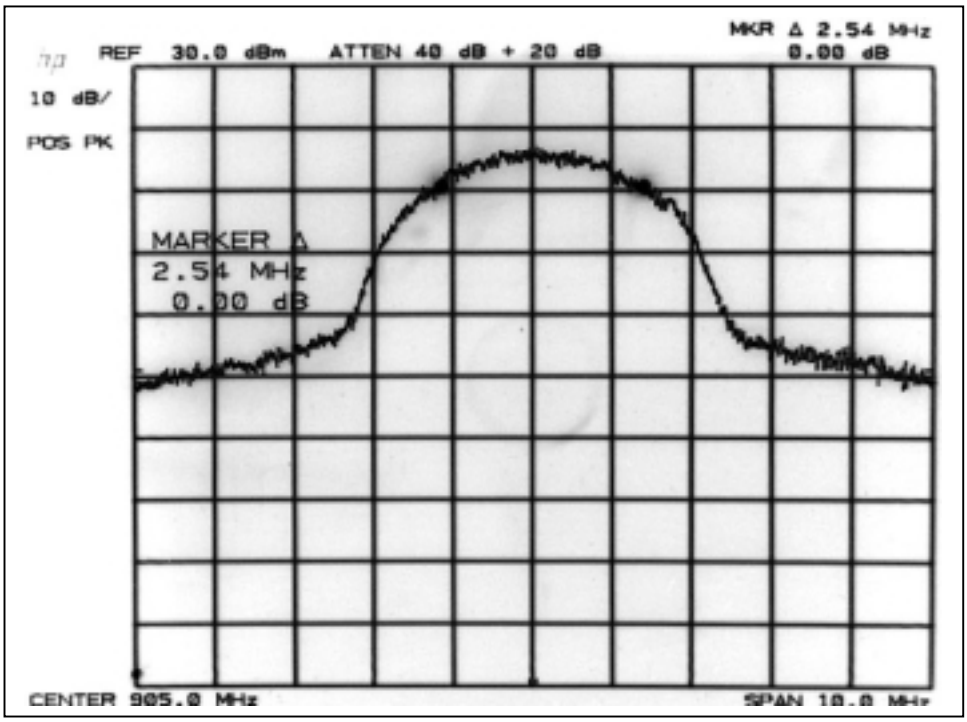
15.247(d): 8 dBm (115 dBµV)

Carrier Frequency [MHz]	RF Power [dBm]	Delta [dB from limit]
905	3.2	-4.8
915	3.9	-4.1
925	2.6	-5.4

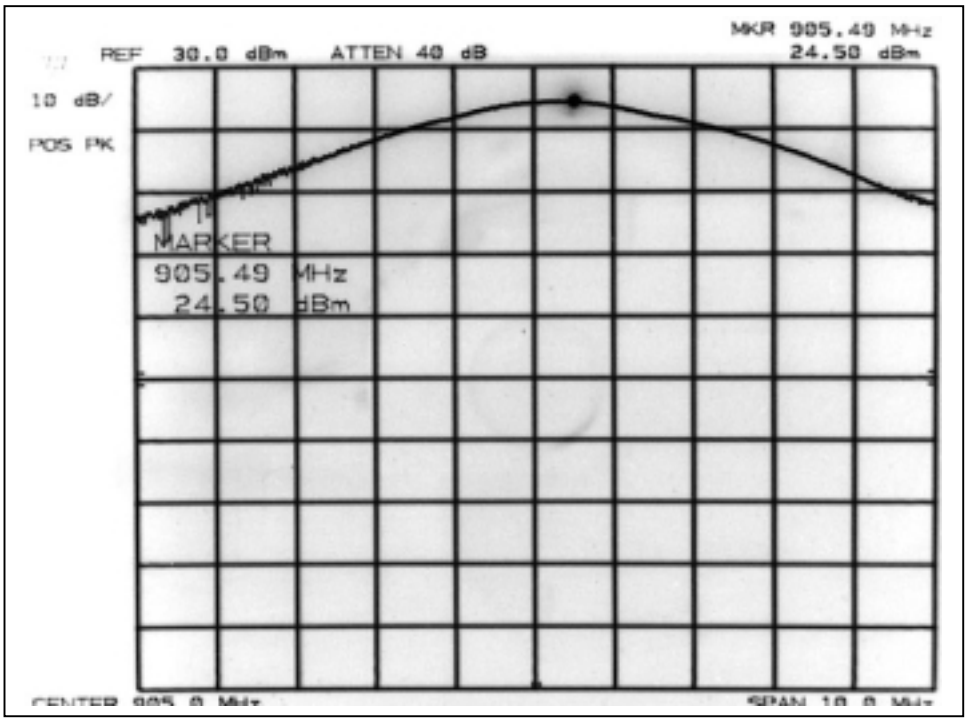
There were no other emissions measured within -10 dB of the specified limits. Measurements were performed while the EUM3003 was transmitting continuously in CCU mode.

Refer to the test data and plots for more detail.

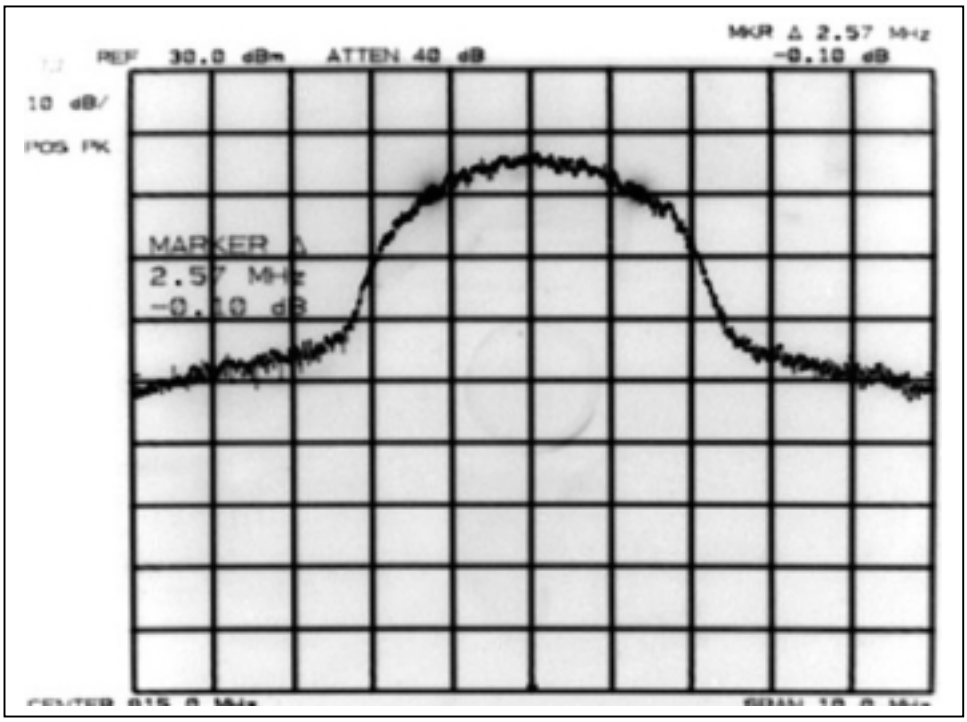
Spectrum Analyzer Plot of 6 dB Bandwidth: Tx @ 905 MHz



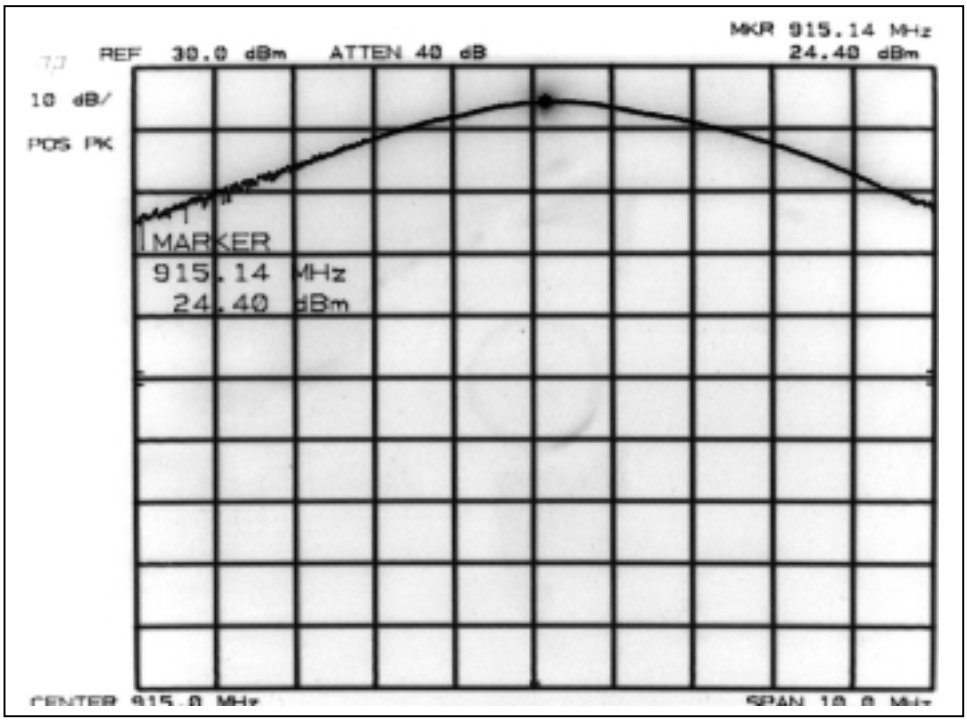
Spectrum Analyzer Plot of Maximum Peak Output Power: Tx @ 905 MHz



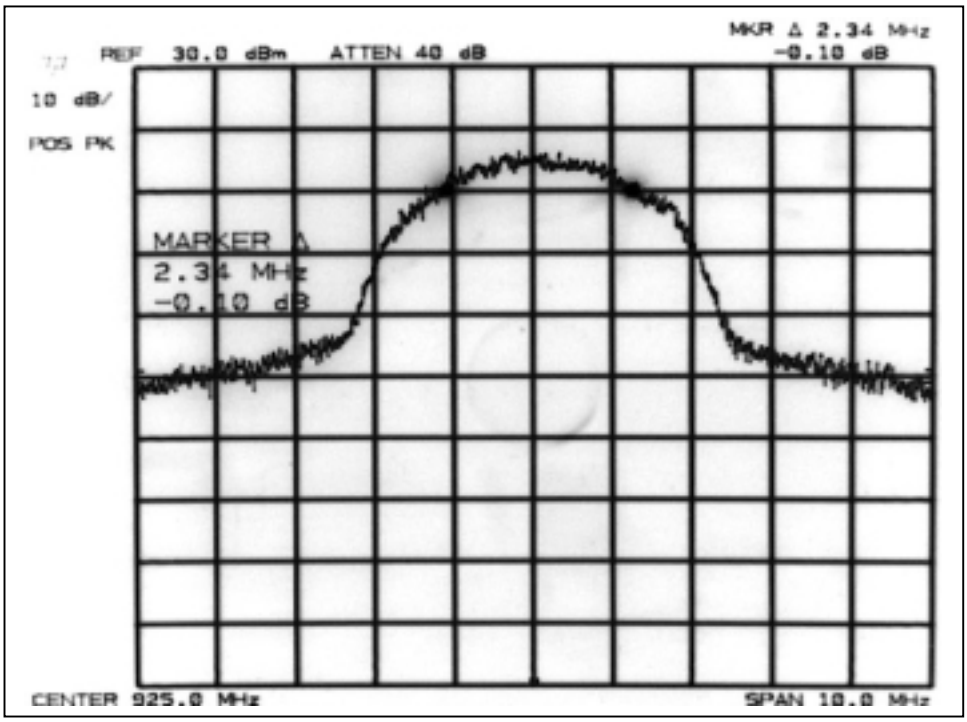
Spectrum Analyzer Plot of 6 dB Bandwidth: Tx @ 915 MHz



