ELECTRONICS TEST CENTRE
MPB TECHNOLOGIES INC.

Test Report Prepared By:

Electronics Test Centre
27 East Lake Hill
Airdrie, Alberta
Canada
T4A 2K3

airdrie@etc-mpbtech.com
http://www.etc-mpb.com/
Telephone: (403) 912-0037
Facsimile: (403) 912-0083

MPBT Report No.: c05e3229-1 Release 1 Date: 8 February 2005

Emissions Testing of the Location Tag in accordance with FCC Part 90 (2003) Private Land Mobile Radio Services, and FCC Part 24 (2003) Personal Communications Services

Test Personnel: Trung Nguyen, Jianming Zhang, David Raynes

Prepared for: CSI Wireless Inc.

4110 – 9th Street S.E.
Calgary, Alberta
Canada
T2G 3C4

Telephone: 1-403-259-3311
Facsimile: 1-403-259-8866

David Raynes
draynes@etc-mpbtech.com
Senior EMC Technologist
Electronics Test Centre (Airdrie)
Authorized Signatory

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

TABLE OF CONTENTS

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 90 (2003), Private Land Mobile Radio Services.

1.2 APPLICANT

This test report has been prepared for CSI Wireless Inc., located in Calgary, Alberta, Canada.

1.3 APPLICABILITY

All test procedures, limits, and results defined in this document apply to the CSI Wireless Inc. Location Tag 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 NVLAP or the Canadian or US governments.

1.4 TEST SAMPLE DESCRIPTION

The test sample provided for testing was a Location Tag:

Product Type:	ReFLEX radio tracking device
Model Number:	LT10R
Serial Number:	Test01, Test02
Cables:	n/a
Power Requirements:	Battery (DC power supply set to 3.8 VDC)
Peripheral Equipment:	nil

More detailed information is provided by CSI Wireless 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.

This report shall not be reproduced, except in full, without prior written approval of **MPB Technologies Inc.**

1.6 SCOPE OF TESTING

Testing was performed in accordance with FCC Part 90 (2004), and ANSI C63.4 (2003).

1.6.1 VARIATIONS IN TEST METHODS

The following variations in test methodology were noted during testing:

The antenna is integral to the device, preventing direct connection to the RF output. Bandwidth and frequency stability were assessed by positioning the device in front of a receiving antenna.

All testing was performed with sample s/n Test01, except where noted as sample s/n Test02.

1.6.2 TEST SAMPLE CONFIGURATION & MODIFICATIONS

The EUT met the requirements without modification.

The RF section is a module approved under FCC ID O33AR100.

In order to facilitate continuous operation over the duration of the tests, wires were added to the test sample for connecting a DC power supply.

2.0 ACRONYMS

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

STATEMENT OF COMPLIANCE

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

The EUT was subjected to the following tests. Compliance status is reported as **PASS** or **FAIL**. Test conditions that are not applicable to the EUT are marked **n/a**. If testing was not performed at this time, the appropriate field is marked **n/t**.

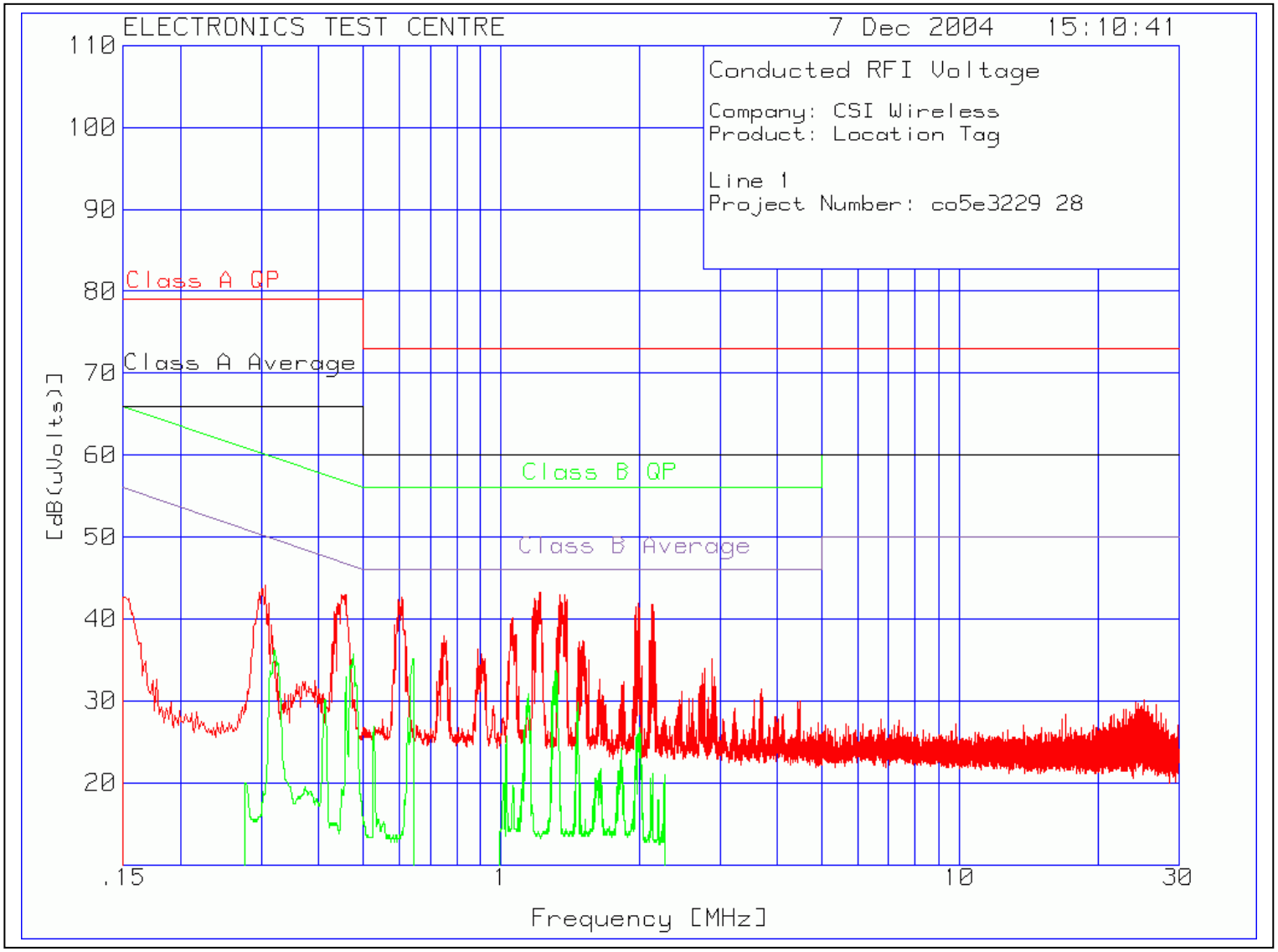
The following table summarizes the test results in terms of the specification and class or level applied, the unique test sample identification, the EUT modification state, and configuration as applicable.

TEST CASE	TEST TYPE	SPECIFICATION	TEST SAMPLE	MOD. STATE	CONFIGURATION	RESULT
§4.1	Conducted Emissions at AC lines	FCC Part 15.107 and 15.207	Location Tag	nil	See § 1.6.2	**n/a**
§4.2	Conducted Emissions at Antenna Port	FCC Part 90	Location Tag	nil	See § 1.6.2	**PASS**
§4.3a	Radiated Emissions (Rx Mode)	FCC Part 15.109	Location Tag	nil	See § 1.6.2	**PASS**
§4.3b	Radiated Emissions (Tx Mode)	FCC Parts 2.1053, 15.205, 15.209, 24.132, 24.133 and 90	Location Tag	nil	See § 1.6.2	**PASS**
§4.4	Frequency Stability	FCC Part 2.1055		nil	See § 1.6.2	**n/t**

4.1 CONDUCTED EMISSIONS AT AC LINES

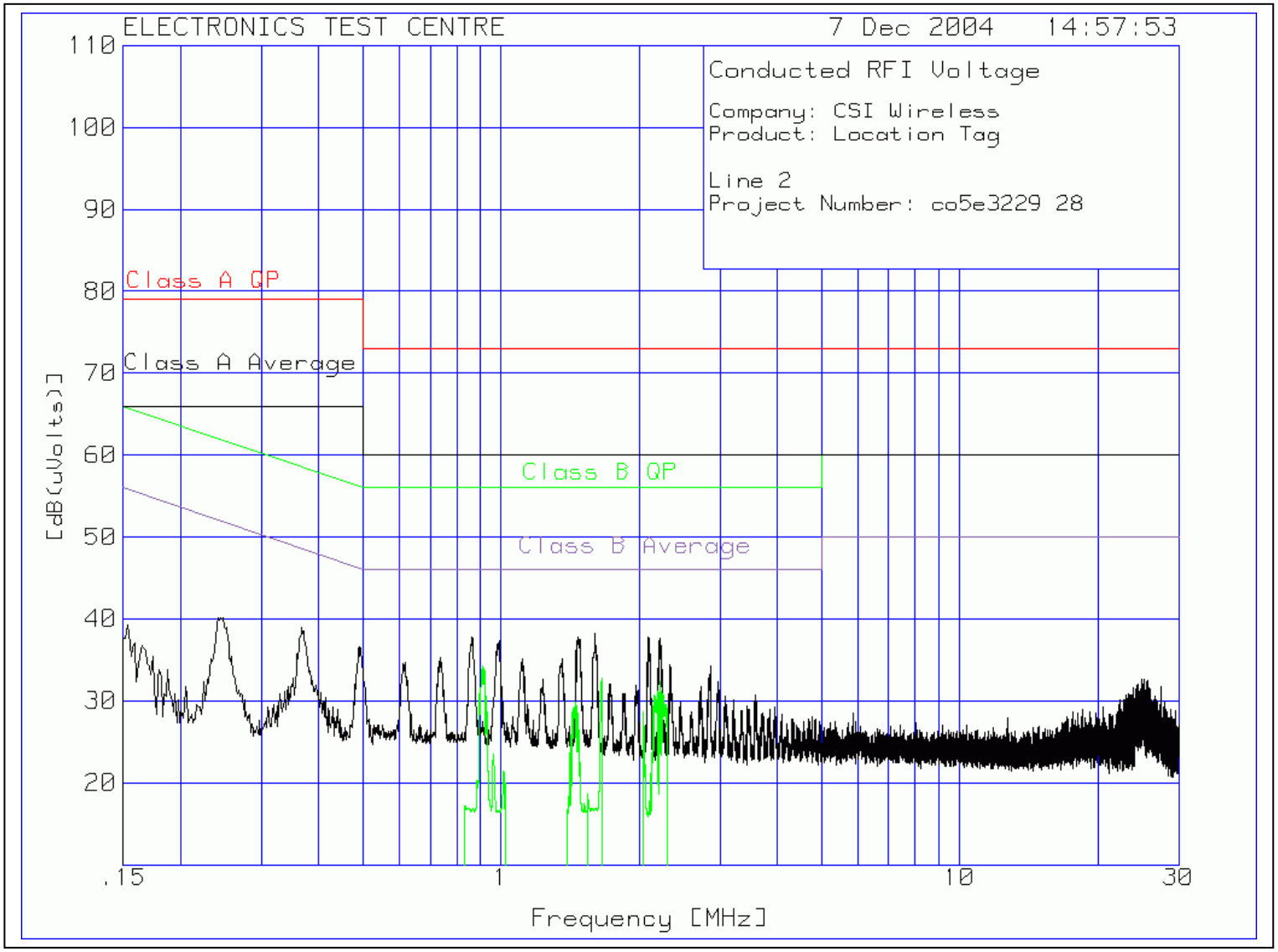
Test Lab: Electronics Test Centre (Airdrie) Test Personnel: Jianming Zhang Test Date: 7 December 2005	Product: Location Tag
Test Result, Location Tag: **PASS**	
Objectives/Criteria The Conducted emissions produced by a system or sub-system shall not exceed the limits for the specifications as stated. **Emission levels should meet the requirements with a margin of 6dB**. The EUT was assessed against the requirements for **Class B**. Temperature = 19 °C Humidity = 36 %	Specification: Frequency (MHz) / Class A QP / Class A Avg / Class B QP / Class B Avg 0.150 - 0.50 / 79 / 66 / 66 – 56 / 56 - 46 0.50 – 5.0 / 73 / 60 / 56 / 46 5 – 30 / 73 / 60 / 60 / 50 Units of measurement are dBμV.
There were no more emissions measured within -10 dB of the specified limit. Refer to the test data plots for more detail.	

Plot of Conducted Emissions: Red trace = Peak data. Green trace = Quasi-Peak data.



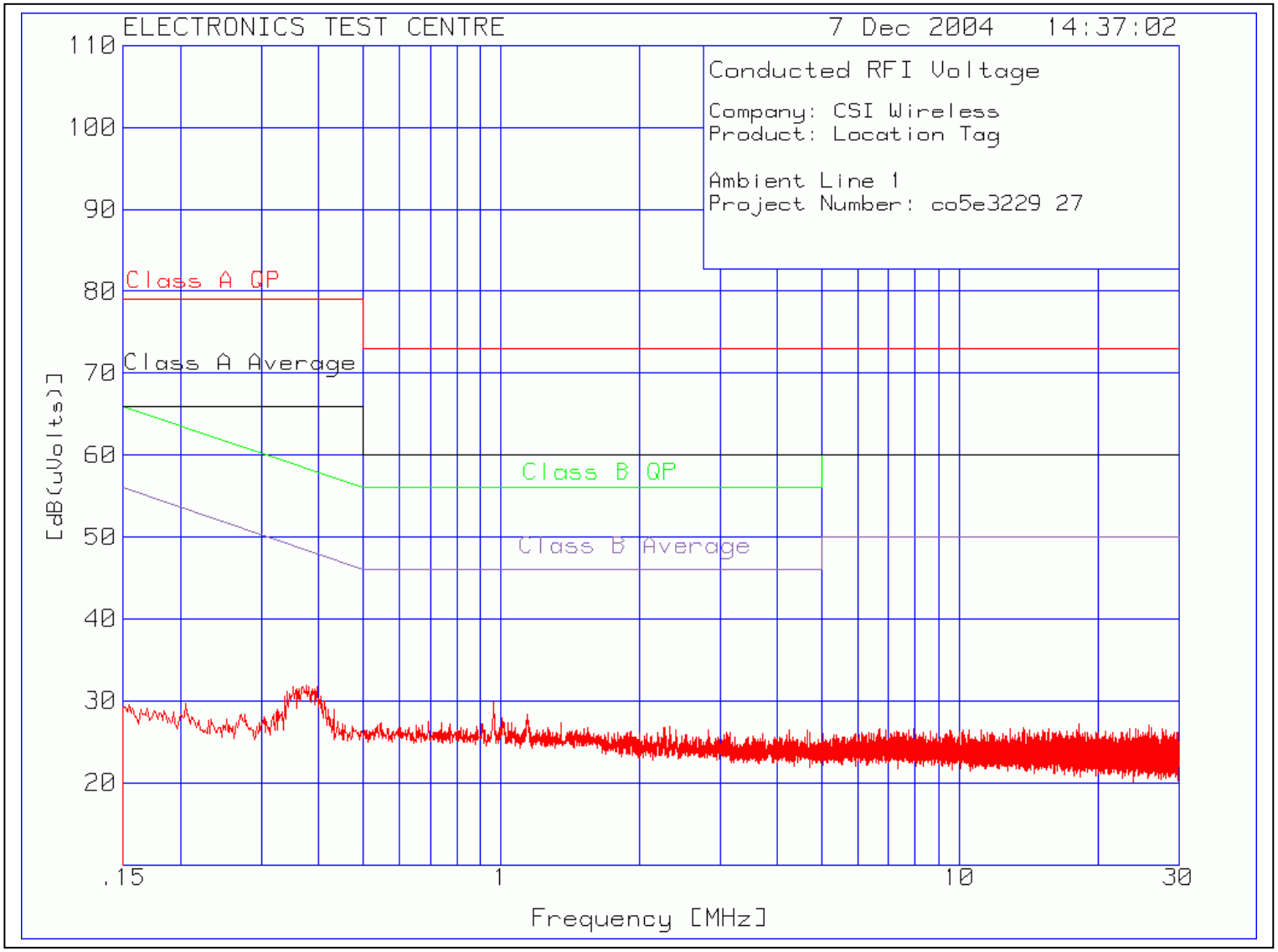
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Plot of Conducted Emissions: Black trace = Peak data. Green trace = Quasi-Peak data.

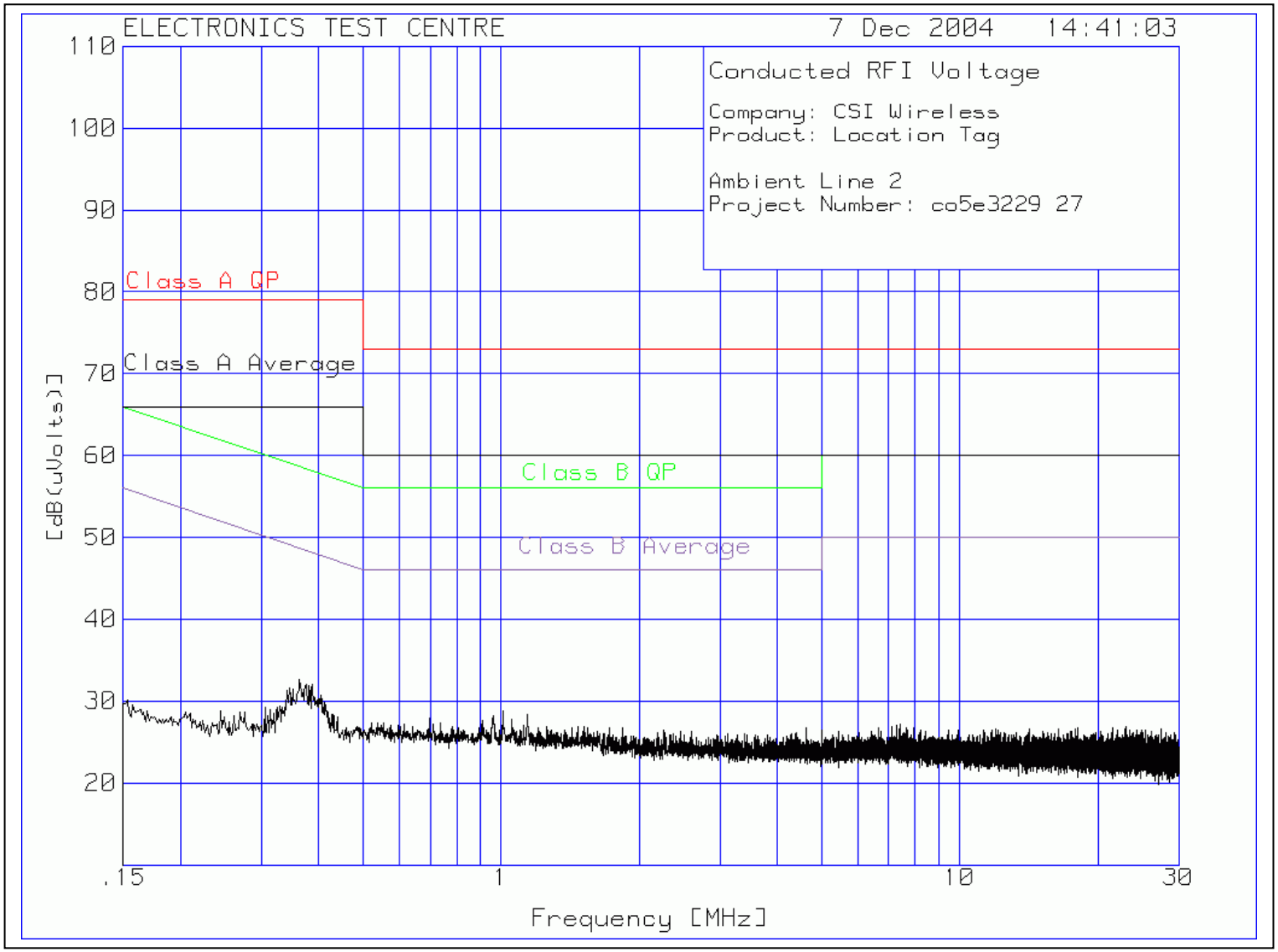


This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Plot of Conducted Emissions Test Chamber Ambient (measurement noise floor):



Plot of Conducted Emissions Test Chamber Ambient: (measurement noise floor):



This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

4.2 CONDUCTED EMISSIONS MEASURED AT ANTENNA PORT

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: David Raynes Test Date: 17 December 2004	Product: Location Tag

Test Result, Location Tag: **PASS**

90.209: BW ≤ 20 kHz			90.210 Emission mask G		
Carrier Frequency [MHz]	99% Bandwidth [kHz]	Delta from limit [kHz]	Carrier Frequency [MHz]	Low RF Power	High RF power
896 (high pwr)	8.15	-11.85	896 (high pwr)	**PASS**	**PASS**
896 (low pwr)	7.60	-12.40	896 (low pwr)	**PASS**	**PASS**
899 (high pwr)	8.69	-11.31	899 (high pwr)	**PASS**	**PASS**
899 (low pwr)	8.61	-11.39	899 (low pwr)	**PASS**	**PASS**
901- (high pwr)	8.44	-11.56	901- (high pwr)	**PASS**	**PASS**
901- (low pwr)	8.59	-11.41	901- (low pwr)	**PASS**	**PASS**
901+ (high pwr)	7.84	-12.16	901+ (high pwr)	**PASS**	**PASS**
901+ (low pwr)	8.70	-11.30	901+ (low pwr)	**PASS**	**PASS**
902 (high pwr)	8.59	-11.41	902 (high pwr)	**PASS**	**PASS**
902 (low pwr)	9.26	-10.74	902 (low pwr)	**PASS**	**PASS**

Measurements were performed while the Location Tag was transmitting continuously.

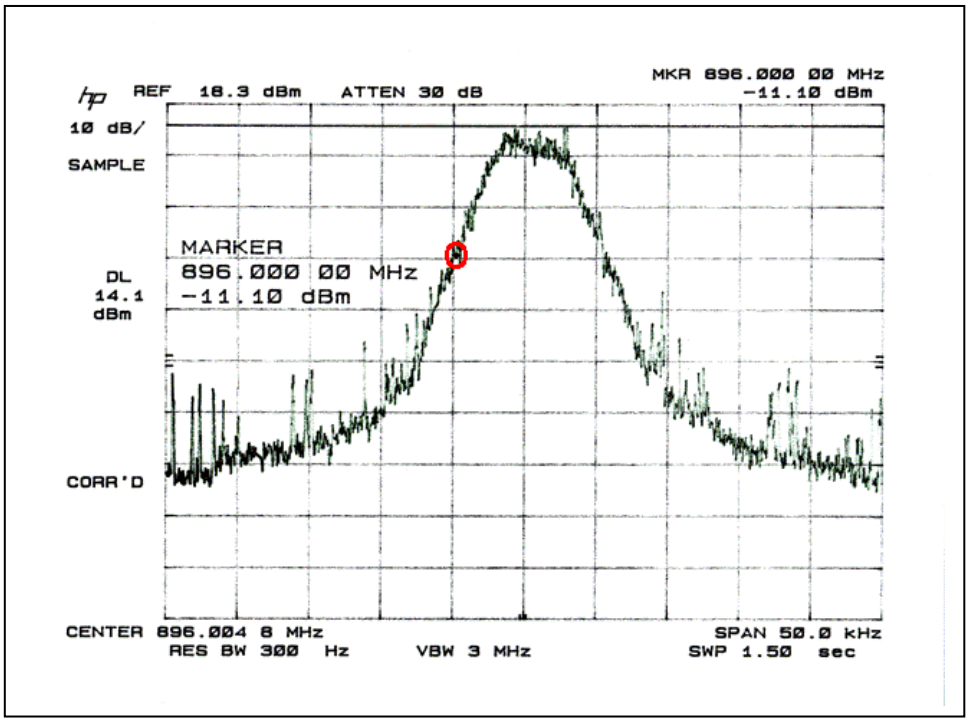
The Location Tag was not tested for conducted emissions at the antenna port. The transmitter antenna is integral to the device, and cannot be removed.

Bandwidth data were collected as radiated emissions. All testing was performed with sample s/n Test01, except where noted as sample s/n Test02.