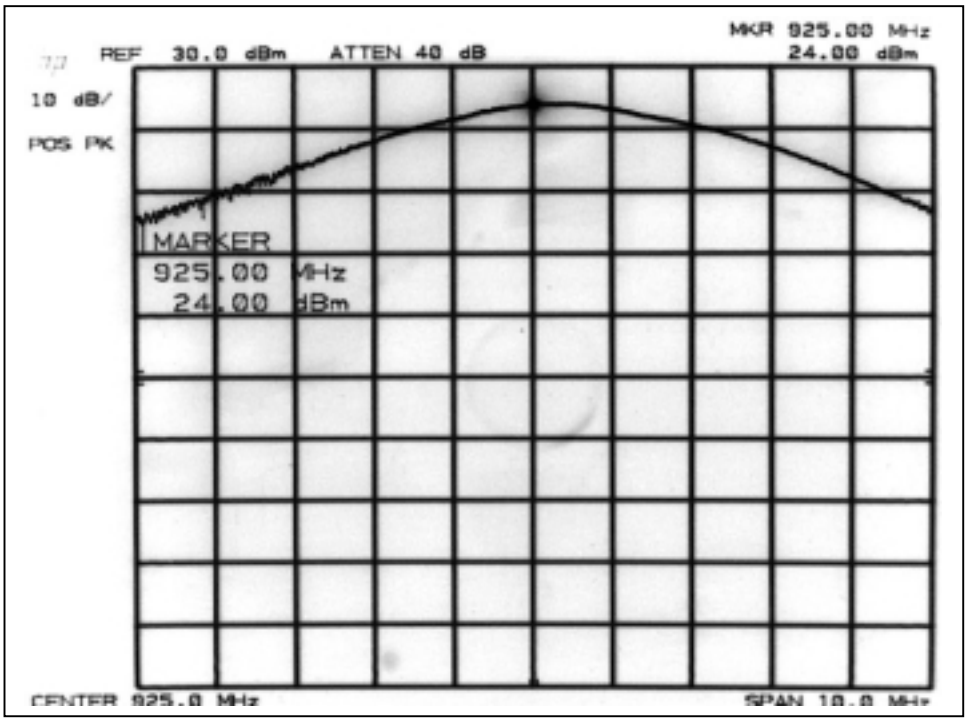
Spectrum Analyzer Plot of Maximum Peak Output Power: Tx @ 915 MHz

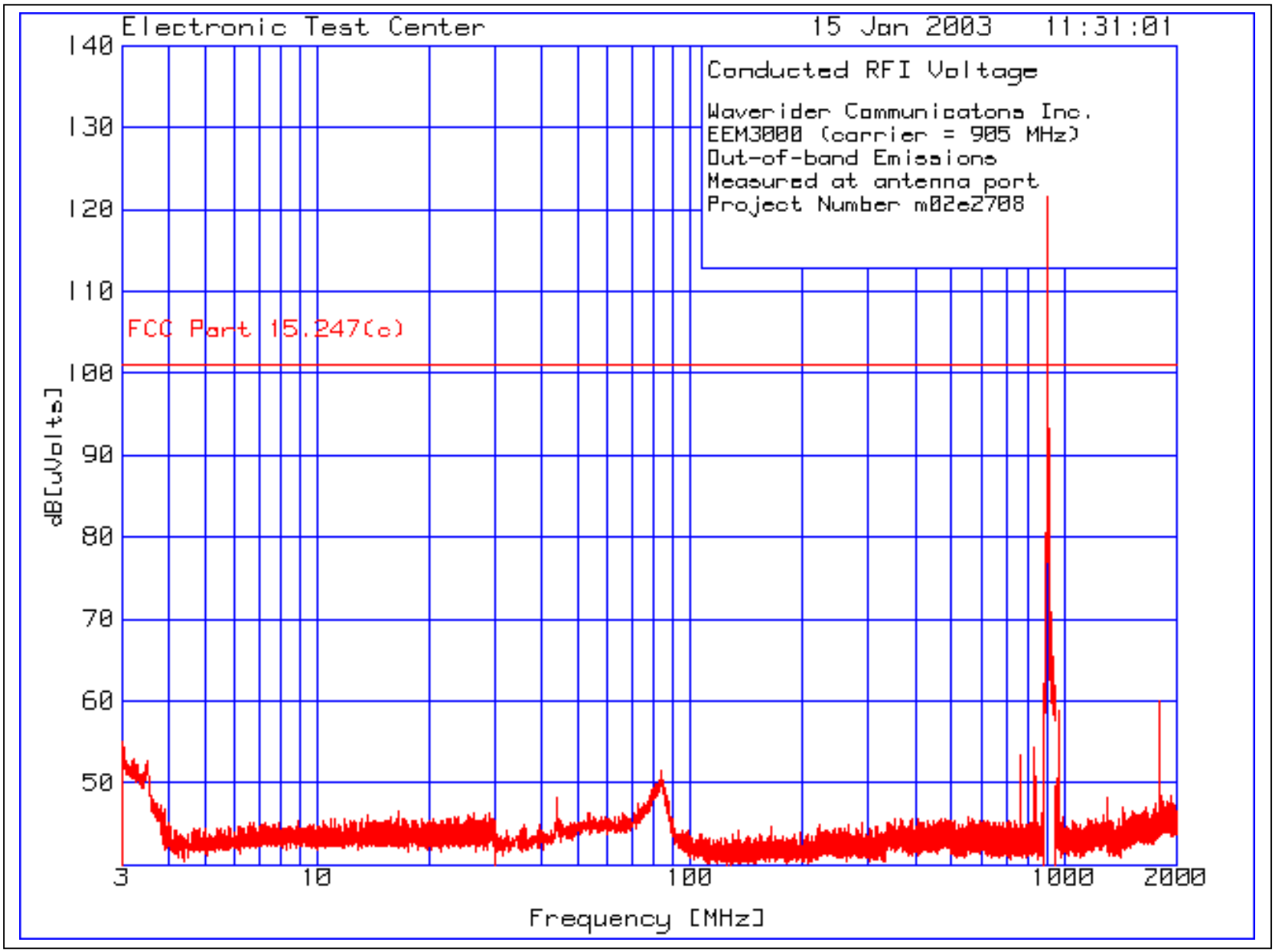


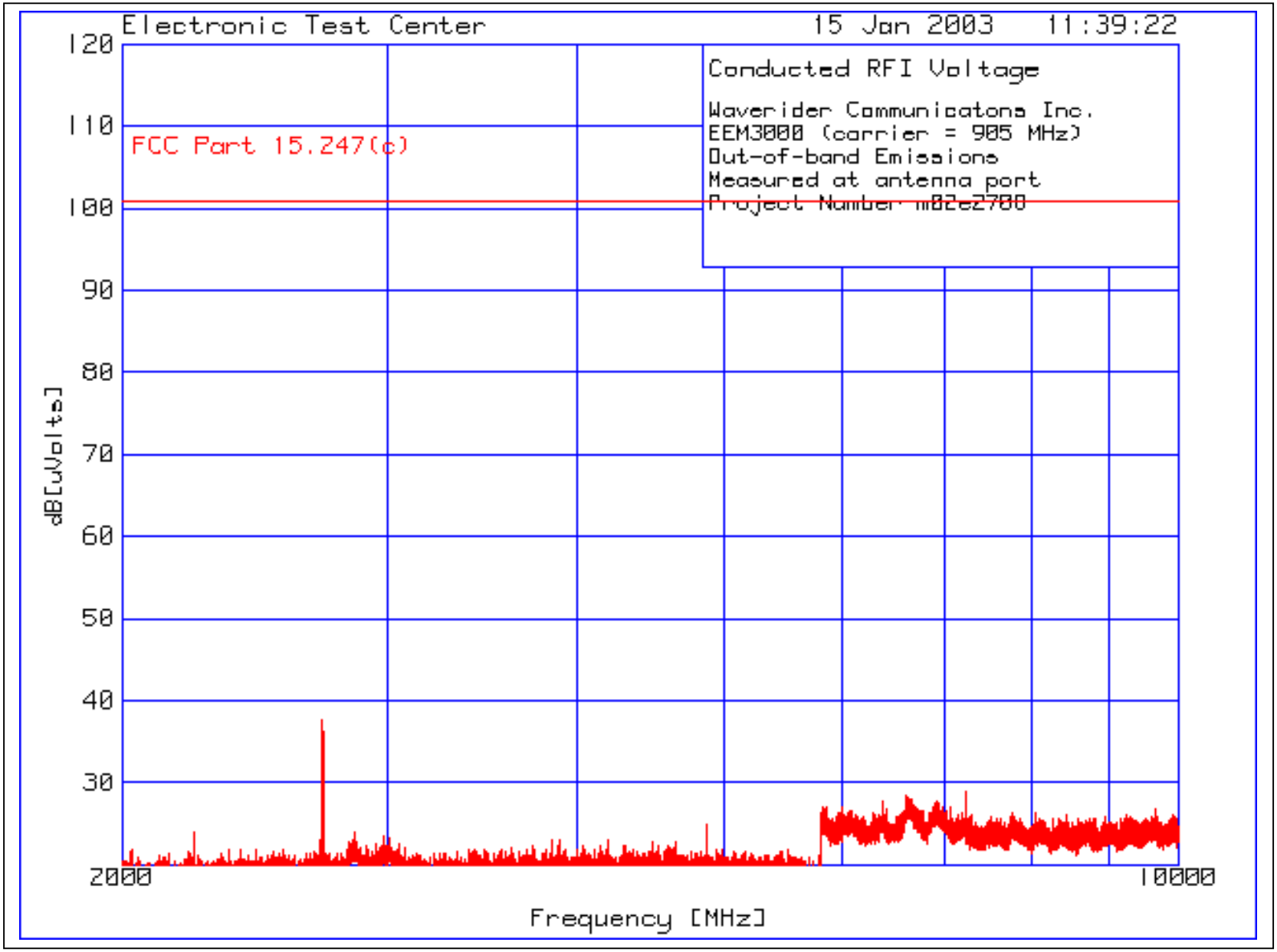
Spectrum Analyzer Plot of 6 dB Bandwidth: Tx @ 925 MHz

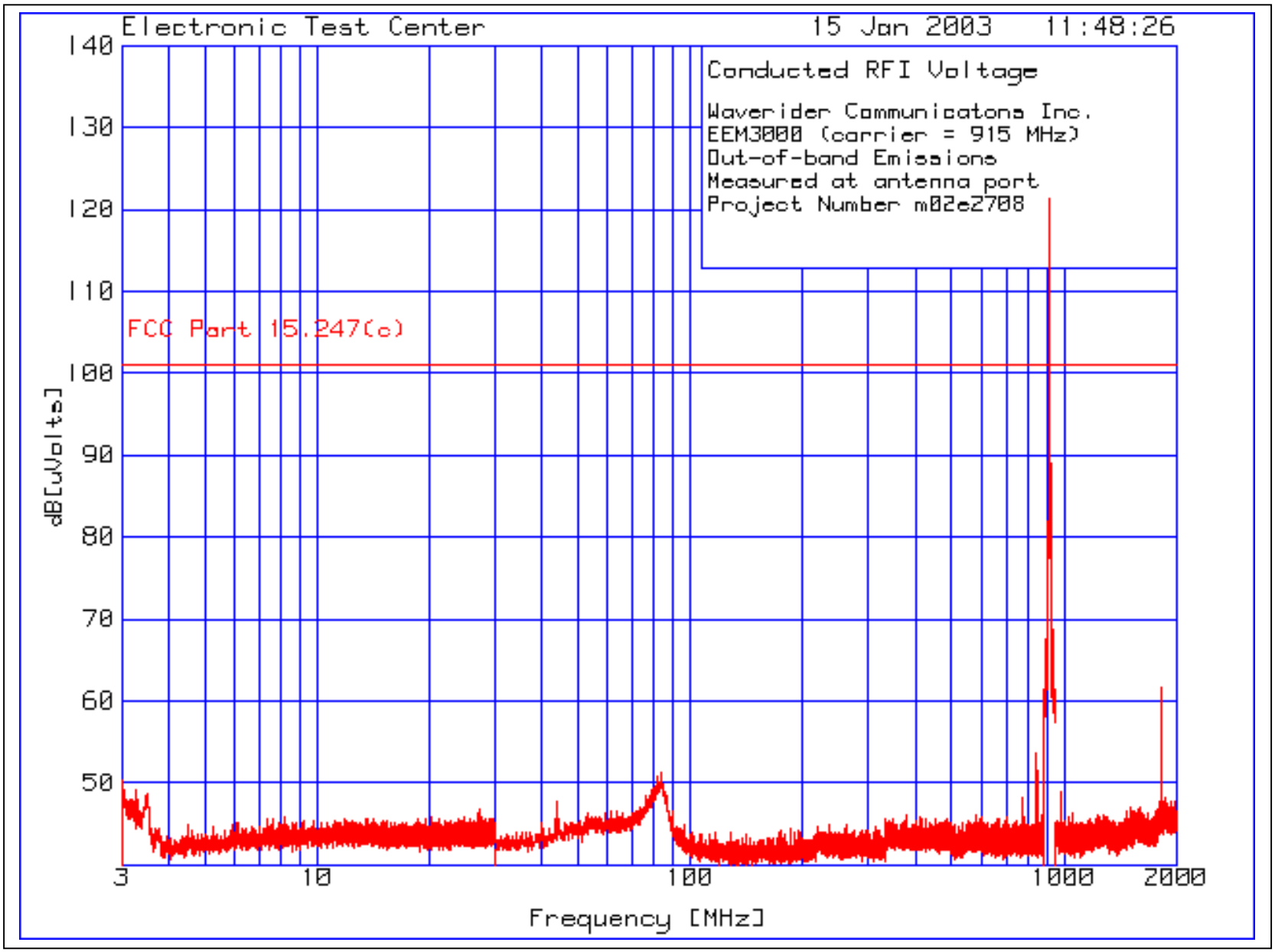


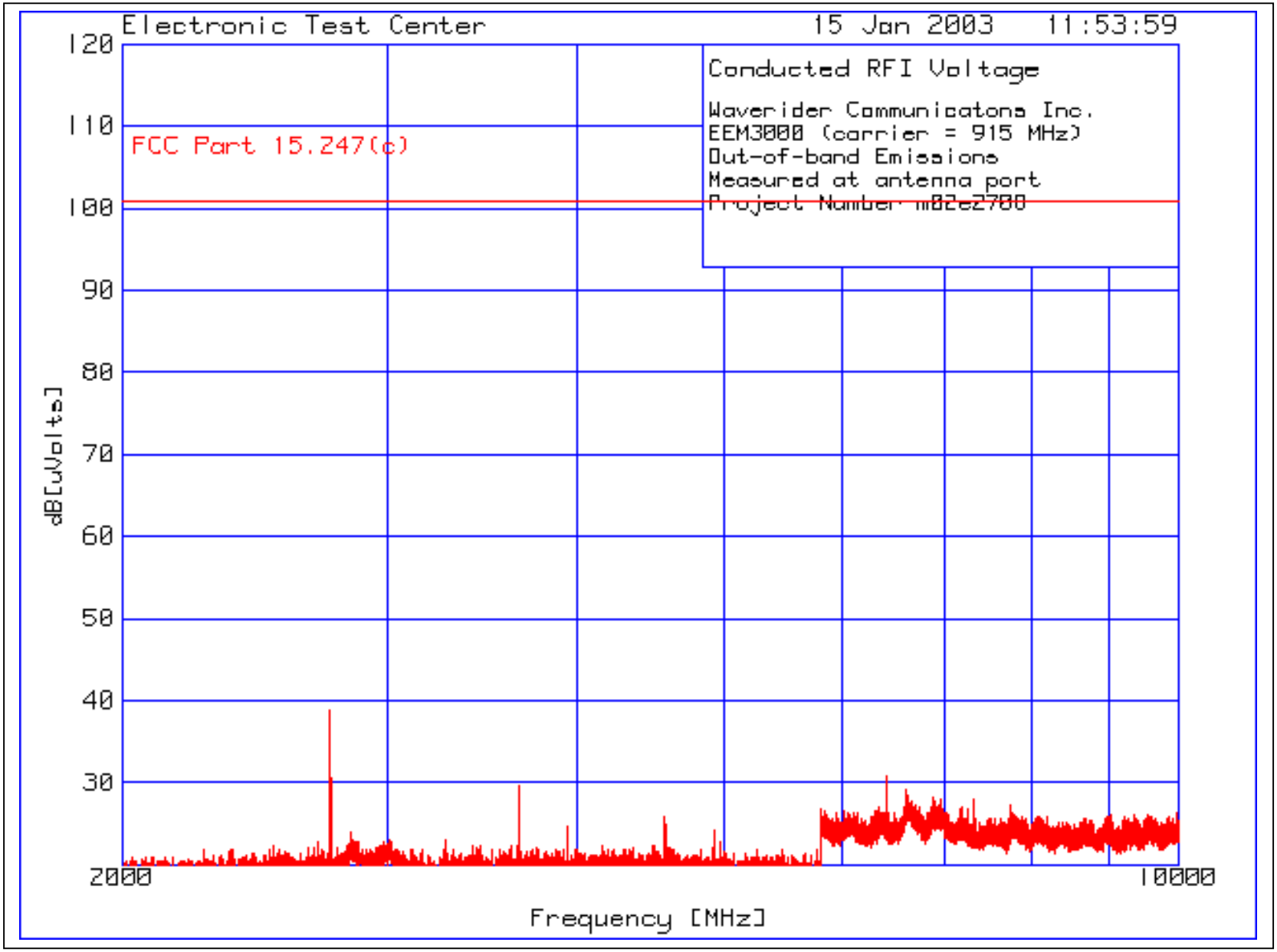
Spectrum Analyzer Plot of Maximum Peak Output Power: Tx @ 925 MHz