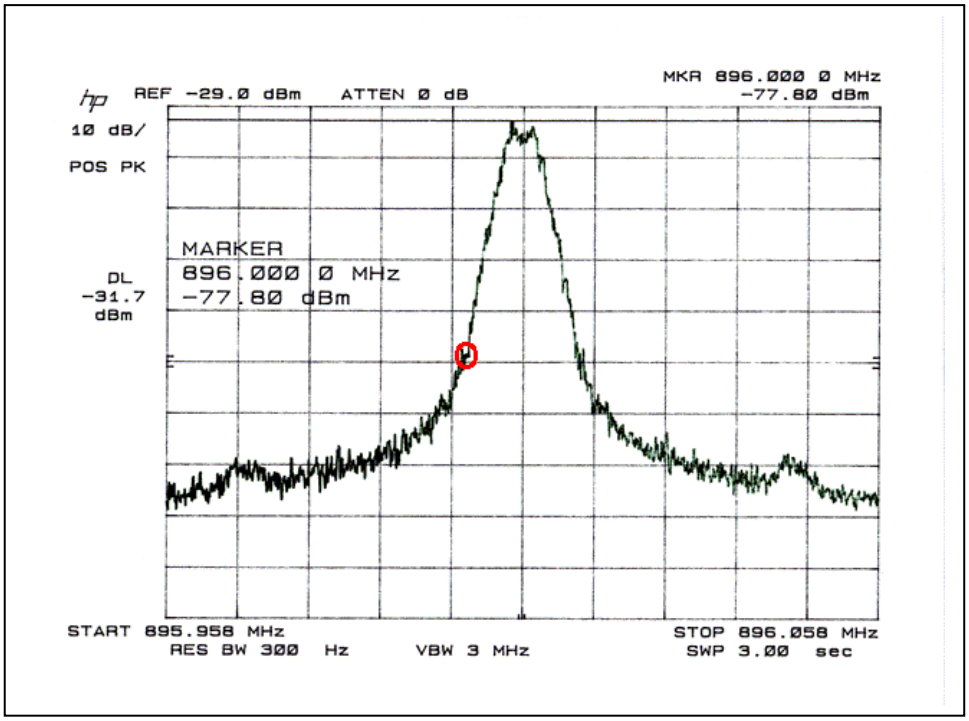
Refer to the test data plots for more detail.

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Spectrum Analyzer Plot: Tx @ 896 MHz High Power (lower band edge)
Delta = -25.2 dB (sample s/n Test02)

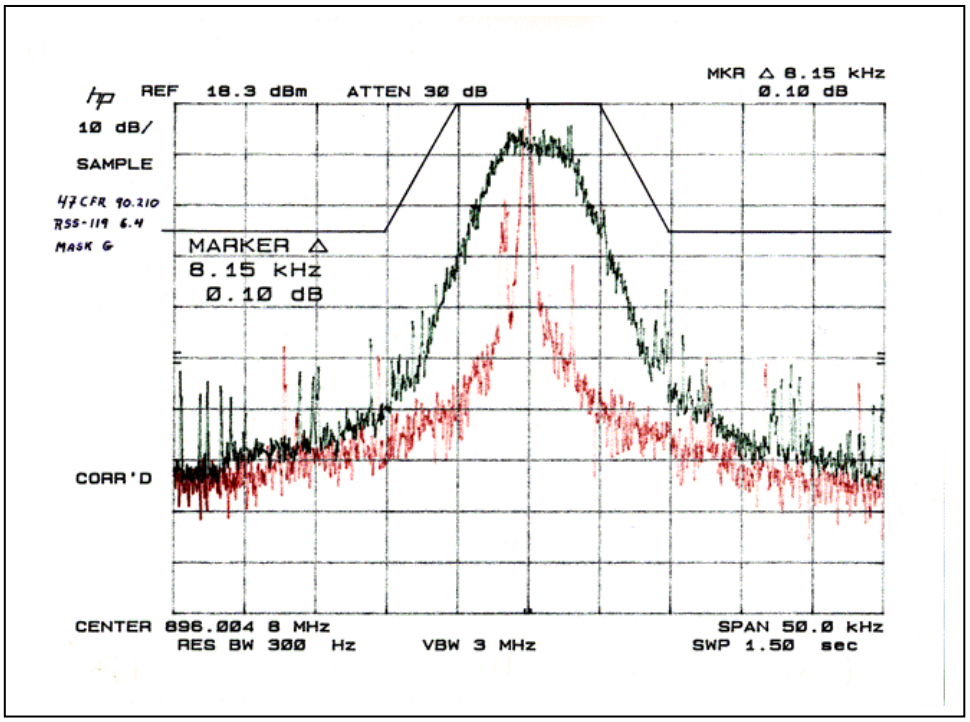


Spectrum Analyzer Plot: Tx @ 896 MHz Low Power (lower band edge)
Delta = -46.1 dB

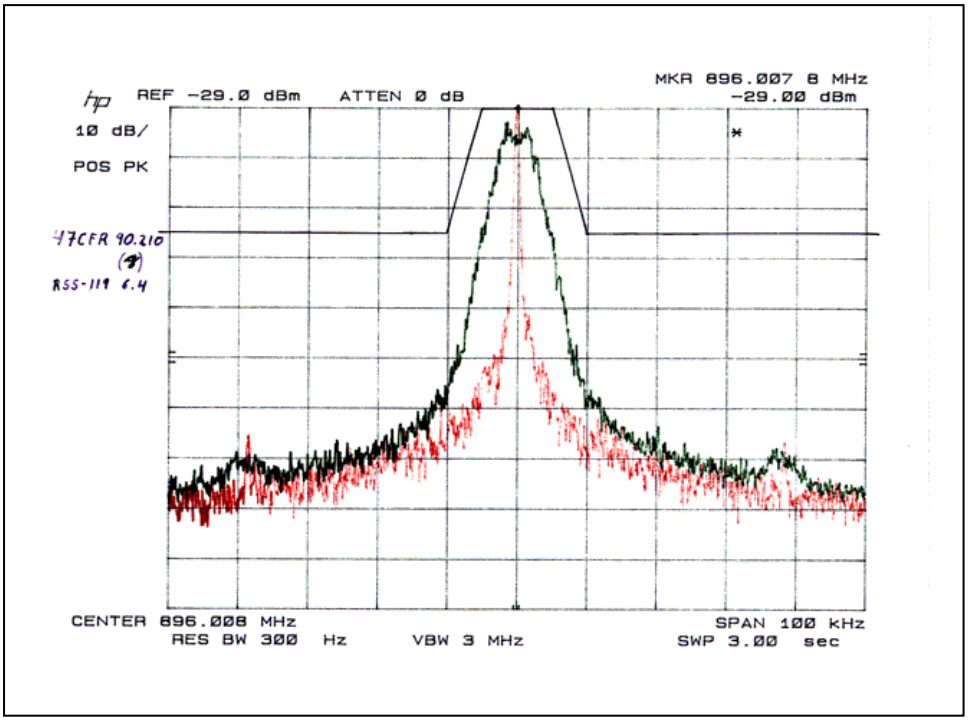


This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Spectrum Analyzer Plot: Emission Mask G: Tx @ 896 MHz High Power
(sample s/n Test02)

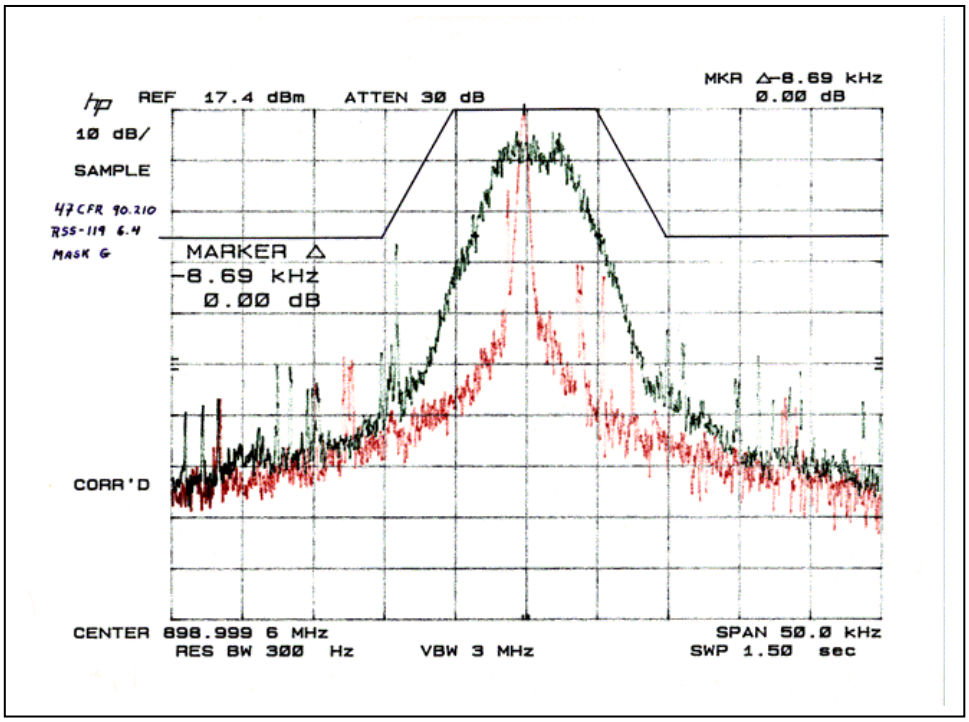


Spectrum Analyzer Plot: Emission Mask G: Tx @ 896 MHz Low Power

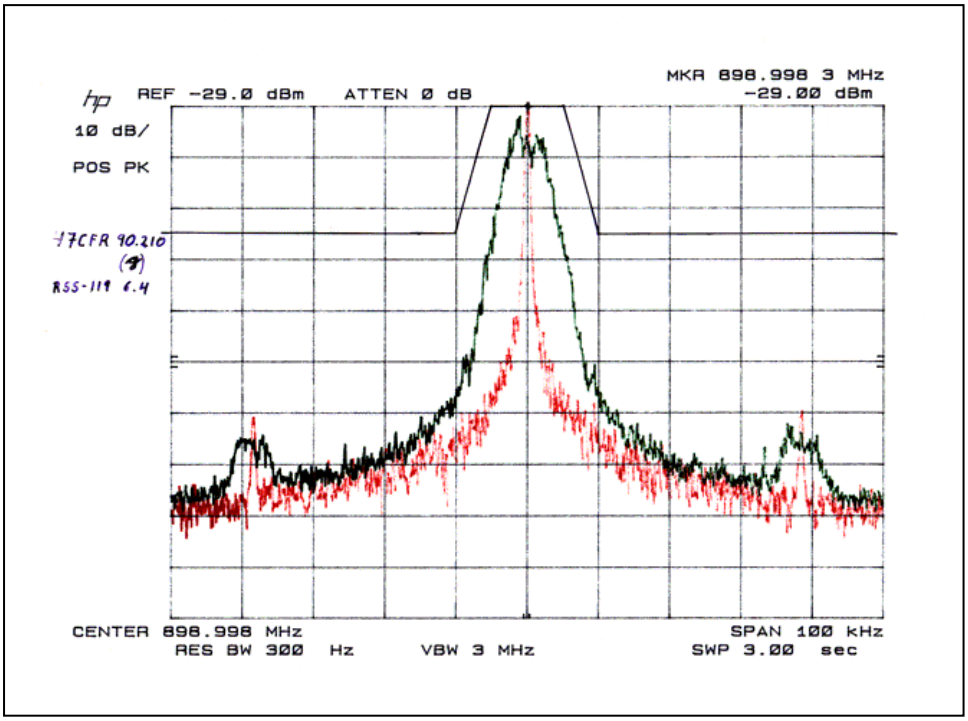


This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Spectrum Analyzer Plot: Emission Mask G: Tx @ 899 MHz High Power (mid-band) (sample s/n Test02)

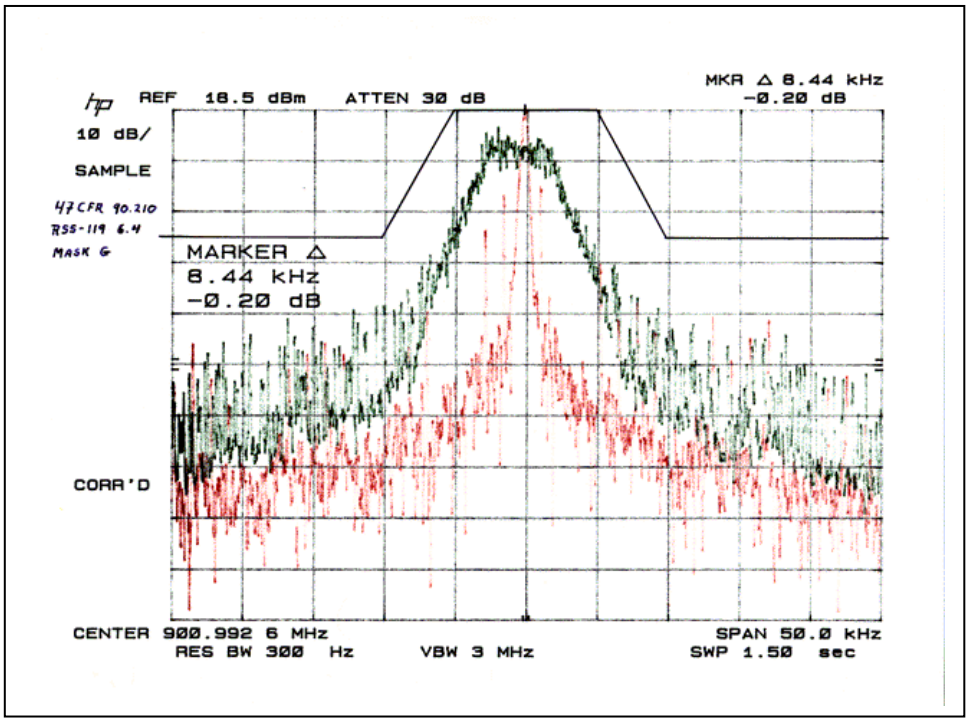


Spectrum Analyzer Plot: Emission Mask G: Tx @ 899 MHz Low Power (mid-band)