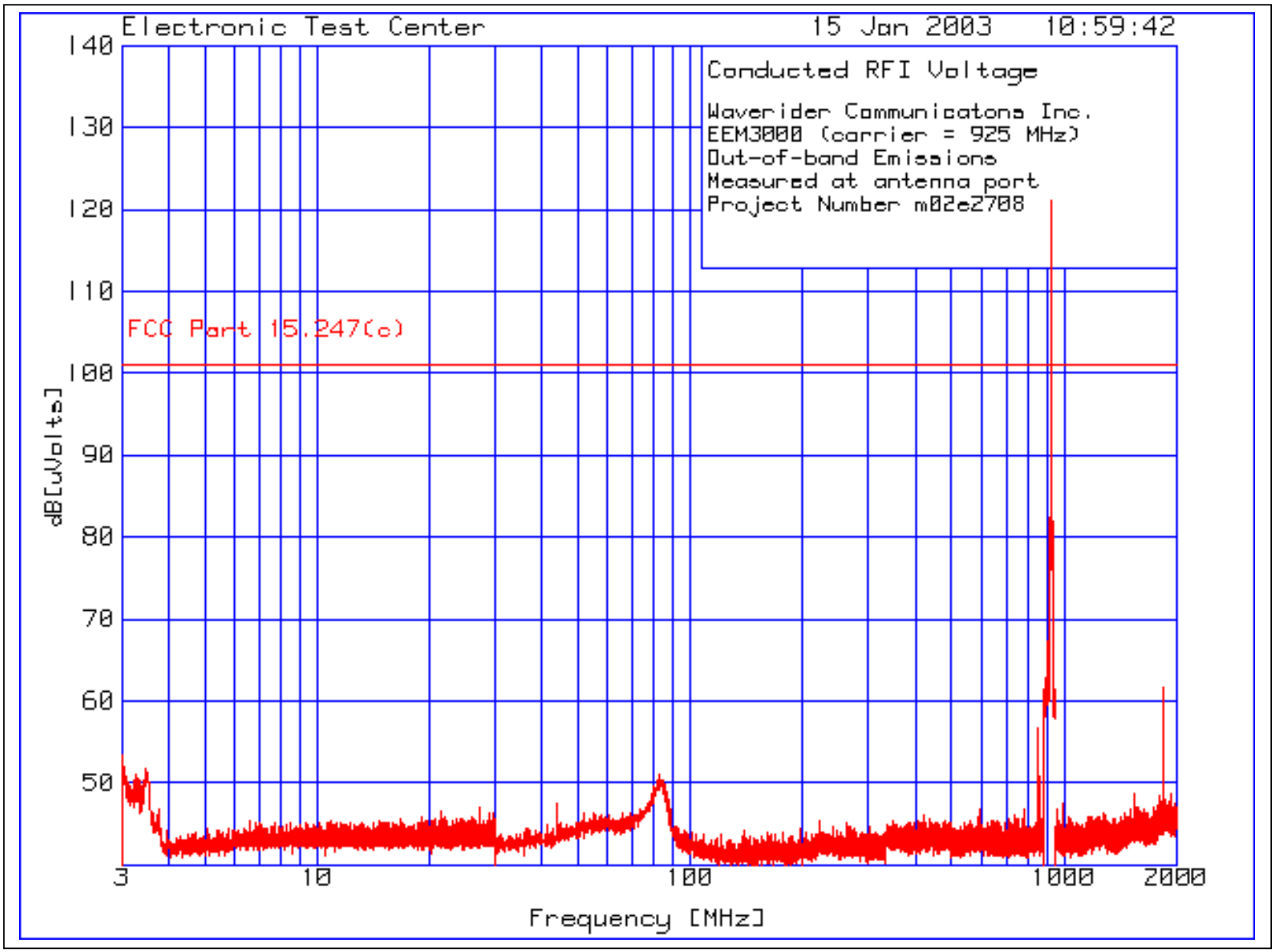


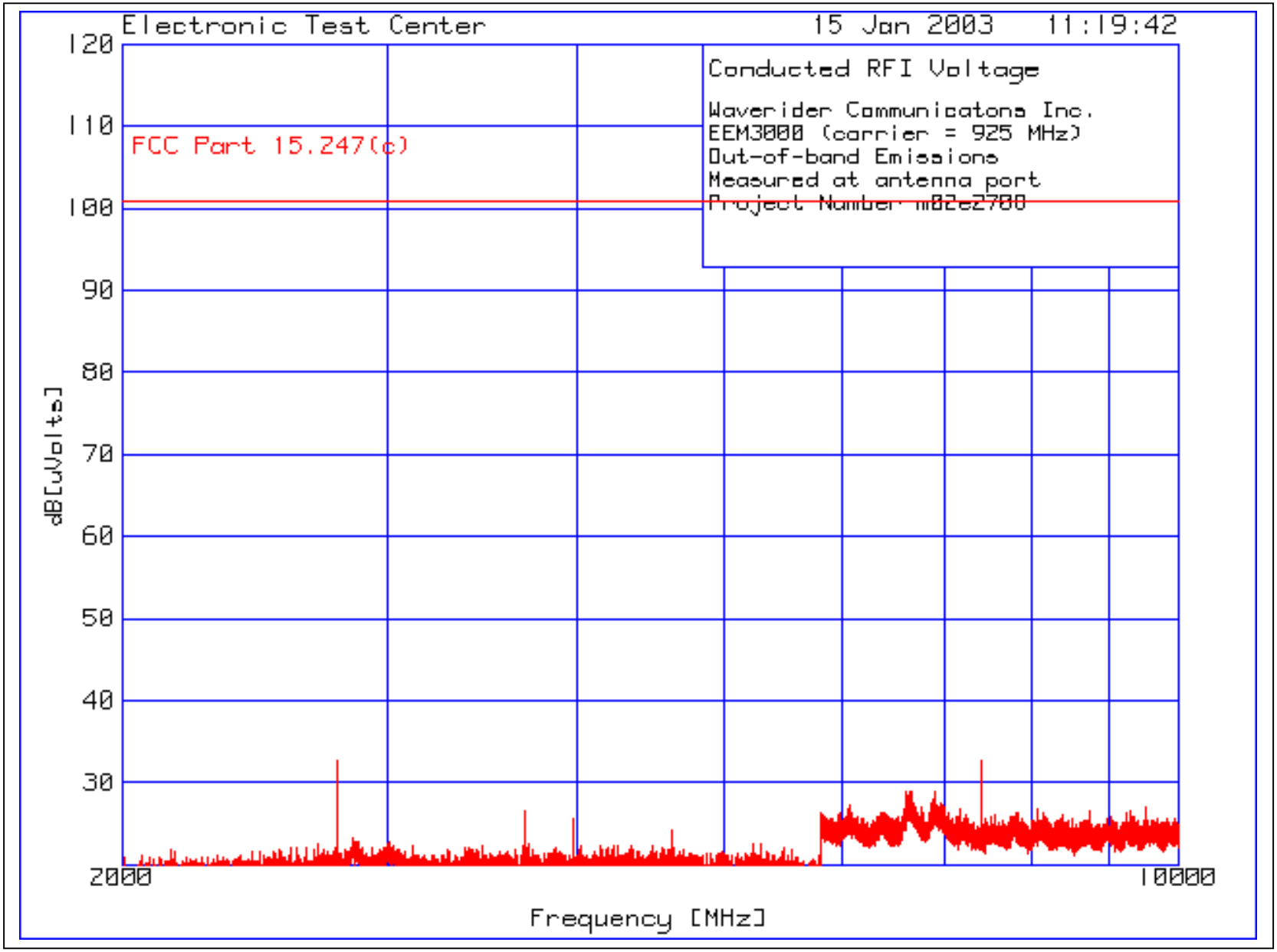




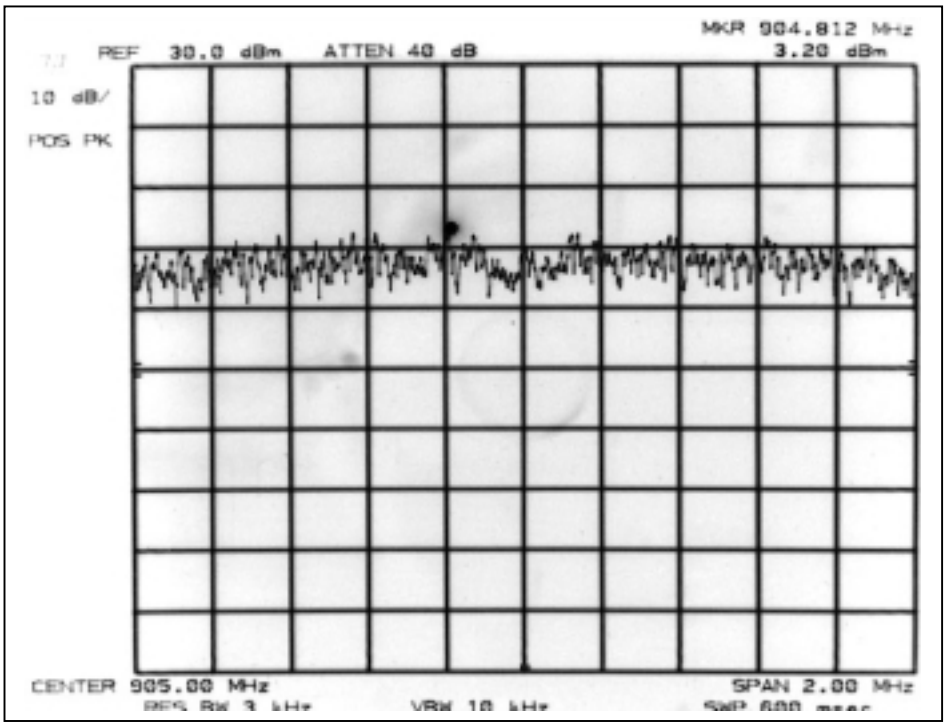




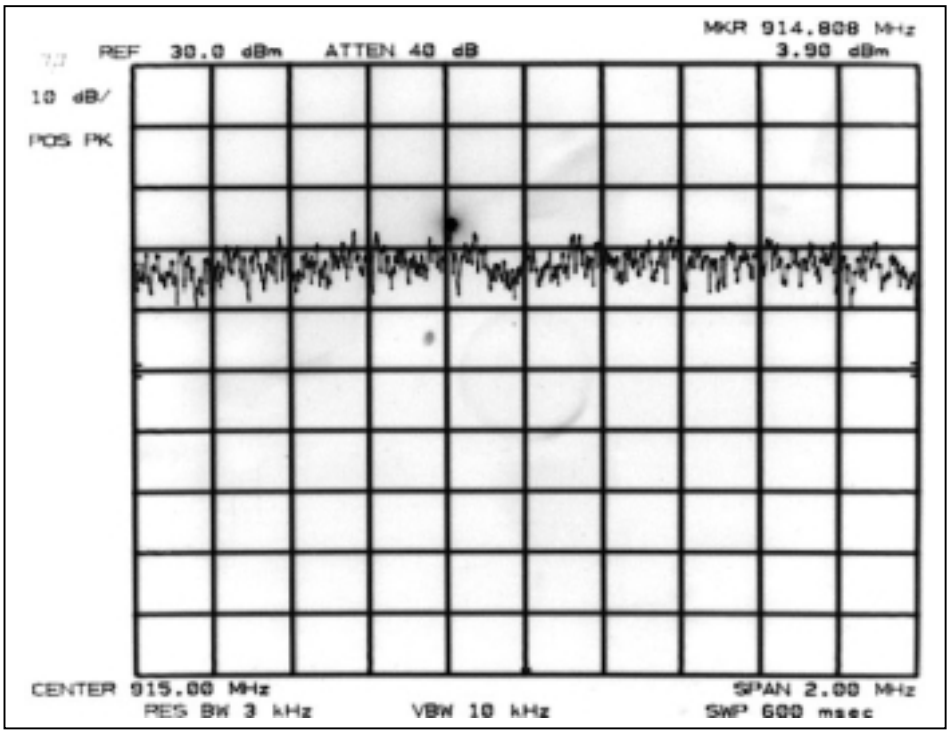




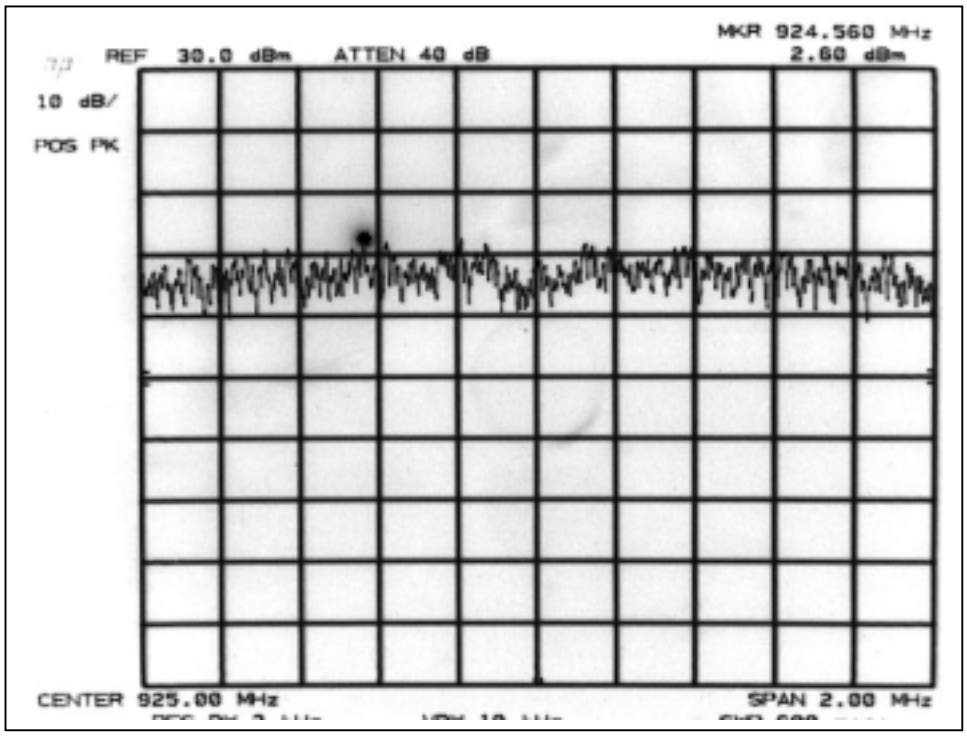
Spectrum Analyzer Plot of Power Spectral Density per Part 15.247(d): Tx @ 905 MHz



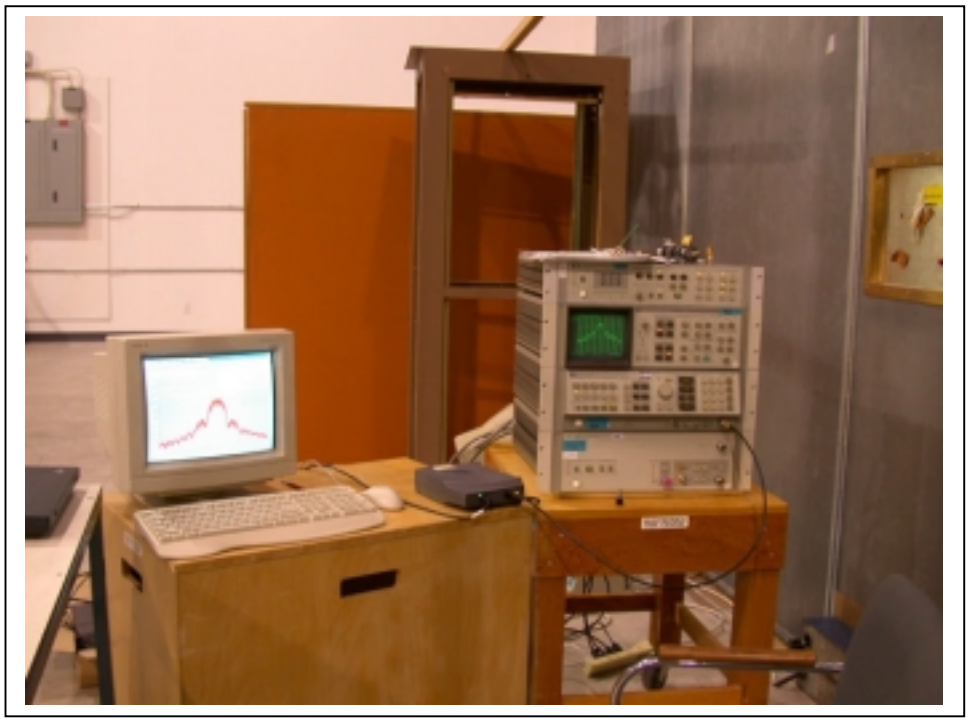
Spectrum Analyzer Plot of Power Spectral Density per Part 15.247(d): Tx @ 915 MHz



Spectrum Analyzer Plot of Power Spectral Density per Part 15.247(d): Tx @ 925 MHz



Picture of setup for measuring Conducted Emissions at Antenna Port:



4.3 RADIATED EMISSIONS INCLUDING RESTRICTED BANDS OF OPERATION

4.3a Receive Mode

Test Lab: MPB Technologies Inc. Airdrie Test Personnel: David Raynes Test Dates: January 2003	Product: EUM3003

Test Result, EUM3003: **PASS**

Objectives/Criteria	Specifications
The Radiated E-Field emissions produced by a system or sub-system, measured at a distance of 3m from the EUT, shall not exceed the limits for the specifications as stated. **Emission levels should meet the requirements with a margin of 6dB.** The EUT was assessed against the requirements of **Class B**. Temperature = 19 °C Humidity = 27 %	FCC Part 15 Subpart B Frequency [MHz] / Class A / **Class B** / QP @ 3m / **QP @ 3m** 30 - 88 / 49.54 / **40.00** 88 - 216 / 53.98 / **43.52** 216 - 960 / 56.90 / **46.02** above 960 / 60.00 / **53.98** Units of measurement are [dBµV/m].

Vertical:			**Horizontal:**		
Frequency [MHz]	Field Strength [dBµV/m]	Delta [dB from limit]	Frequency [MHz]	Field Strength [dBµV/m]	Delta [dB from limit]
87.9169	39.19	-0.81	925.4026	37.89	-8.13
43.9127	37.28	-2.72	856.9471	36.07	-9.95
848.6516	36.15	-9.87			
822.7378	35.80	-10.22			

There were no more emissions measured within -10 dB of the specified limit. Refer to the test data and plots for more detail.