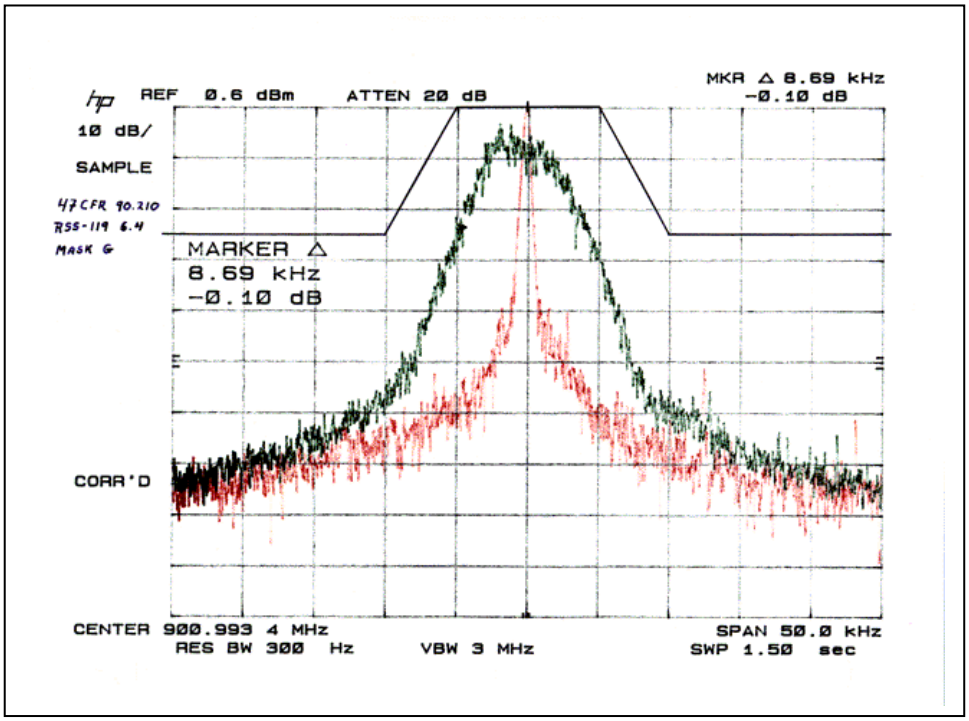


This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Spectrum Analyzer Plot: Emission Mask G: Tx @ 901 MHz High Power (sample s/n Test02)

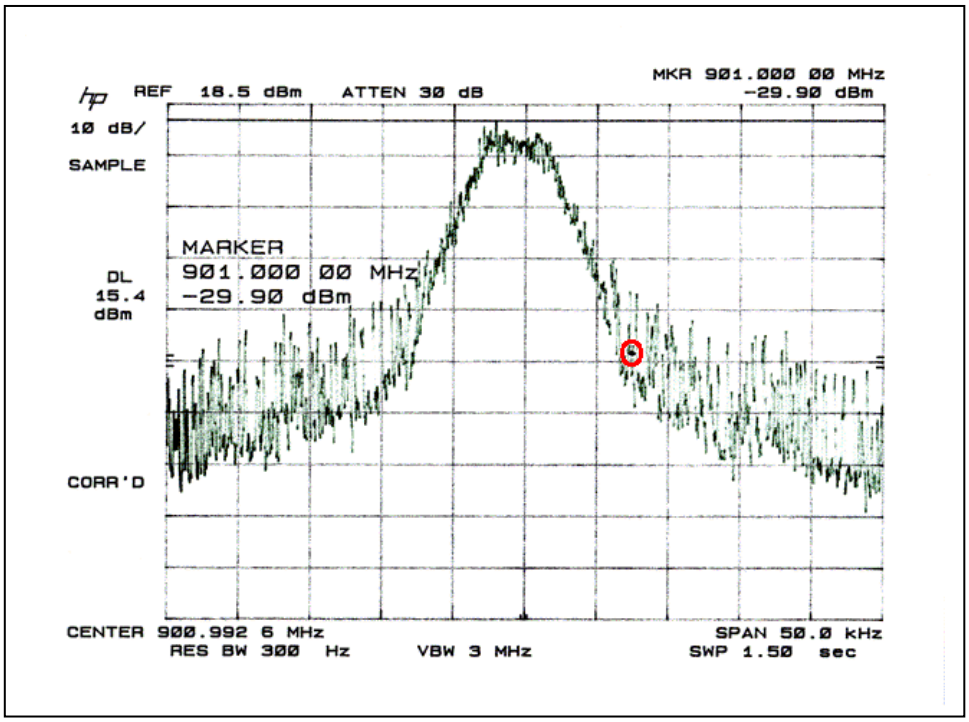


Spectrum Analyzer Plot: Emission Mask G: Tx @ 901 MHz Low Power (sample s/n Test02)

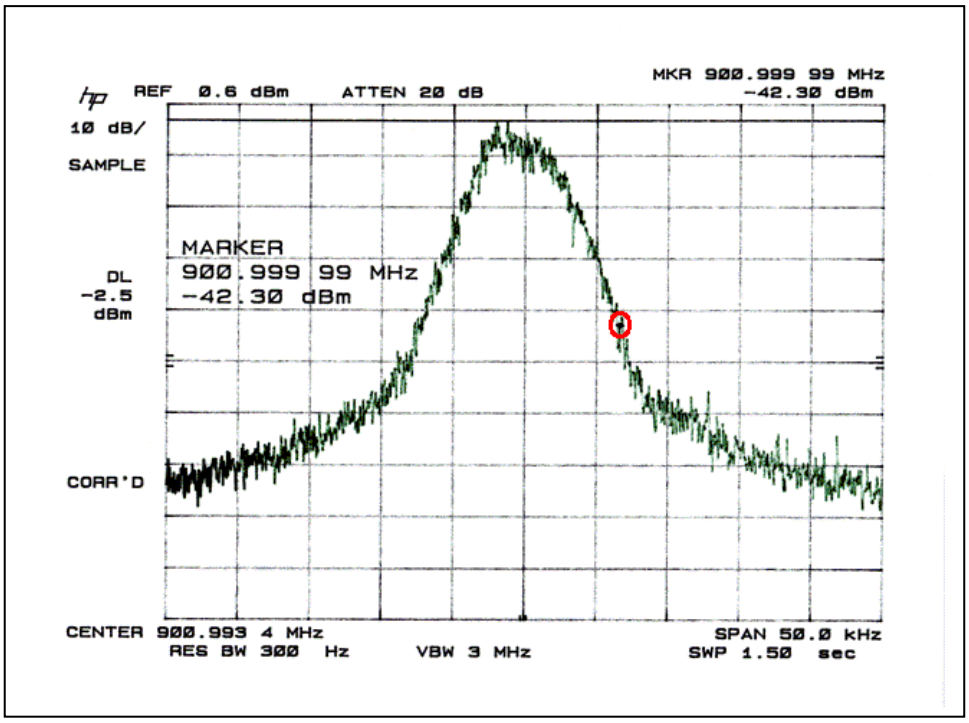


This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Spectrum Analyzer Plot: Tx @ 901 MHz High Power (upper band edge)
Delta = -45.3 dB (sample s/n Test02)

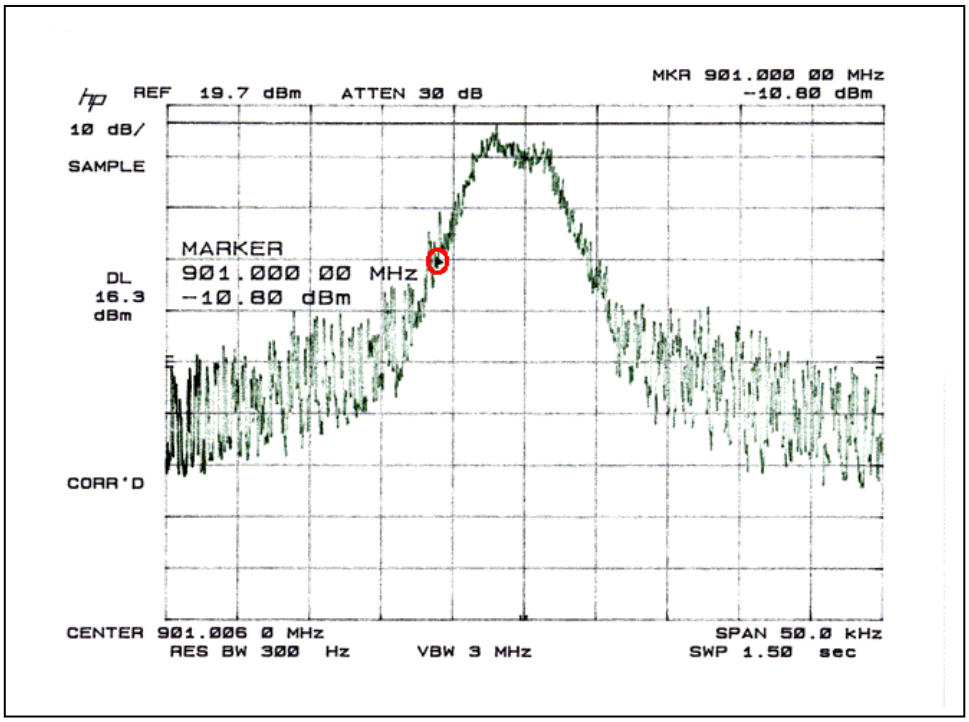


Spectrum Analyzer Plot: Tx @ 901 MHz Low Power (upper band edge)
Delta = -39.8 dB (sample s/n Test02)

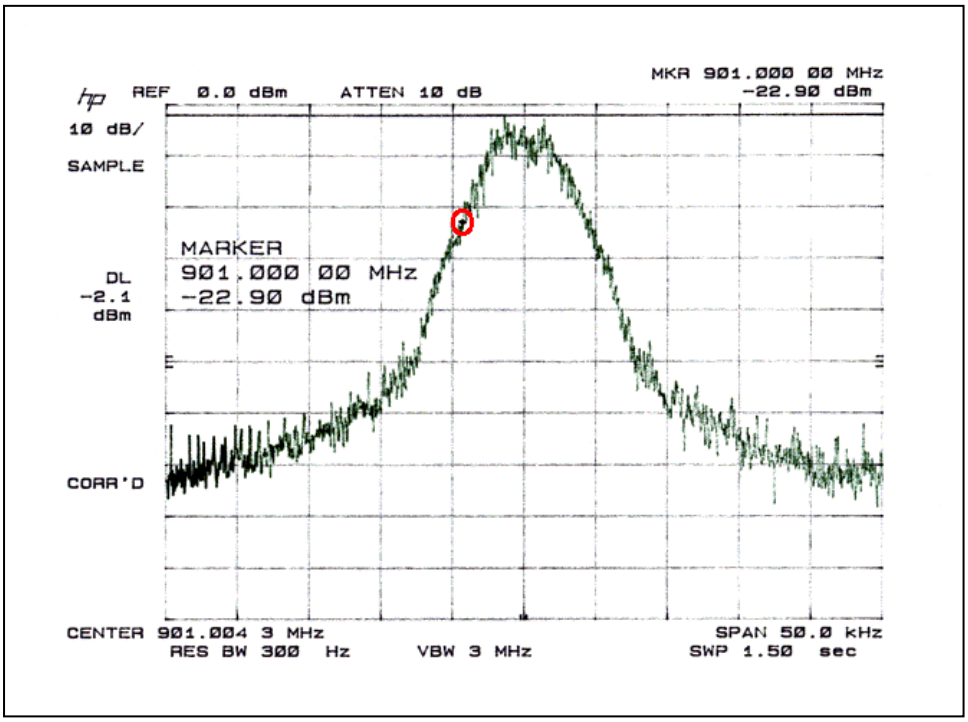


This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Spectrum Analyzer Plot: Tx @ 901 MHz High Power (lower band edge)
Delta = -27.1 dB (sample s/n Test02)

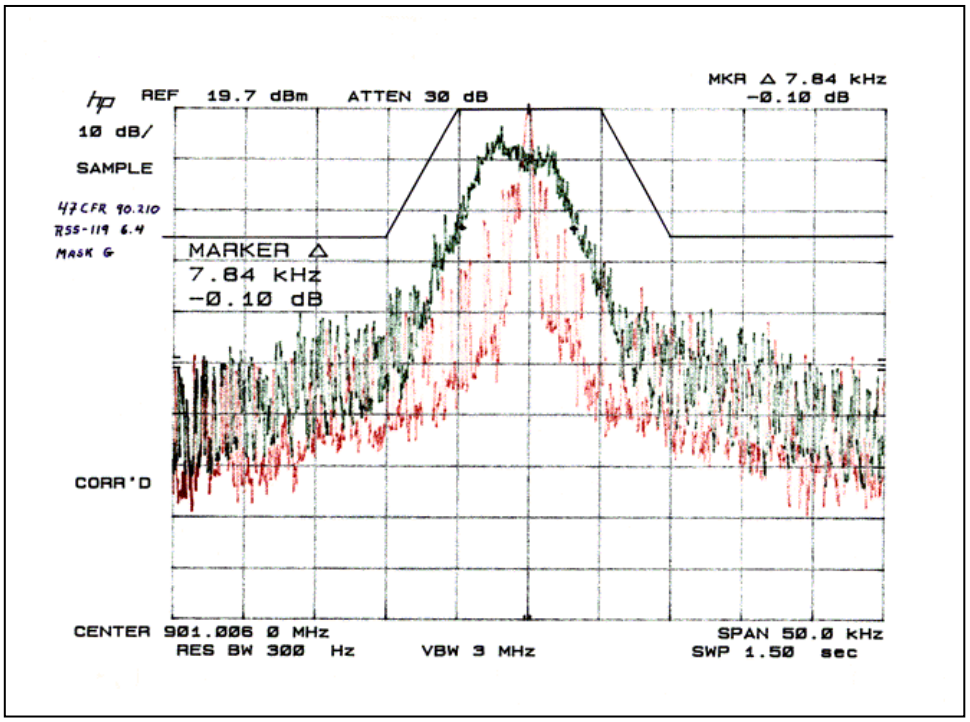


Spectrum Analyzer Plot: Tx @ 901 MHz Low Power (lower band edge)
Delta = -20.8 dB (sample s/n Test02)

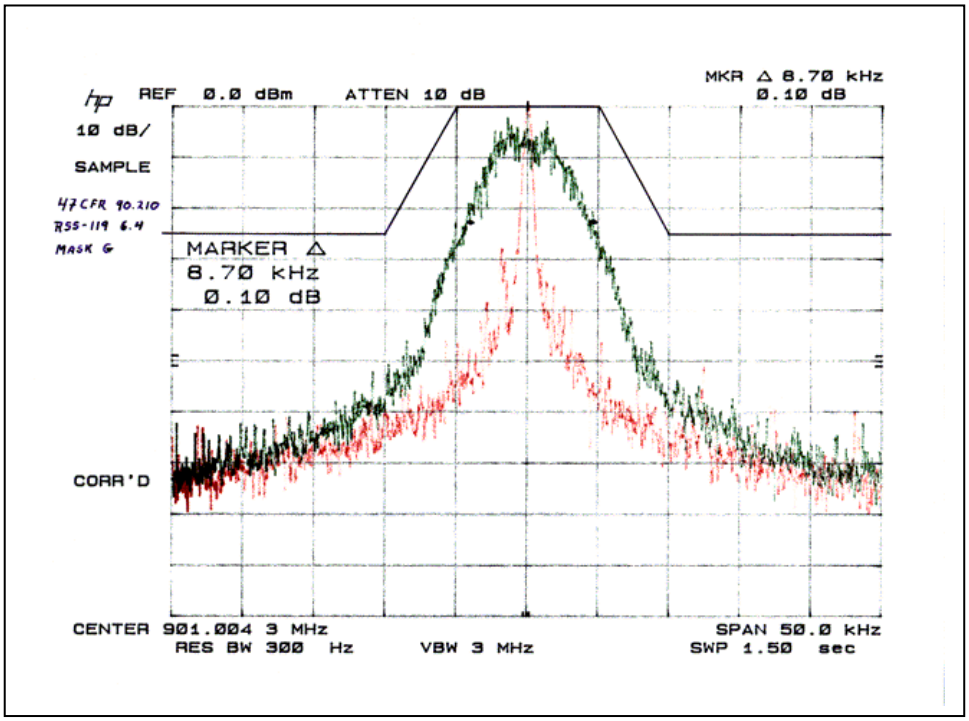


This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Spectrum Analyzer Plot: Emission Mask G: Tx @ 901 MHz High Power
(sample s/n Test02)

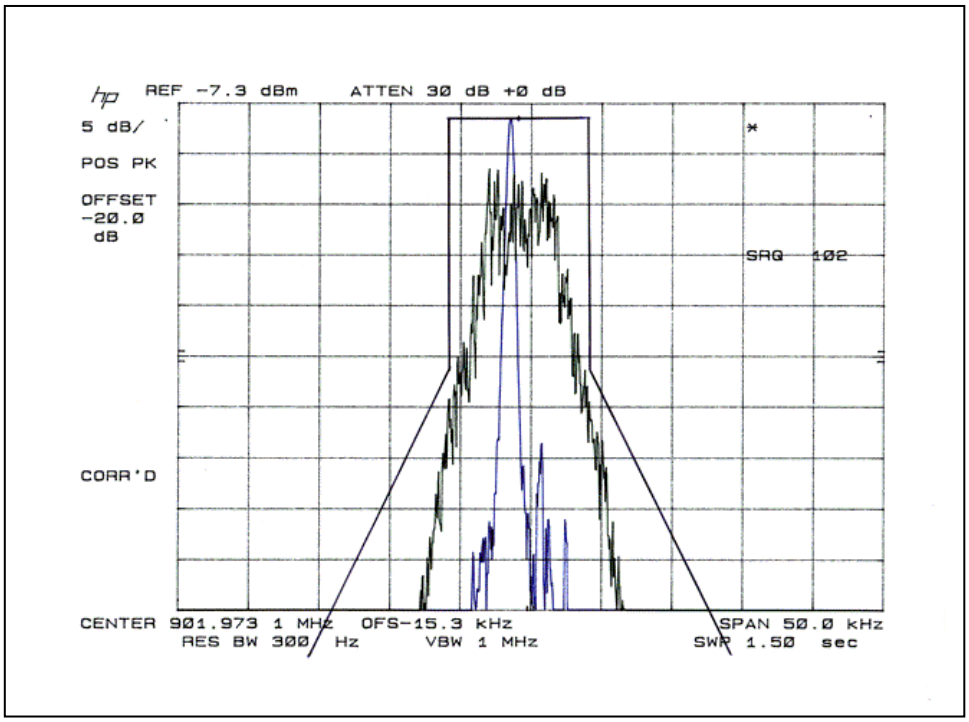


Spectrum Analyzer Plot: Emission Mask G: Tx @ 901 MHz Low Power
(sample s/n Test02)



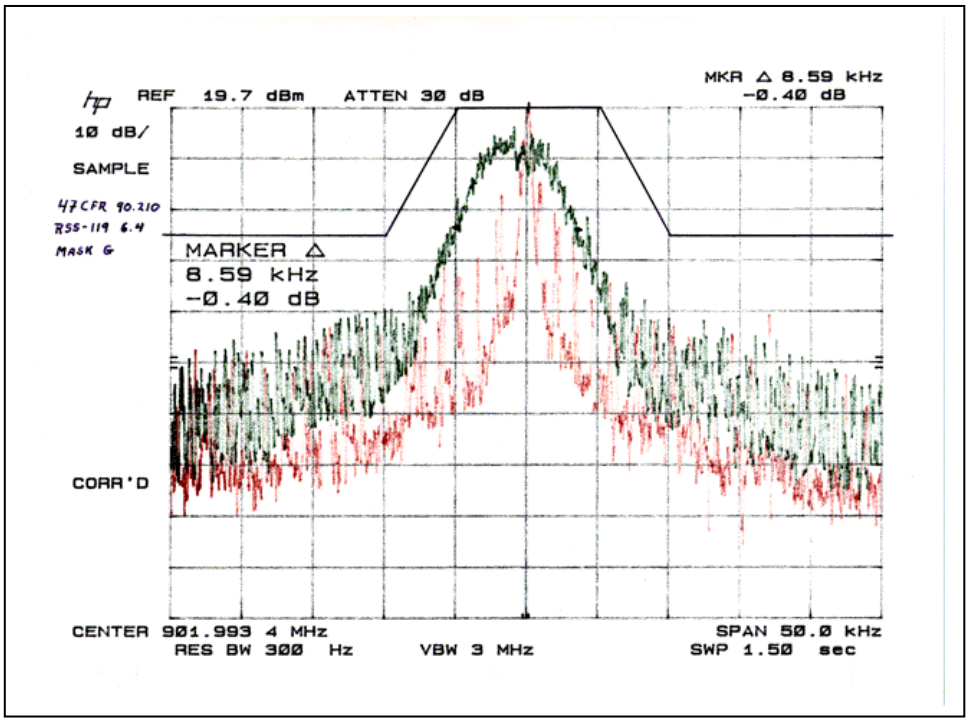
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Spectrum Analyzer Plot: Emission Mask per Part 24.133(a)(1):
Tx @ 901 MHz High Power (sample s/n Test02)

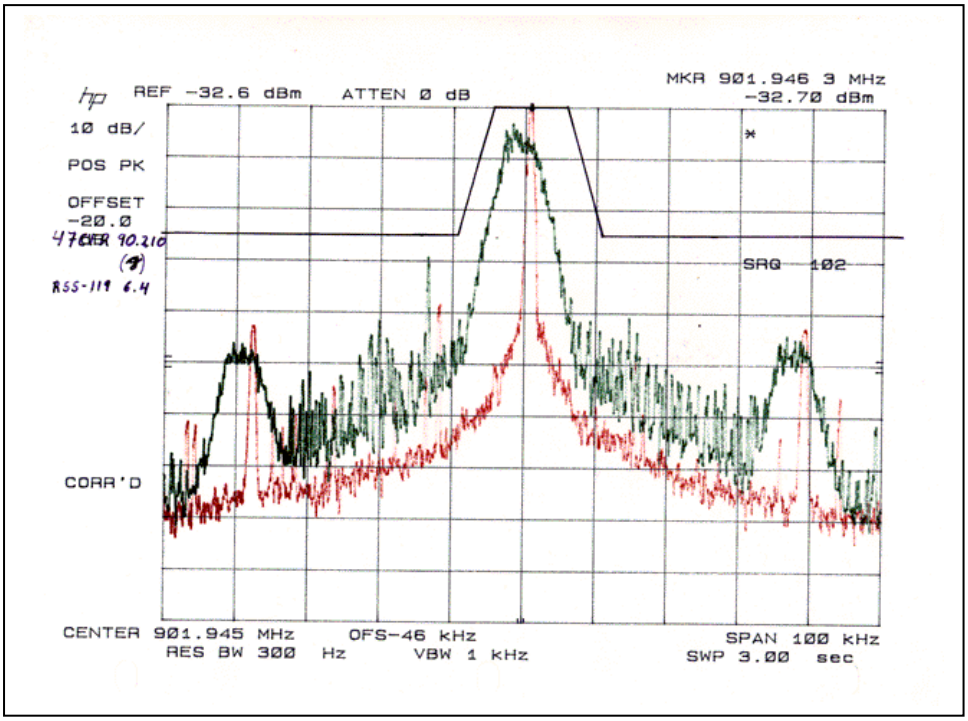


This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Spectrum Analyzer Plot: Emission Mask G: Tx @ 902 MHz High Power
(sample s/n Test02)