Radiated Emissions Data:

The emissions data is presented in tabular form, showing the uncorrected spectrum analyzer reading, the correction factors applied, the net result, the value(s) of up to 4 limits at the frequency measured, and the margin between the result and the limit(s).

For example:

```
Test    Meter  Gain/Loss Transducer Level Limit:1     2     3     4
Frequency Reading  Factor    Factor    [dB(uVolts)]
  [MHz]   [dB(uV)]  [dB]      [dB]
=============================================================================
94.0036    37.1 qp   2.2      8.5      47.8   54      43.5   50.5   40.5
Azimuth: 156  Height:113 Vert    Margin [dB]  -6.2    4.3    -2.7   7.3
```

Test Frequency [MHz}	94.0036	Test Frequency f = 94.0036 MHz
Meter Reading [dB (uV)]	37.1 qp	The reading with Quasi-Peak detector
Gain/Loss Factor [dB]	2.2	Net correction for preamp gain & cable loss
Transducer Factor [dB]	8.5	Correction for antenna loss
Level [dB (uVolts)]	47.8	Corrected value for field strength
Limit: 1	54	The value of Limit 1 at 94.0036 MHz
Margin [dB]	-6.2	The field strength is 6.2 dB below Limit 1
Limit: 2	43.5	The value of Limit 2 at 94.0036 MHz
Margin [dB]	4.3	The field strength is 4.3 dB above Limit 2
Limit: 3	50.5	The value of Limit 3 at 94.0036 MHz
Margin [dB]	-2.7	The field strength is 2.7 dB below Limit 3
Limit: 4	40.5	The value of Limit 4 at 94.0036 MHz
Margin [dB]	7.3	The field strength is 7.3 dB above Limit 4

Meter Reading in dBuV + Gain/Loss Factor in dB + Transducer Factor in dB = Corrected Field Strength

Notes: When a preamp is used, the resulting gain is compensated.
Margin of less than 6 dB is indicated by highlighting.

Waverider Communications Inc.

EUM3003 Rev C
Antenna Port terminated
Rx @ 925 MHz in EUM mode

Project Number m01e2708-2 ⇓

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
Range: 1 30 - 1000MHz								
649.9797	5.46 qp	7.62	20.4	33.48	56.9	57	47.46	46.02
Azimuth: 1	Height:109 Horz		Margin [dB]:		-23.42	-23.52	-13.98	-12.54
674.4575	5.46 qp	7.85	20.91	34.22	56.9	57	47.46	46.02
Azimuth: 57	Height:383 Horz		Margin [dB]:		-22.68	-22.78	-13.24	-11.8
725.0361	5.43 qp	8.06	21.5	34.99	56.9	57	47.46	46.02
Azimuth: 172	Height:136 Horz		Margin [dB]:		-21.91	-22.01	-12.47	-11.03
751.7913	5.46 qp	8.1	21.46	35.02	56.9	57	47.46	46.02
Azimuth: 314	Height:115 Horz		Margin [dB]:		-21.88	-21.98	-12.44	-11
856.9471	5.43 qp	8.76	21.88	36.07	56.9	57	47.46	46.02
Azimuth: 105	Height:133 Horz		Margin [dB]:		-20.83	-20.93	-11.39	-9.95
925.4026	5.46 qp	9.14	23.29	37.89	56.9	57	47.46	46.02
Azimuth: 232	Height:171 Horz		Margin [dB]:		-19.01	-19.11	-9.57	-8.13
Range: 1 30 - 1000MHz								
43.9127	20.22 qp	2.51	14.55	37.28	49.54	50	40.46	40
Azimuth: 257	Height:101 Vert		Margin [dB]:		-12.26	-12.72	-3.18	-2.72
56.3389	7.91 qp	2.81	10.36	21.08	49.54	50	40.46	40
Azimuth: 137	Height:194 Vert		Margin [dB]:		-28.46	-28.92	-19.38	-18.92
74.5443	14.75 qp	2.72	7.71	25.18	49.54	50	40.46	40
Azimuth: 4	Height:102 Vert		Margin [dB]:		-24.36	-24.82	-15.28	-14.82
74.5861	15.28 qp	2.72	7.71	25.71	49.54	50	40.46	40
Azimuth: 3	Height:102 Vert		Margin [dB]:		-23.83	-24.29	-14.75	-14.29
80.4834	16.93 qp	2.97	7.56	27.46	49.54	50	40.46	40
Azimuth: 17	Height:135 Vert		Margin [dB]:		-22.08	-22.54	-13	-12.54
83.4668	17.97 qp	3.07	7.32	28.36	49.54	50	40.46	40
Azimuth: 343	Height:102 Vert		Margin [dB]:		-21.18	-21.64	-12.1	-11.64
83.9124	18.59 qp	3.09	7.29	28.97	49.54	50	40.46	40
Azimuth: 254	Height:102 Vert		Margin [dB]:		-20.57	-21.03	-11.49	-11.03

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
84.6867	17.76 qp	3.11	7.23	28.1	49.54	50	40.46	40
Azimuth: 272	Height:103	Vert		Margin [dB]:	-21.44	-21.9	-12.36	-11.9
85.2218	17.47 qp	3.13	7.22	27.82	49.54	50	40.46	40
Azimuth: 0	Height:135	Vert		Margin [dB]:	-21.72	-22.18	-12.64	-12.18
85.3607	17.77 qp	3.14	7.23	28.14	49.54	50	40.46	40
Azimuth: 0	Height:103	Vert		Margin [dB]:	-21.4	-21.86	-12.32	-11.86
85.4398	16.36 qp	3.14	7.24	26.74	49.54	50	40.46	40
Azimuth: 198	Height:103	Vert		Margin [dB]:	-22.8	-23.26	-13.72	-13.26
85.9869	16.24 qp	3.16	7.28	26.68	49.54	50	40.46	40
Azimuth: 0	Height:101	Vert		Margin [dB]:	-22.86	-23.32	-13.78	-13.32
86.1701	15.97 qp	3.17	7.29	26.43	49.54	50	40.46	40
Azimuth: 293	Height:102	Vert		Margin [dB]:	-23.11	-23.57	-14.03	-13.57
86.5601	15.06 qp	3.18	7.32	25.56	49.54	50	40.46	40
Azimuth: 0	Height:114	Vert		Margin [dB]:	-23.98	-24.44	-14.9	-14.44
87.9169	28.53 qp	3.23	7.43	39.19	49.54	50	40.46	40
Azimuth: 239	Height:109	Vert		Margin [dB]:	-10.35	-10.81	-1.27	-.81
89.2161	12.55 qp	3.24	7.54	23.33	53.98	50	40.46	43.52
Azimuth: 0	Height:103	Vert		Margin [dB]:	-30.65	-26.67	-17.13	-20.19
91.4898	8.6 qp	3.17	7.96	19.73	53.98	50	40.46	43.52
Azimuth: 0	Height:315	Vert		Margin [dB]:	-34.25	-30.27	-20.73	-23.79
96.8153	13.44 qp	2.99	9.27	25.7	53.98	50	40.46	43.52
Azimuth: 0	Height:105	Vert		Margin [dB]:	-28.28	-24.3	-14.76	-17.82
101.9051	9.75 qp	2.96	10.56	23.27	53.98	50	40.46	43.52
Azimuth: 0	Height:148	Vert		Margin [dB]:	-30.71	-26.73	-17.19	-20.25
101.9953	14.44 qp	2.96	10.58	27.98	53.98	50	40.46	43.52
Azimuth: 0	Height:105	Vert		Margin [dB]:	-26	-22.02	-12.48	-15.54
102.245	13.57 qp	2.97	10.64	27.18	53.98	50	40.46	43.52
Azimuth: 0	Height:108	Vert		Margin [dB]:	-26.8	-22.82	-13.28	-16.34
103.9288	8.32 qp	3.03	11.04	22.39	53.98	50	40.46	43.52
Azimuth: 0	Height:105	Vert		Margin [dB]:	-31.59	-27.61	-18.07	-21.13
106.2014	7.13 qp	3.12	11.47	21.72	53.98	50	40.46	43.52
Azimuth: 0	Height:111	Vert		Margin [dB]:	-32.26	-28.28	-18.74	-21.8

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
108.4813	6.49 qp	3.21	11.79	21.49	53.98	50	40.46	43.52
Azimuth: 0	Height:104 Vert			Margin [dB]:	-32.49	-28.51	-18.97	-22.03
670.3236	6.23 qp	7.88	19.61	33.72	56.9	57	47.46	46.02
Azimuth: 0	Height:144 Vert			Margin [dB]:	-23.18	-23.28	-13.74	-12.3
822.7378	6.15 qp	8.4	21.25	35.8	56.9	57	47.46	46.02
Azimuth: 0	Height:180 Vert			Margin [dB]:	-21.1	-21.2	-11.66	-10.22
848.6516	6.12 qp	8.93	21.1	36.15	56.9	57	47.46	46.02
Azimuth: 0	Height:123 Vert			Margin [dB]:	-20.75	-20.85	-11.31	-9.87