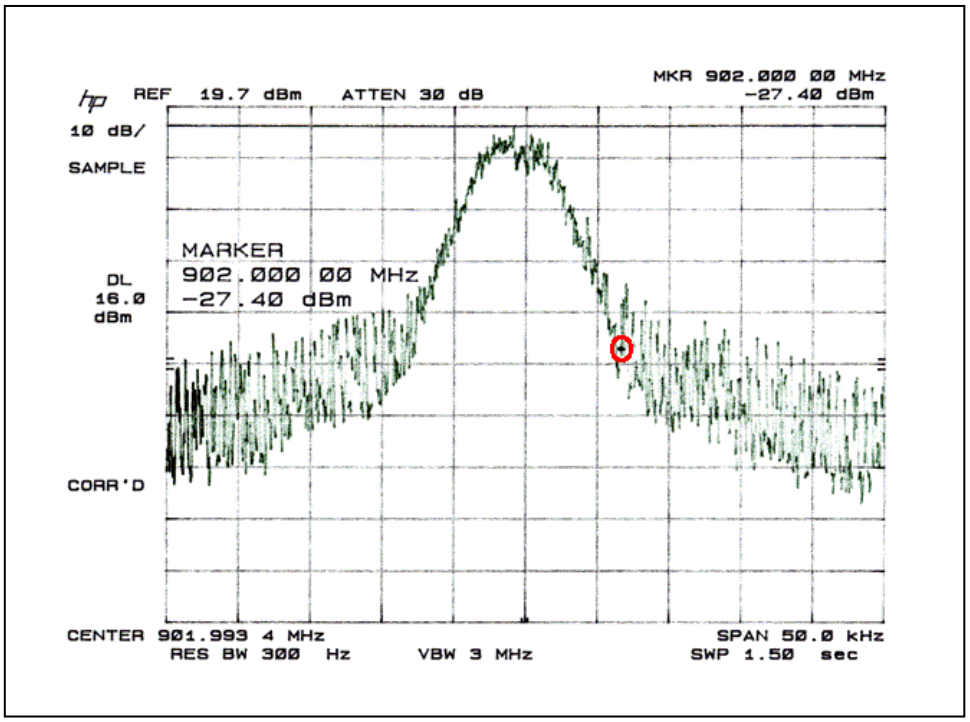


Spectrum Analyzer Plot: Emission Mask G: Tx @ 902 MHz Low Power

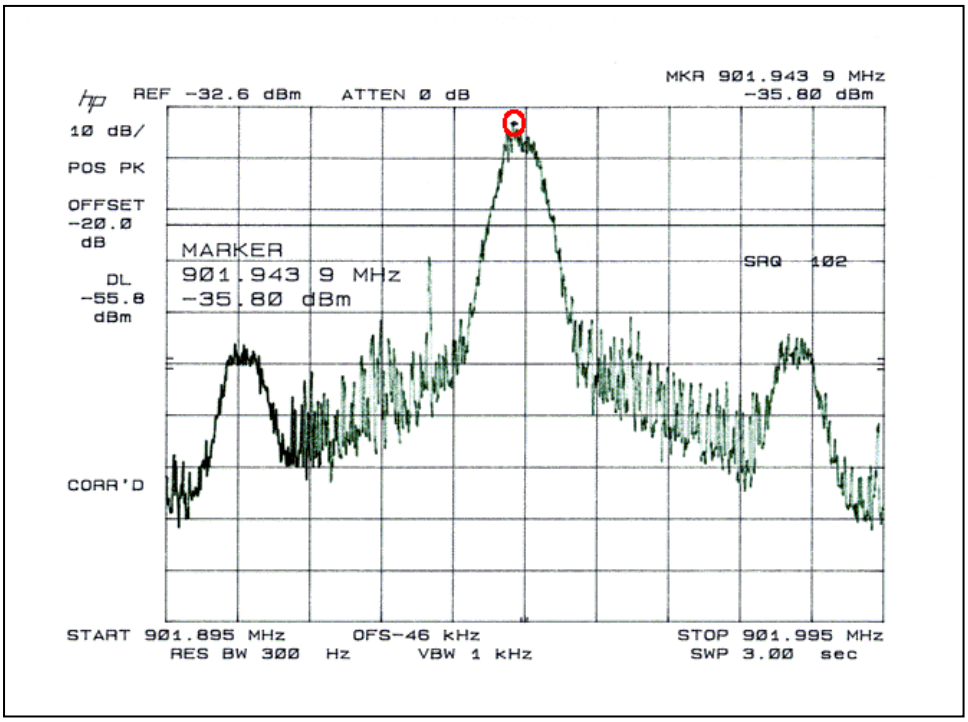


This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Spectrum Analyzer Plot: Tx @ 902 MHz High Power (upper band edge)
Delta = -43.4 dB (sample s/n Test02)



Spectrum Analyzer Plot: Tx @ 902 MHz Low Power (upper band edge)
Delta = > 20.0 dB



This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

4.3 RADIATED EMISSIONS INCLUDING RESTRICTED BANDS OF OPERATION

4.3a Receive Mode

Test Lab: MPB Technologies Inc. Airdrie Test Personnel: Trung Nguyen Test Date: 1 December 2004	Product: Location Tag
Test Result, Location Tag: **PASS**	
Objectives/Criteria 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 = 32 %	Specification: FCC Part 15 Subpart C Frequency Class A Class B [MHz] 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

Horizontal:			**Vertical:**		
Frequency [MHz]	Field Strength [dBμV/m]	Delta [dB from limit]	Frequency [MHz]	Field Strength [dBμV/m]	Delta [dB from limit]
			40.3823	33.16	-6.84

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

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

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 Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1	2	3 ⇓	4
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

⇓		The applicable Limit
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
Azimuth:	156	The turntable was 156 degrees CW from facing the antenna
Height:	113	The antenna was 113 cm above the ground
Limit: 1 Margin [dB]	54 -6.2	The value of Limit 1 at 94.0036 MHz The field strength is 6.2 dB below Limit 1
Limit: 2 Margin [dB]	43.5 4.3	The value of Limit 2 at 94.0036 MHz The field strength is 4.3 dB above Limit 2
Limit: 3 Margin [dB]	50.5 -2.7	The value of Limit 3 at 94.0036 MHz The field strength is 2.7 dB below Limit 3
Limit: 4 Margin [dB]	40.5 7.3	The value of Limit 4 at 94.0036 MHz 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

Note: When a preamp is used, the resulting gain is compensated.
Highlighting indicates a margin of less than 6 dB.

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

CSI Wireless
Product: Location Tag
Rx Mode
Radio Off GPS on (HP) Digit on
Project: c05e3229 07

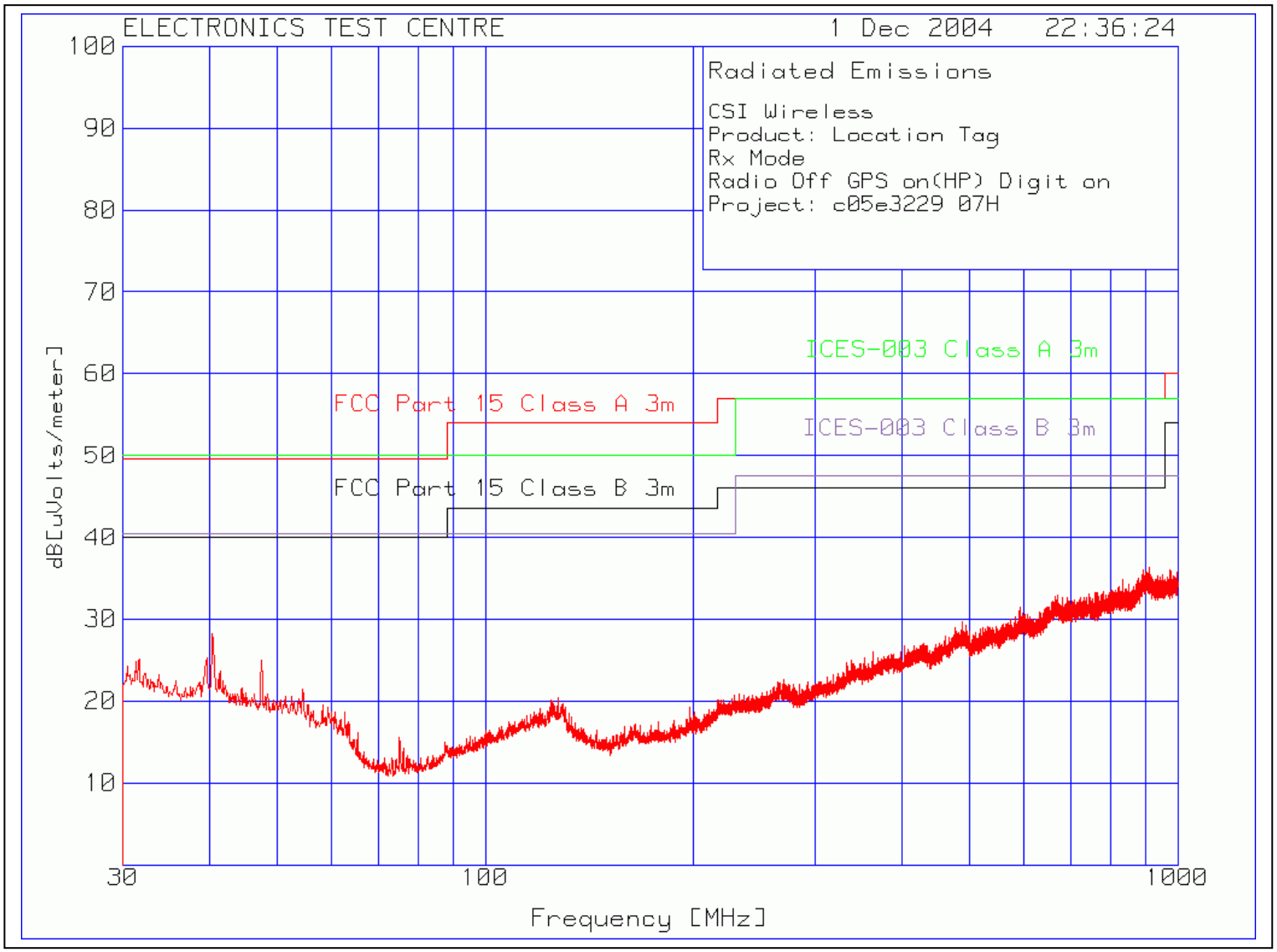
Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3 ⇓	4
Range: 1 30 - 1000MHz								
40.3823	17.87 qp	1.61	13.68	33.16	49.54	50	40	40.46
Azimuth: 144	Height:101 Vert			Margin [dB]:	-16.38	-16.84	-6.84	-7.3

LIMIT 1: FCC Part 15 Class A 3m
LIMIT 2: ICES-003 Class A 3m
LIMIT 3: FCC Part 15 Class B 3m ⇐
LIMIT 4: ICES-003 Class B 3m

qp - Quasi-Peak detector

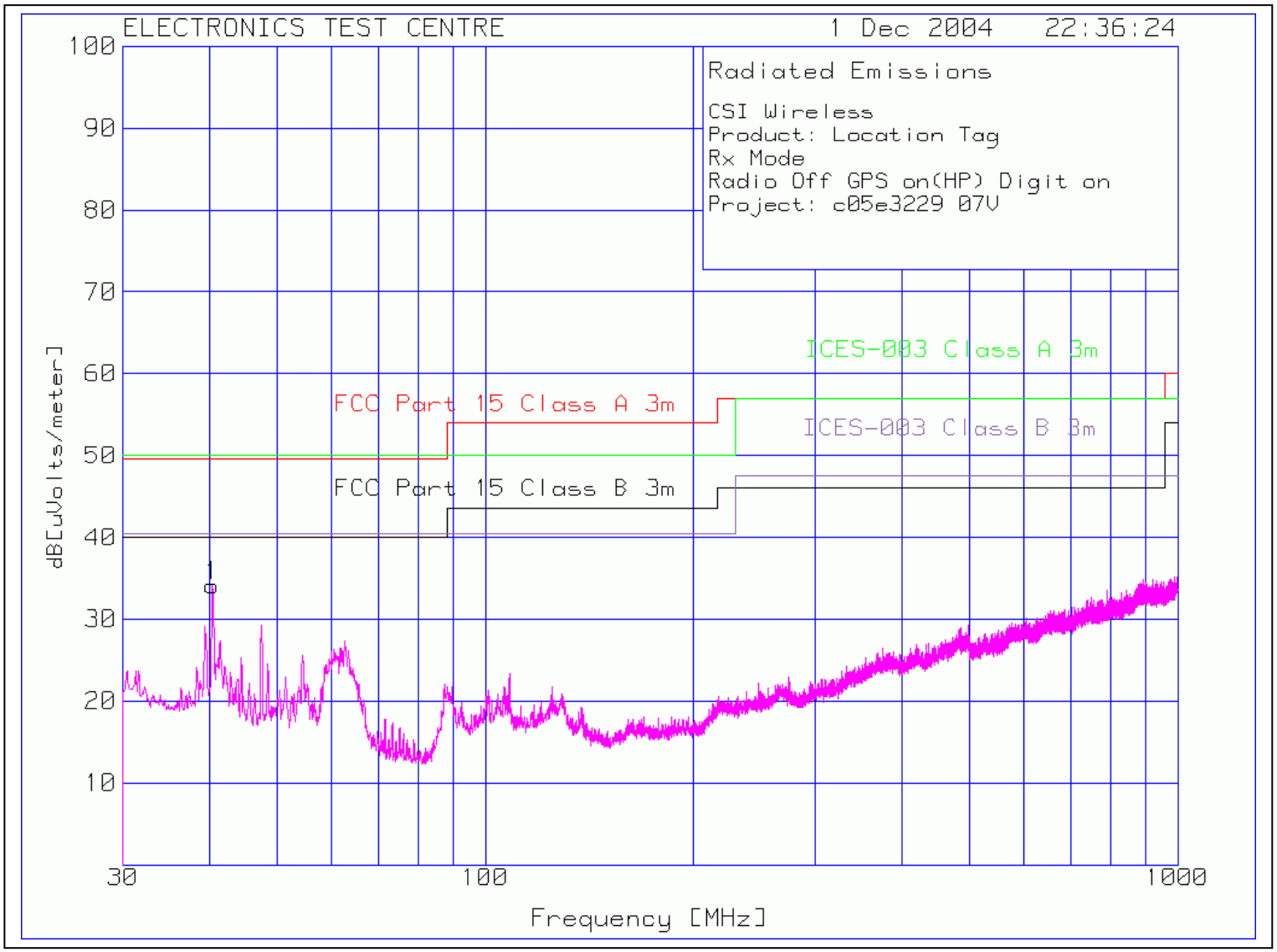
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Plot of Radiated Emissions: Horizontal polarization



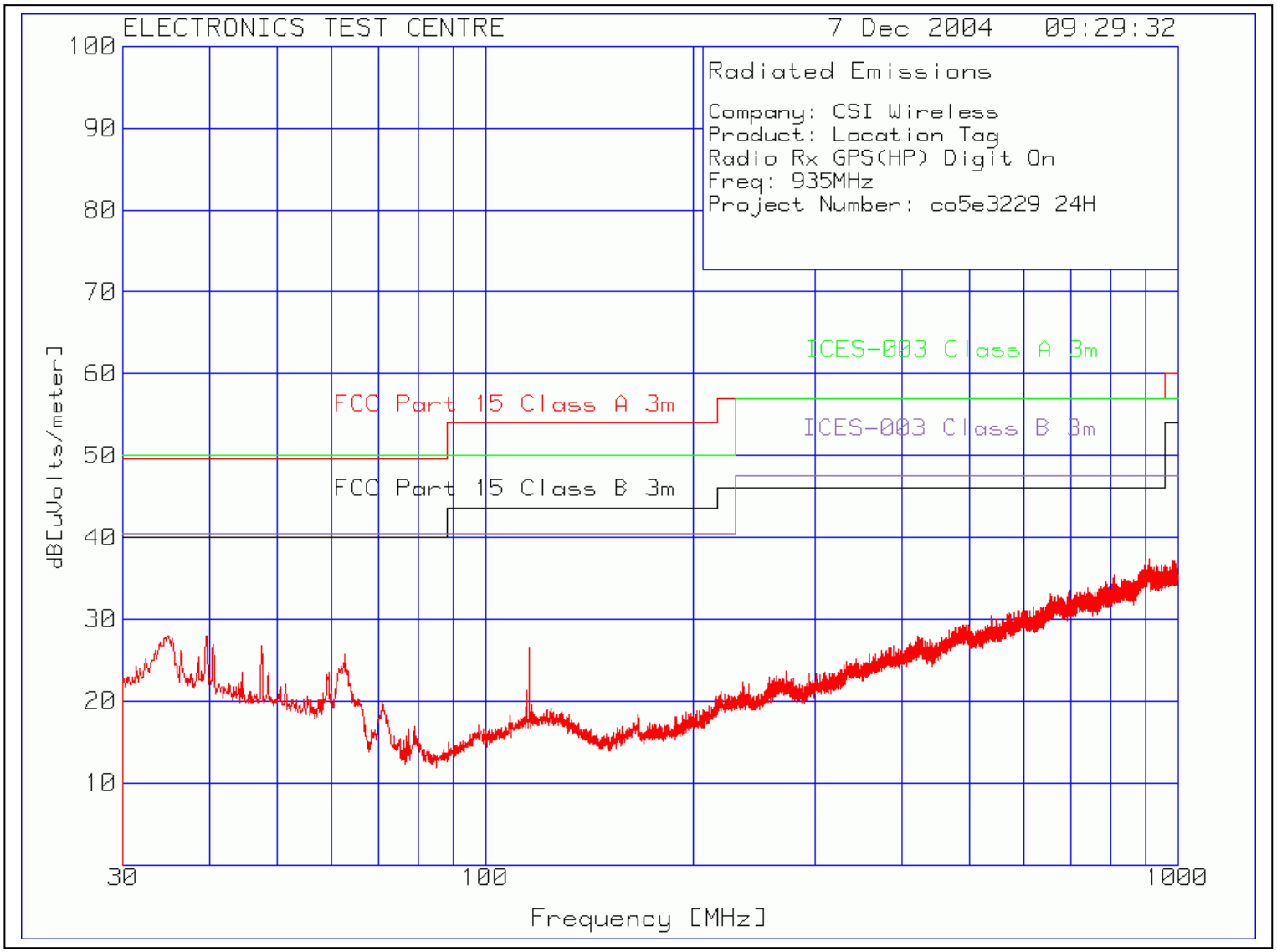
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Plot of Radiated Emissions: Vertical polarization



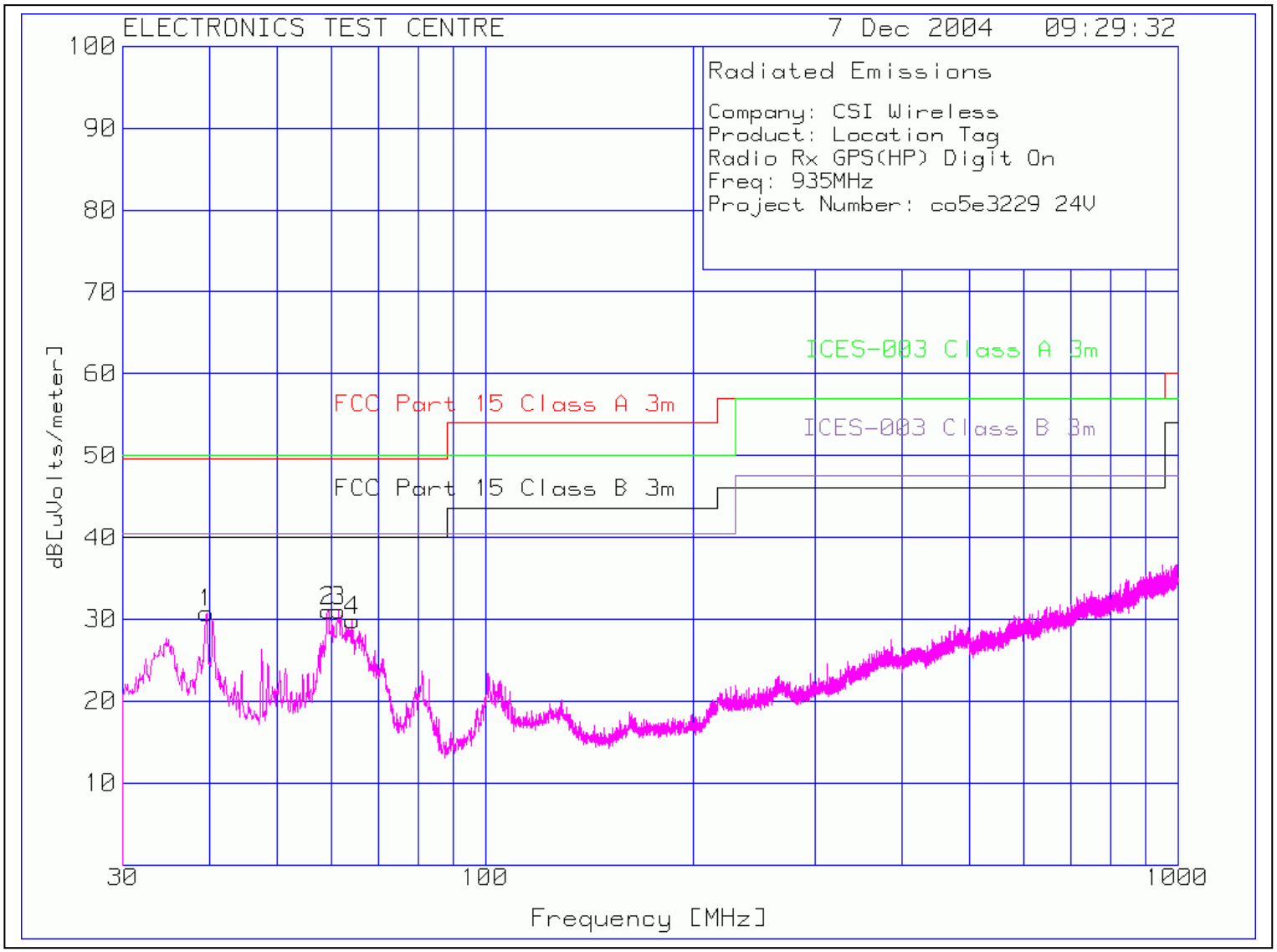
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Plot of Radiated Emissions: Horizontal polarization



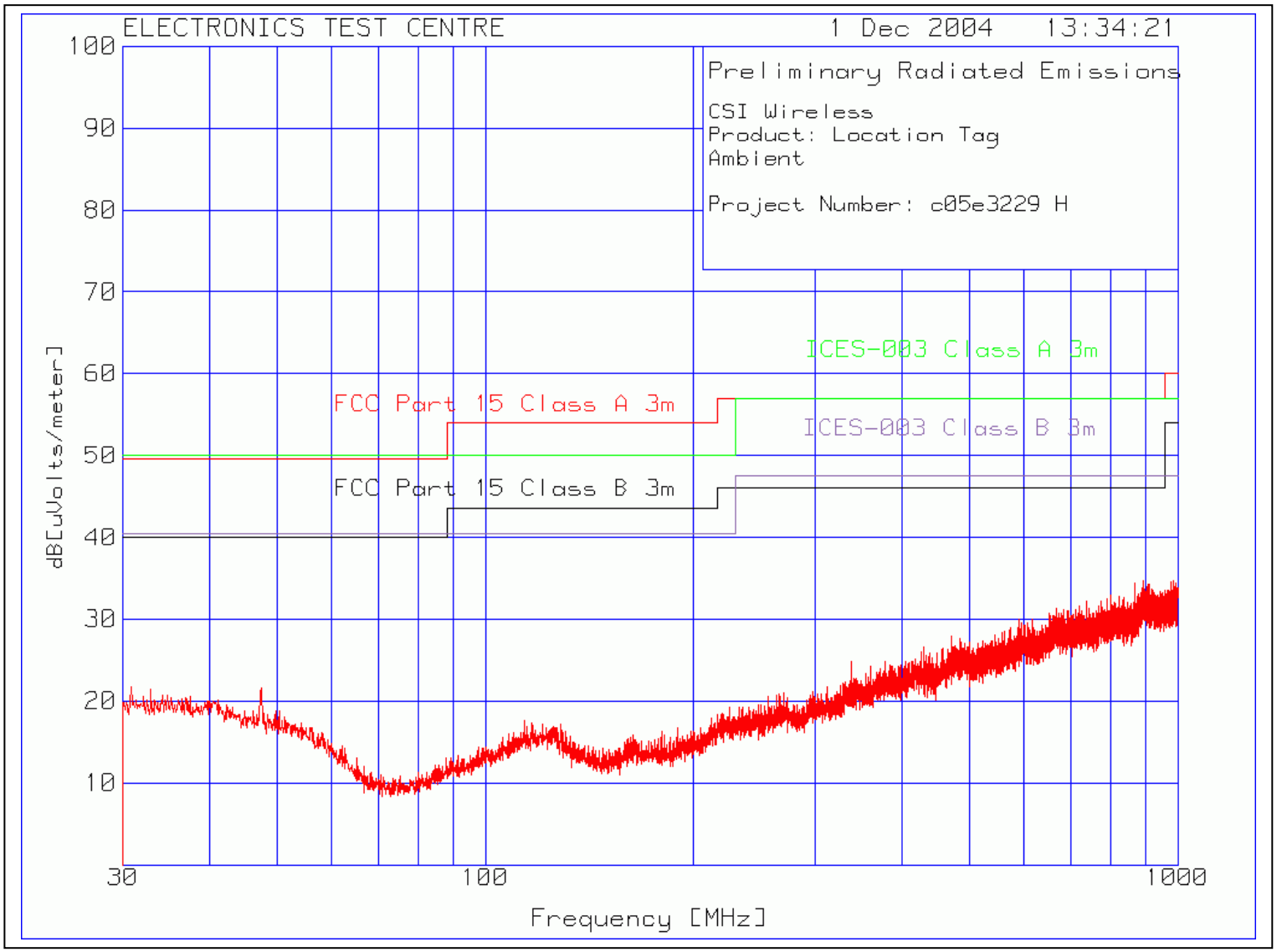
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Plot of Radiated Emissions: Horizontal polarization