LIMIT 1: FCC Part 15 Class A 3m

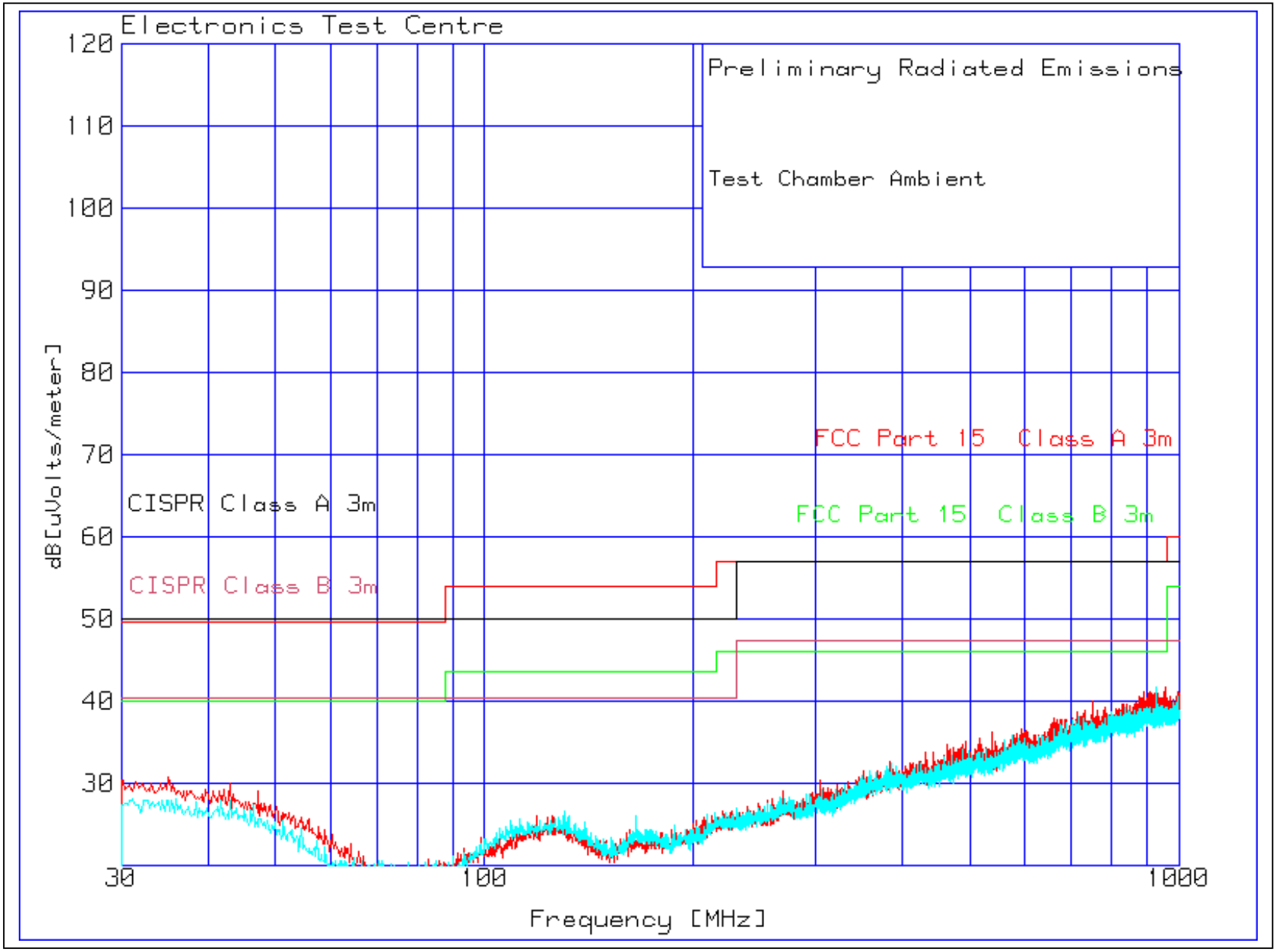
LIMIT 2: CISPR Class A 3 m

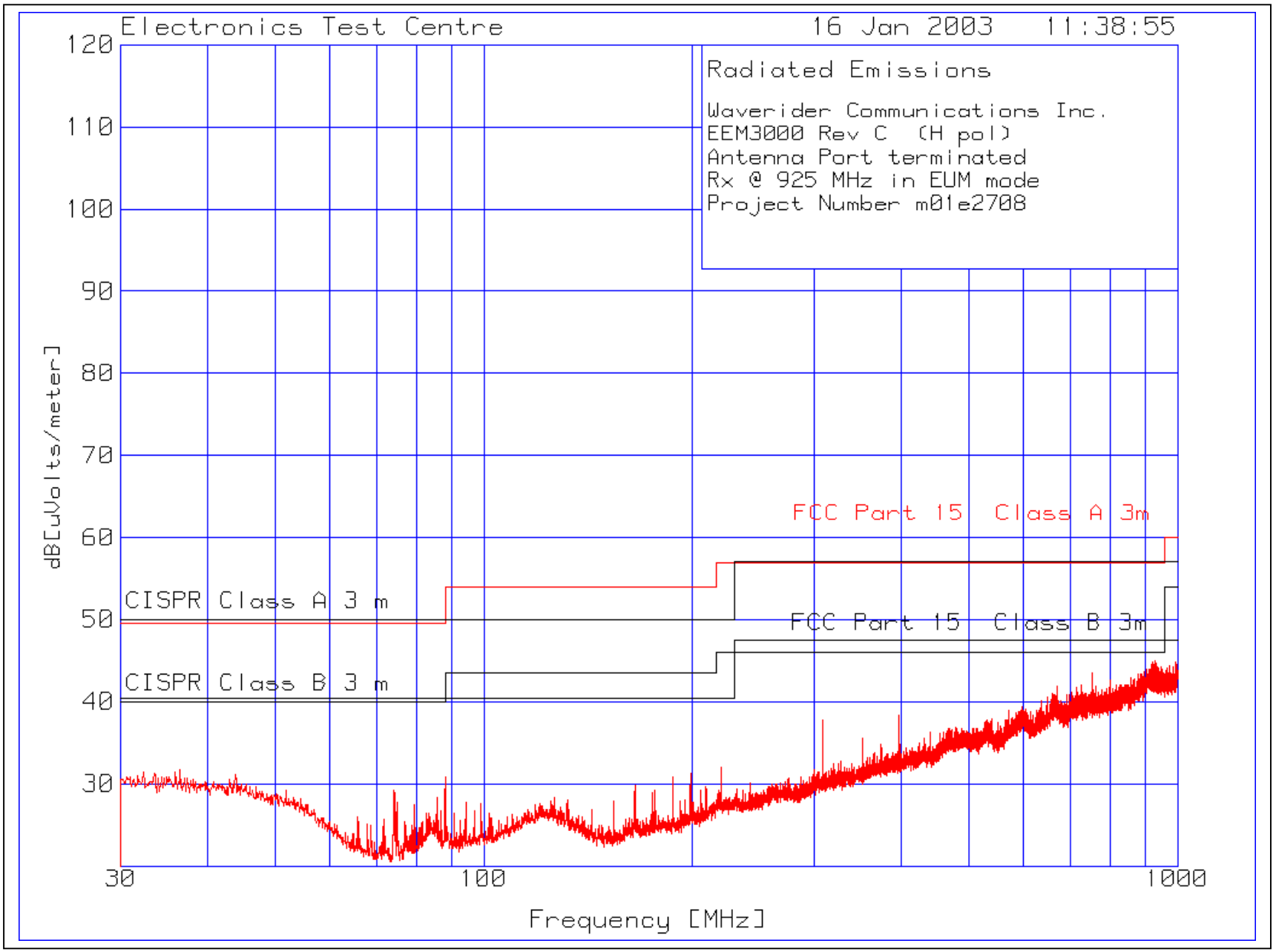
LIMIT 3: CISPR Class B 3 m

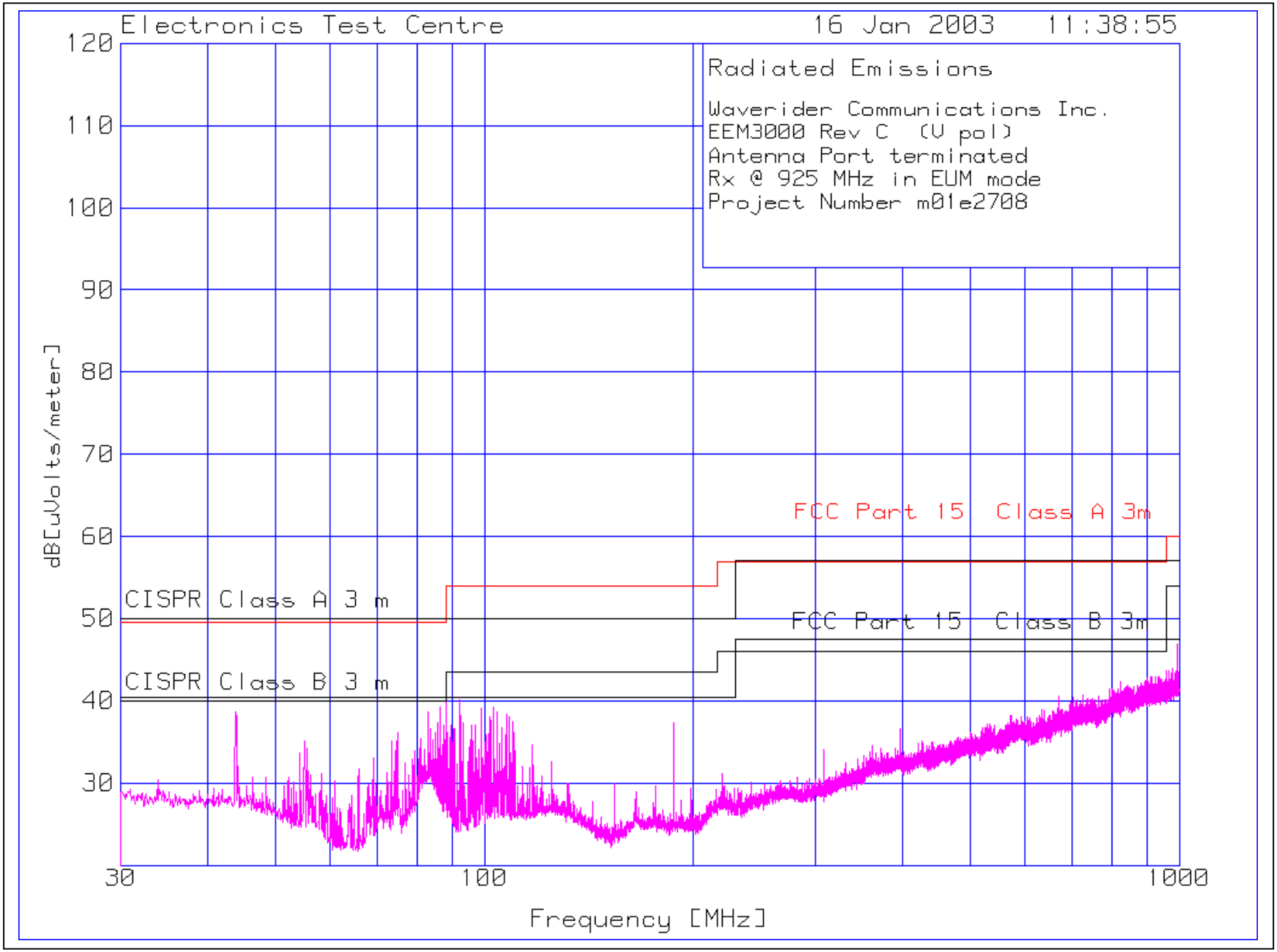
LIMIT 4: FCC Part 15 Class B 3m

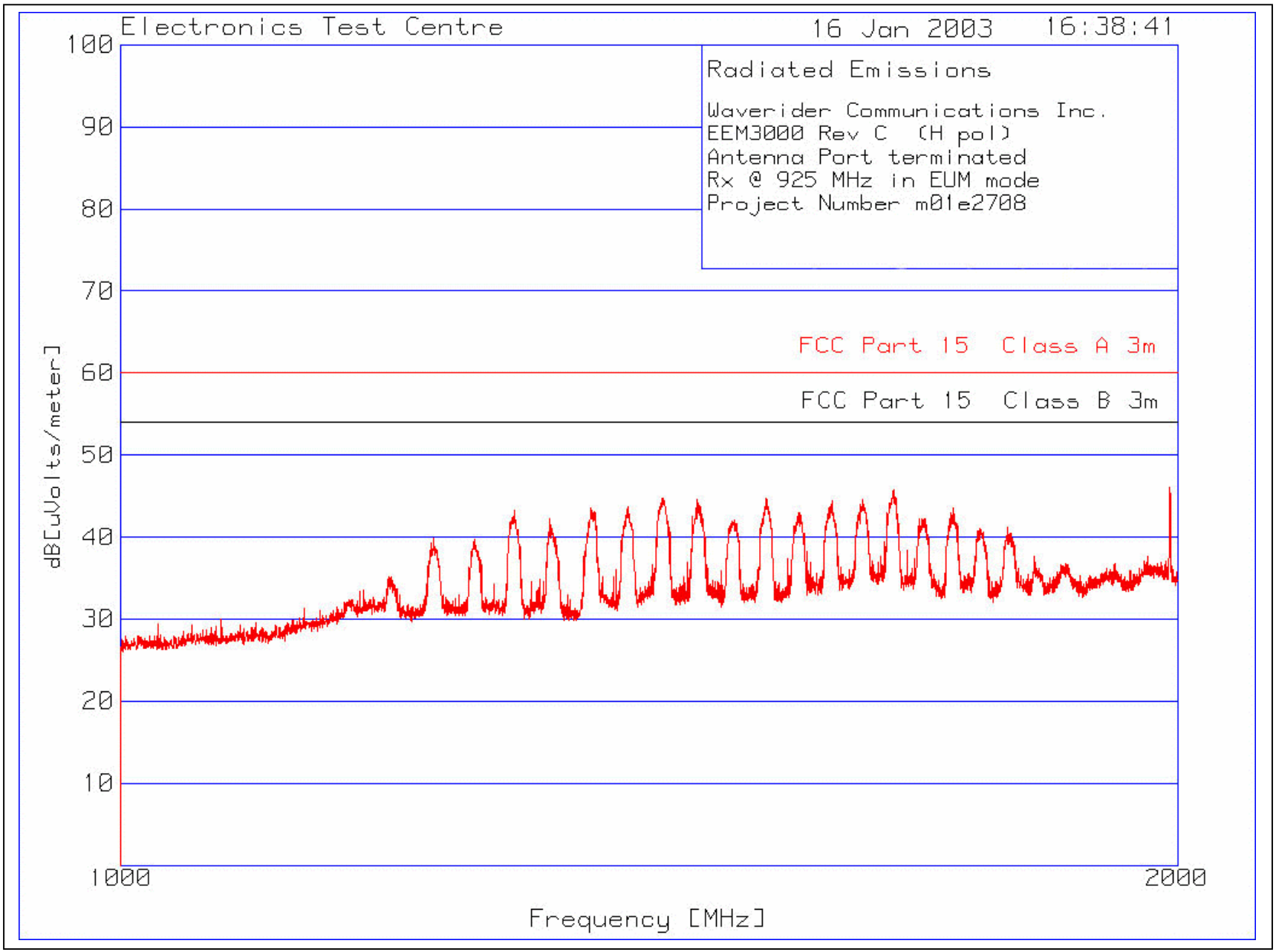
qp = Quasi-Peak detector

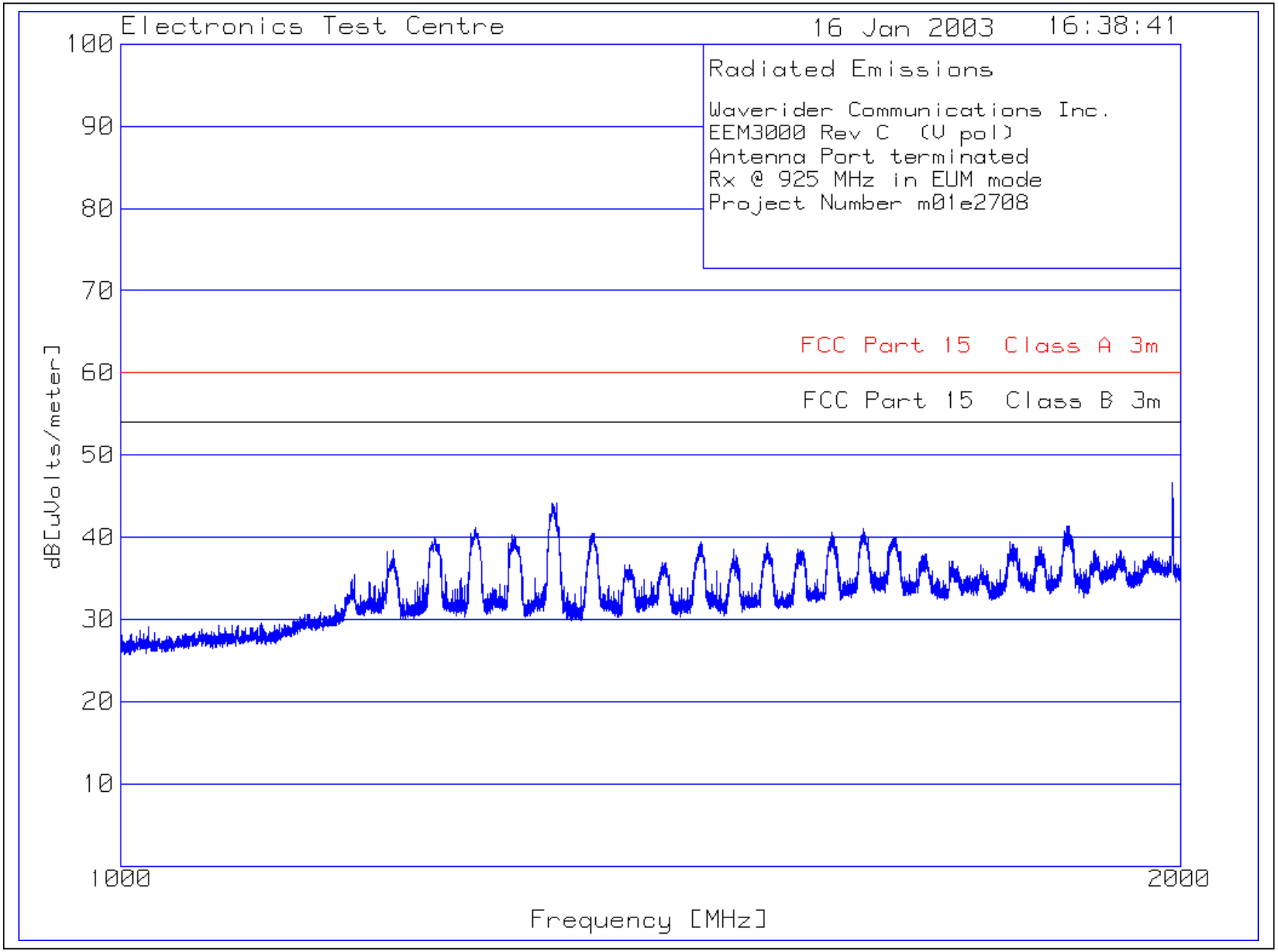
File: Rx925 QP.TXT

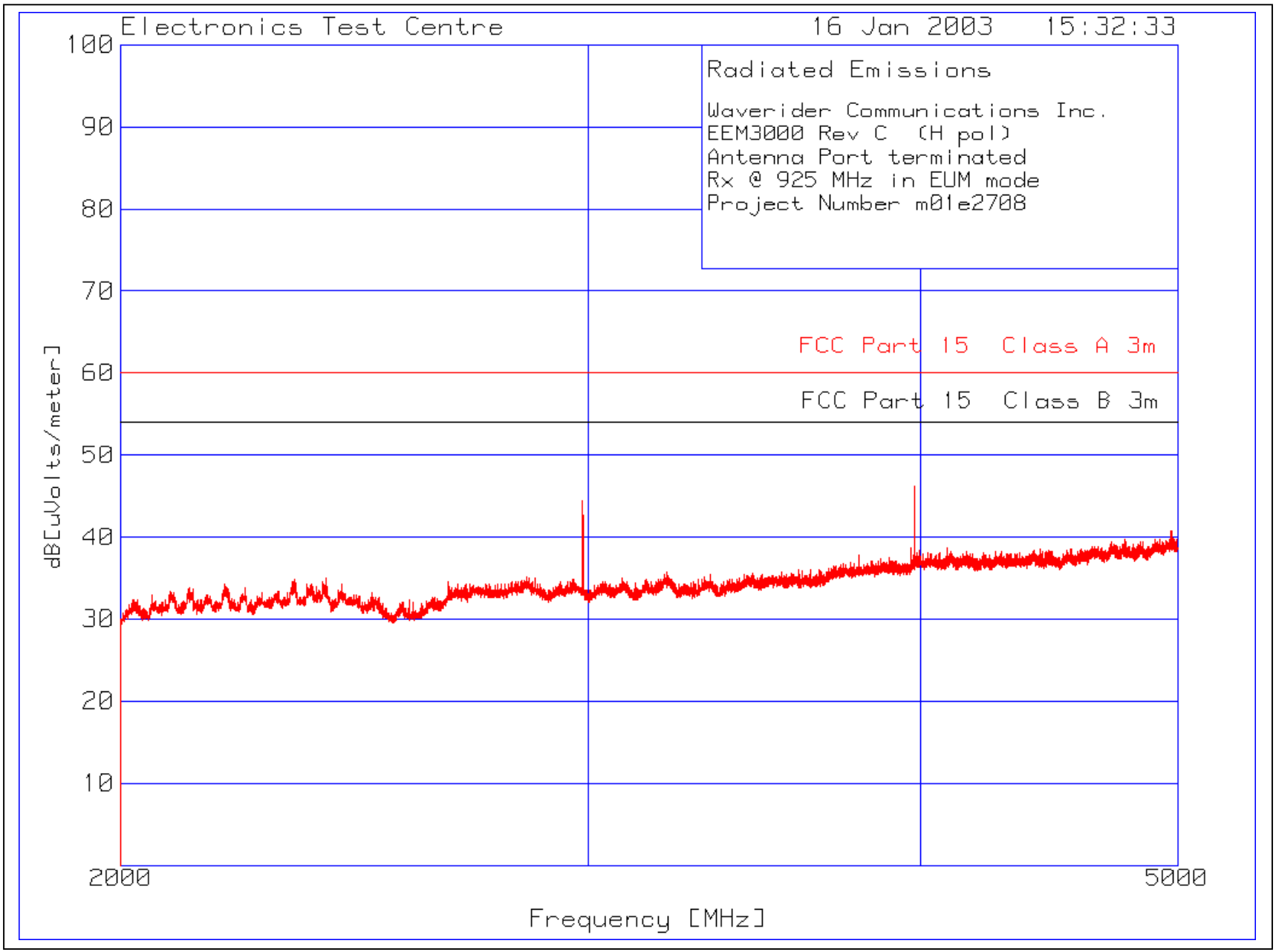


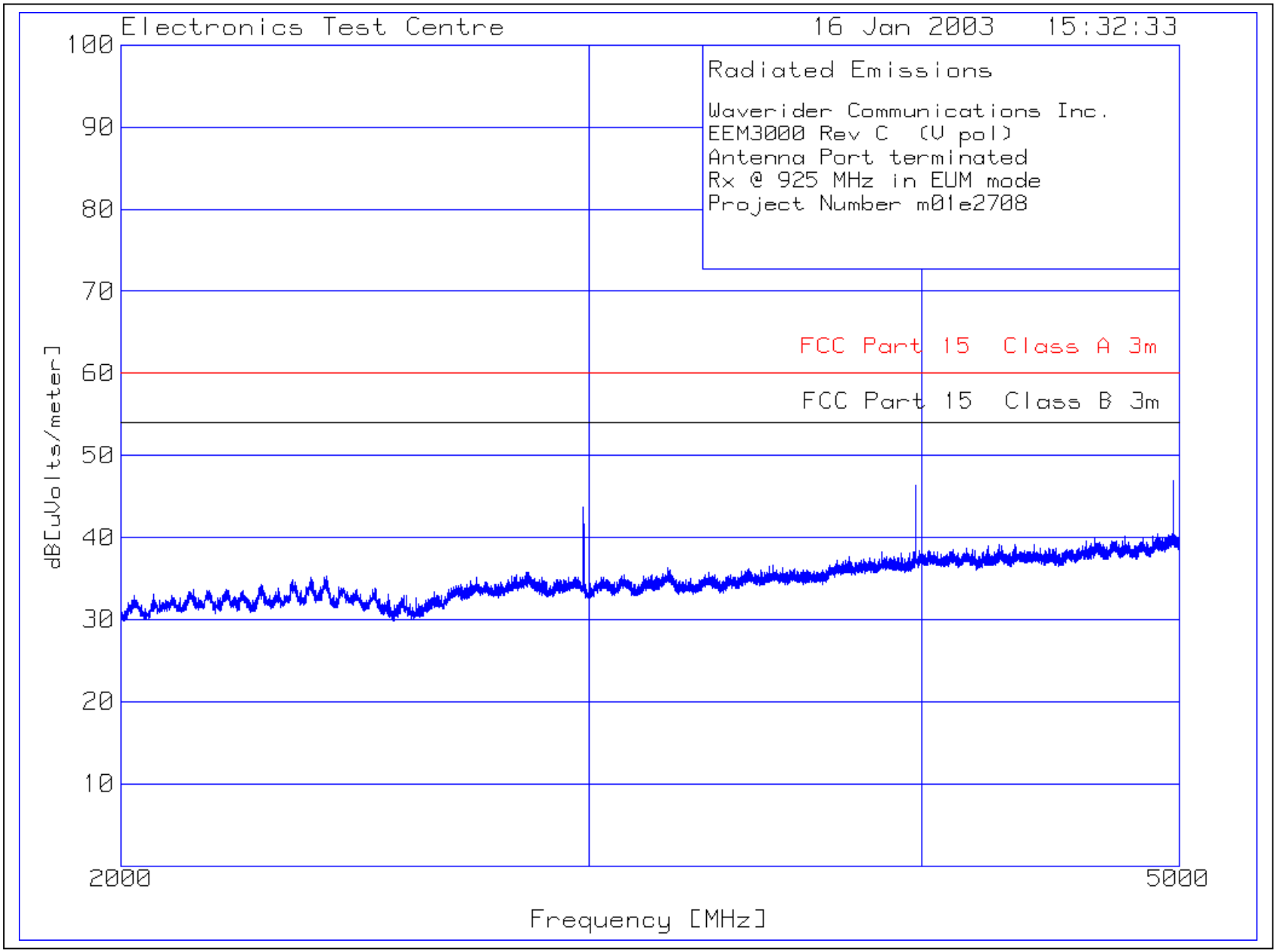












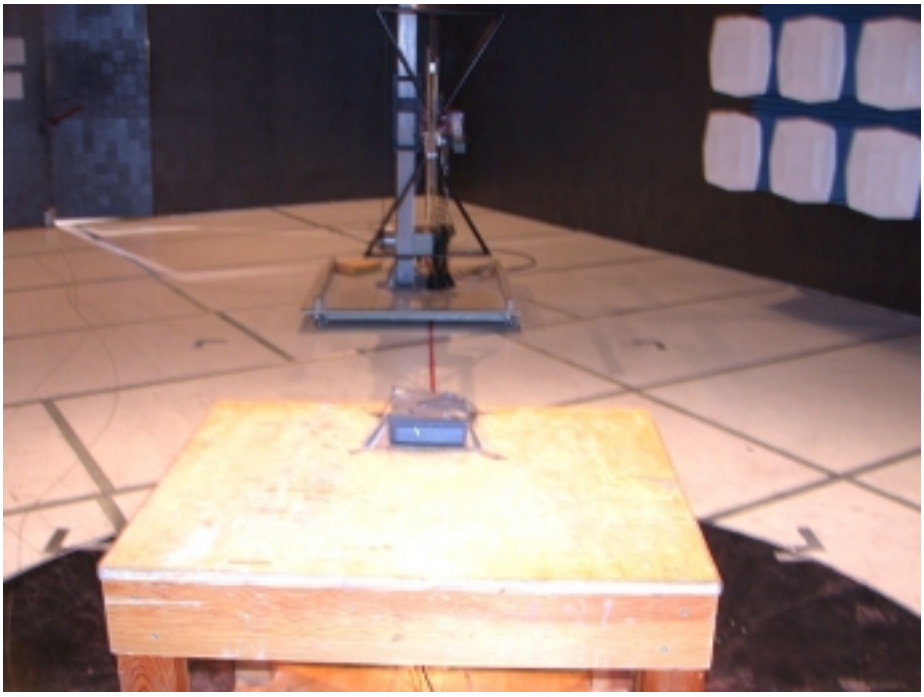
4.3b Transmit Mode

Test Lab: MPB Technologies Inc. Airdrie Test Personnel: David Raynes Dates: 28 November 2002 to 7 January 2003	Product: EUM3003
Test Result, EUM3003: **Not Applicable**	
Comments: As confirmed by the conducted measurements at the antenna port, there was no degradation of emission performance.	

Picture of Radiated Emissions Setup: EUM3003.

Picture of Radiated Emissions Setup: EUM3003.

Picture of Radiated Emissions Setup: EUM3003.



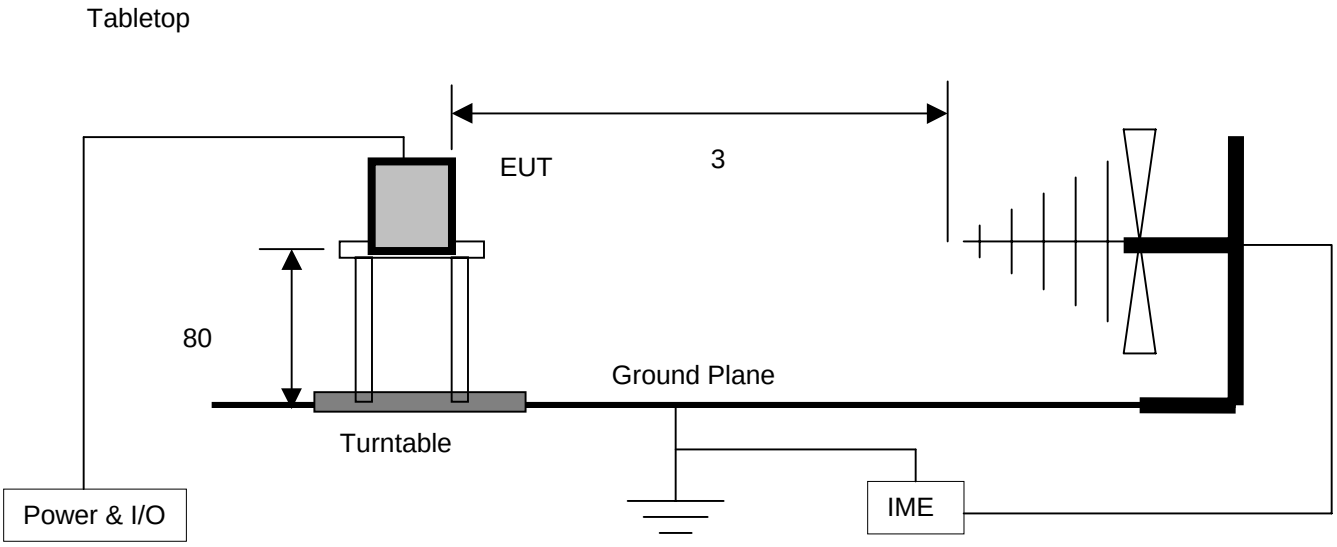
Picture of Radiated Emissions Setup: EUM3003.

5.5 TEST CONFIGURATION

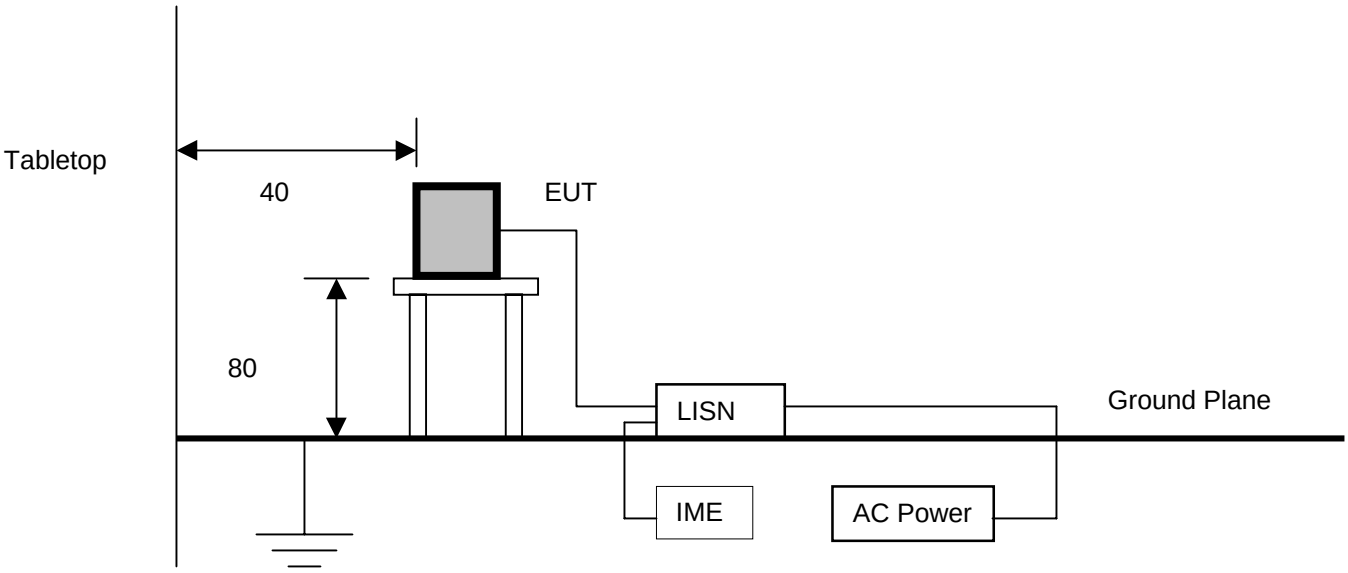
Tabletop Equipment

The following diagrams illustrate the configuration of the EUT test and measurement equipment for Radiated and Conducted Emissions Testing of tabletop equipment.

Radiated Emissions



Conducted Emissions



6.0 TEST EQUIPMENT

The following equipment was used for this procedure. All measurement devices are calibrated annually, traceable to NIST.

6.1 RADIATED EMISSIONS

a) Spectrum Analyzer with RF Preselector
b) CISPR Quasi-peak Adapter
c) Power Isolation Transformers
d) Biconilog antenna (20 MHz to 2 GHz)
e) Antenna mast positioner, and controller
f) Flush-mounted turntable, and controller
g) Personal Computer and EMC software

6.2 CONDUCTED EMISSIONS

a) Spectrum Analyzer with RF Preselector
b) Line Impedance Stabilization Network, 50 μH
c) CISPR Quasi-peak Adapter
d) Isolation Transformer
e) Personal Computer and EMC software

6.3 CALIBRATION

All measurement instrumentation conforms to ANSI C63.2. Calibration is maintained in accordance with manufacturer recommendations. Each measurement device is labeled with its ETC asset number and calibration due date.

6.3.1 CALIBRATION ACCURACY

Test equipment used to provide quantitative measurements are calibrated with standards traceable to the National Research Council, National Institute of Standards and Technology or other national standards. Instrumentation systems for emissions measurements have the following accuracies:

Frequency = ± 1 kHz
Amplitude (RE) = ± 4.01 dB
Amplitude (CE) = ± 3.25 dB

6.3.2 TEST EQUIPMENT DESCRIPTION

The equipment used in the tests was selected from the following list.

Instrument	Manufacturer	Model No.	Asset No.	Calibration Due
Spectrum Analyzer	Hewlett Packard	8566B	9565	13 November 2003
Spectrum Analyzer	Hewlett Packard	8566B	9168	10 December 2003
RF Preselector	Hewlett Packard	85685A	9563	14 August 2004
RF Preselector	Hewlett Packard	85685A	9728	30 July 2004
Quasi-Peak Adapter	Hewlett Packard	85650A	4411	30 July 2004
Quasi-Peak Adapter	Hewlett Packard	85650A	9243	7 August 2004
Line Impedance Stabilization Network	EMCO	3825/2r	9331	2 November 2003
Biconilog Antenna	ARA	Lpb-2520/A	4318	3 August 2004
Dual Ridged Guide Antenna	EMCO	3115	19357	2 August 2004
Low Noise Amplifier	MITEQ	JS43-01001800-21-5P	4354	4 Decenber 2003

Appendix A

EUM3003

Test Sample Description
(from data provided by Waverider Communications Inc.)

Product Application	**Product Category**
Commercial ✔ Military o	Telecommunications o Information Technology ✔ Surface Transportation o Aerospace o Test & Measurement o Other o _____
Product Name	EUM3003
Part/Model No.	EUM3003
Serial Number	n/a
Power Requirements: **(Voltage, AC/DC, Hz, Current)**	120 VAC 60 Hz to AC-DC adapter
Typical Installation Instructions or Configuration	Connected via an Ethernet cable with a ferrite bead to a personal computer or an Ethernet router. Antenna fixed mounted at a minimum of 20cm from user.
Ground Connection (in addition to power cord)	Nil
Internally Generated Frequencies	32.768 kHz (microprocessor) 3.6864 MHz (microprocessor) 11 MHz (DSSS BBP) 22 MHz (synthesizer reference) 25 MHz (Ethernet reference) 44 MHz (reference oscillator) 70 MHz (Intermediate Frequency) 140 MHz (IF Oscillator) 905 – 925 MHz (RFLO – IF) 975 – 995 MHz (Radio Frequency Local Oscillator)
Peripheral Support Equipment	Personal Computer
Description and number of interconnecting Leads & Cables	One Ethernet cable with ferrite bead attached. One power supply cable One Antenna
Brief Functional Description	The EUM3003 is a 900MHz radio module intended to provide connectivity between an end-user's computer and an Internet Service Provider. It is a single PCB wireless solution based on the Intersil PRISM II Direct Sequence Chip Set. Data from the I/O port is spread using a defined PN code and then modulated using CCK modulation. The modulated signal is then up-converted to the 900MHz band. In receive mode, the signal from the antenna port is amplified and then down converted to an IF frequency of 70MHz before it is demodulated and despread.