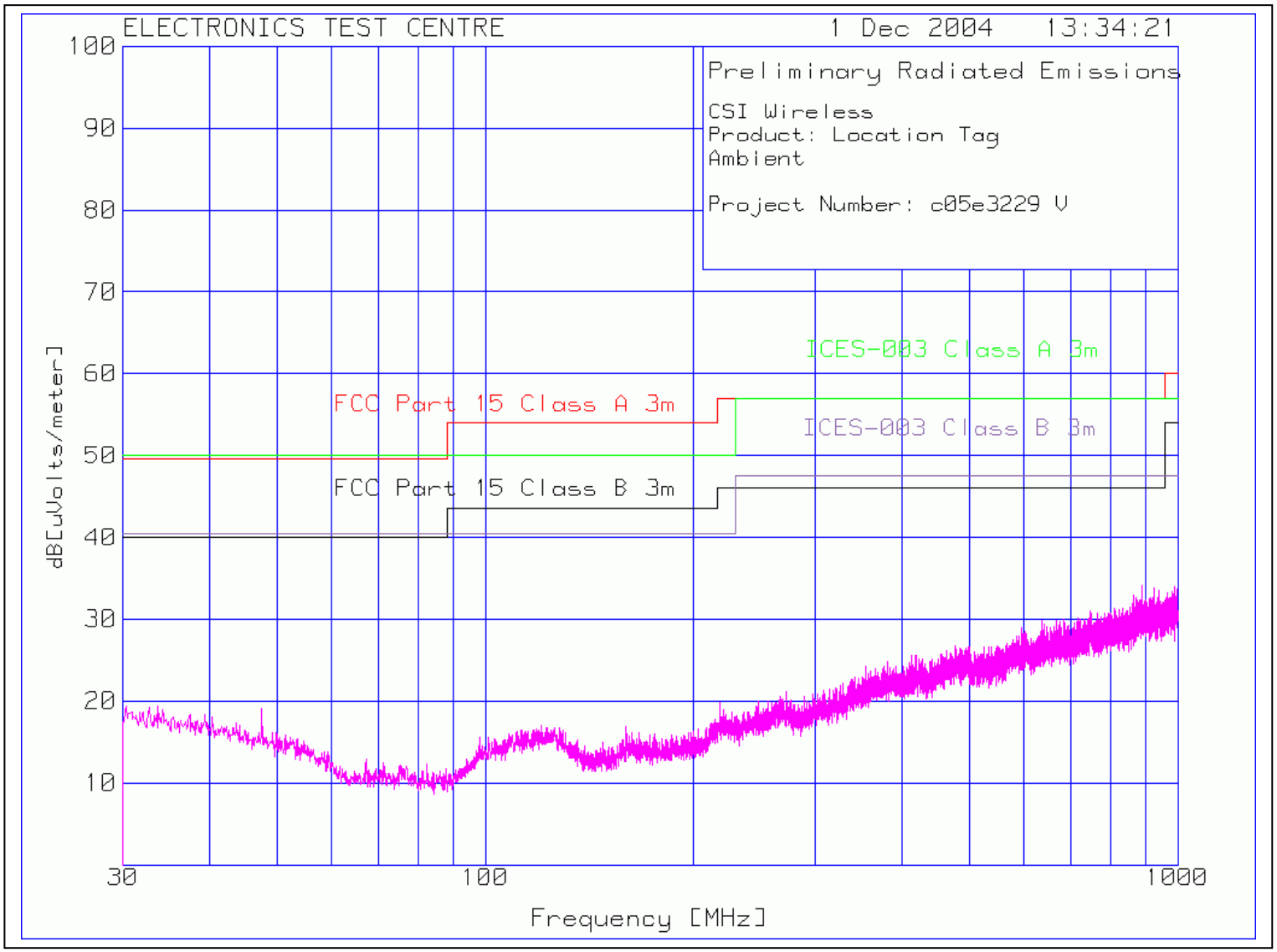
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Plot of Radiated Emissions: Vertical polarization



This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Plot of Radiated Emissions: Vertical polarization



This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

4.3b Transmit Mode

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: Trung Nguyen, Jianming Zhang, David Raynes Test Date: 1 – 17 December 2004	Product: Location Tag
Test Result, Location Tag: **PASS**	
The Radiated E-Field emissions produced by EUT, measured at a distance of 3m, shall not exceed these limits within the restricted bands of operation. Any emissions lying outside these bands shall be at least 20 dB down from the level of the fundamental. Attenuation below the limits of 15.209 is not required.	Frequency [MHz] / Limit (QP @ 3m) [dBμV/m] .009 – 0.490 : 88.5 – 53.8 .490 – 1.7 : 53.8 – 43 1.7 – 30 : 49.50 30 – 88 : 40.00 88 – 216 : 43.52 216 – 960 : 46.02 above 960 : 53.98

Restricted Bands of Operation per Part 15.205:

MHz	MHz	MHz	MHz	MHz	GHz	GHz
0.0900000 – 0.1100000	8.2910000 - 8.2940000	16.804250 - 16.804750	162.01250 - 167.17000 *	1660.0000 – 1710.0000	3.6000000 – 4.4000000	14.470000 – 14.500000
0.4950000 - 0.5050000 *	8.3620000 - 8.3660000	25.500000 - 25.670000	167.72000 - 173.20000 *	1718.8000 – 1722.2000	4.5000000 – 5.1500000	15.350000 – 16.200000
2.1735000 - 2.1905000	8.3762500 - 8.3867500	37.500000 - 38.250000	240.00000 – 285.00000	2200.0000 – 2300.0000	5.3500000 – 5.4600000	17.700000 – 21.400000
4.1250000 - 4.1280000	8.4142500 - 8.4147500	73.000000 - 74.600000	322.00000 - 335.40000	2310.0000 – 2390.0000	7.2500000 – 7.7500000	22.010000 – 23.120000
4.1772500 - 4.1777500	12.290000 - 12.293000	74.800000 - 75.200000	399.90000 – 410.00000	2483.5000 – 2500.0000 *	8.0250000 – 8.5000000	23.600000 – 24.000000
4.2072500 - 4.2077500	12.519750 - 12.520250	108.00000 - 121.94000 **	608.00000 – 614.00000	2655.0000 – 2900.0000	9.0000000 – 9.2000000	31.200000 – 31.800000
5.6770000 - 5.6830000	12.576750 - 12.577250	123.00000 - 138.00000 **	960.00000 – 1240.0000 ***	3260..0000 – 3267.0000	9.3000000 – 9.5000000	36.430000 – 36.500000
6.2150000 - 6.2180000	13.360000 - 13.410000	149.90000 - 150.05000 *	1300.0000 – 1427.0000 ***	3332.0000 – 3339.0000	10.600000 – 12.700000	Above 38.600000
6.2677500 - 6.2682500	16.420000 - 16.423000	156.52475- 156.52525	1435.0000 – 1626.5000	3345.8000 – 3358.0000	13.250000 – 13.400000	
6.3117500 - 6.3122500	16.694750 - 16.695250	156.70000 - 156.90000	1645.5000 – 1646.5000	3500.0000 – 3600.0000 ****		

* US only ** Canada 108 – 138 MHz *** Canada 960 – 1427 MHz **** Canada only

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Radiated Emissions Data:

Operation in Restricted Bands:

nominal f_c (MHz)	**f** (MHz)	Field Strength (dBμV/m) Average	Limit (dBμV/m) Average	Delta (dB)	Antenna Polarization	Antenna Height (cm)	Azimuth (Degrees)
896	2687.8692	51.08	53.98	-2.9	H	125	149
896	2687.9119	42.51	53.98	-11.47	V	132	51
899	2696.9610	51.05	53.98	-2.93	H	100	122
899	2696.9689	44.09	53.98	-9.89	V	101	53
901	2703.0950	53.48	53.98	-0.50	H	100	147
901	2702.8988	52.02	53.98	-1.96	V	100	184
901	4505.0706	34.96	53.98	-19.02	H	100	281
901	4504.8580	31.58	53.98	-22.40	V	103	61

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Carrier and spurious emissions: nominal $\mathbf{f}_c$ = 896 MHz

Frequency (MHz)	Azimuth (Degrees)	Antenna Height (cm)	Ant. Pol.	EUT Spectrum Analyzer Reading (dBuV)	Substitute Tx Spectrum Analyzer Reading (dBuV)	Power Delivered To Tx Antenna After Cable Loss (dBm)	Corrected Tx Antenna Power (dBm)	Tx Antenna Gain (dBi)	EIRP (isotropic) (dBm)	ERP (dipole) (dBm)	ERP Limit (dBm)	Delta (dB)	ERP (Watts)
895.9838	113	155	H	48.5	48.5	26.7	26.7	6.1	32.8	30.65			1.16
895.9793	27	159	V	46.2	46.2	24.1	24.1	6.3	30.4	28.25			0.67
1791.9288	285	100	H	64.3	64.1	-24.7	-24.5	5.8	-18.7	-20.85	-13	-7.85	
1791.9858	351	101	V	68.9	70.0	-24.2	-25.3	6.8	-18.5	-20.65	-13	-7.65	
2687.8692	149	125	H	65.9	65.8	-26.6	-26.5	5.0	-21.5	-23.65	-13	-10.65	
2687.9119	51	132	V	57.5	57.3	-33.3	-33.1	5.0	-28.1	-30.25	-13	-17.25	
4479.7304	135	128	H	32.7						$\leq$ -33	-13	$\geq$ 20	
4480.1076	330	275	V	40.7						$\leq$ -33	-13	$\geq$ 20	

Emissions were investigated up to 10 GHz. All unreported emissions were found to be more than 20 dB below the applicable limit.

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Carrier and spurious emissions: nominal $\mathbf{f}_c$ = 899 MHz

Frequency (MHz)	Azimuth (Degrees)	Antenna Height (cm)	Ant. Pol.	EUT Spectrum Analyzer Reading (dBuV)	Substitute Tx Spectrum Analyzer Reading (dBuV)	Power Delivered To Tx Antenna After Cable Loss (dBm)	Corrected Tx Antenna Power (dBm)	Tx Antenna Gain (dBi)	EIRP (isotropic) (dBm)	ERP (dipole) (dBm)	ERP Limit (dBm)	Delta (dB)	ERP (Watts)
898.9337	166	101	H	48.3	48.3	27.3	27.3	6.0	33.3	31.15			1.30
898.9314	42	100	V	45.8	45.8	24.4	24.4	6.4	30.8	28.65			0.73
1798.0269	35	180	H	69.1	70.0	-21.5	-22.6	5.6	-16.5	-18.65	-13	-5.65	
1797.9492	183	135	V	64.0	64.0	-30.1	-30.1	6.7	-23.4	-25.55	-13	-12.55	
2696.9610	122	100	H	65.9	65.7	-26.2	-26.0	5.0	-21.0	-23.15	-13	-10.25	
2696.9689	53	101	V	59.1	59.3	-29.9	-30.1	5.0	-25.1	-27.25	-13	-14.25	

Emissions were investigated up to 10 GHz. All unreported emissions were found to be more than 20 dB below the applicable limit.

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Carrier and spurious emissions: nominal $\mathbf{f}_c$ = 901 MHz

Frequency (MHz)	Azimuth (Degrees)	Antenna Height (cm)	Ant. Pol.	EUT Spectrum Analyzer Reading (dBuV)	Substitute Tx Spectrum Analyzer Reading (dBuV)	Power Delivered To Tx Antenna After Cable Loss (dBm)	Corrected Tx Antenna Power (dBm)	Tx Antenna Gain (dBi)	EIRP (isotropic) (dBm)	ERP (dipole) (dBm)	ERP Limit (dBm)	Delta (dB)	ERP (Watts)
901.0775	34	100	H	48.1	48.1	26.2	26.2	6.0	32.2	30.05			1.01
901.0775	26	105	V	45.7	45.7	23.6	23.6	6.3	29.9	27.75			0.60
1802.0004	329	132	H	66.7	66.4	-25.5	-25.2	5.8	-19.4	-21.55	-13	-8.55	
1801.9450	134	135	V	70.8	71.0	-23.5	-23.7	6.8	-16.9	-19.05	-13	-6.05	
2703.0950	147	100	H	70.4	69.9	-22.5	-22.0	5.0	-17.0	-19.15	-13	-6.15	
2702.8988	184	100	V	67.1	67.2	-23.4	-23.5	5.0	-18.5	-20.65	-13	-7.65	
4505.0706	281	100	H	40.7						$\leq$ -33	-13	$\geq$ 20	
4504.8767	61	103	V	39.1						$\leq$ -33	-13	$\geq$ 20	

Emissions were investigated up to 10 GHz. All unreported emissions were found to be more than 20 dB below the applicable limit.

ERP limit per Part 24.132 = 7 Watts

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Carrier and spurious emissions: nominal $\mathbf{f}_c$ = 902 MHz

Frequency (MHz)	Azimuth (Degrees)	Antenna Height (cm)	Ant. Pol.	EUT Spectrum Analyzer Reading (dBuV)	Substitute Tx Spectrum Analyzer Reading (dBuV)	Power Delivered To Tx Antenna After Cable Loss (dBm)	Corrected Tx Antenna Power (dBm)	Tx Antenna Gain (dBi)	EIRP (isotropic) (dBm)	ERP (dipole) (dBm)	ERP Limit (dBm)	Delta (dB)	ERP (Watts)
901.9794	3	102	H	49.1	49.1	26.3	26.3	6.0	32.3	30.15			1.04
901.8787	27	106	V	46.5	46.5	24.5	24.5	6.3	30.8	28.65			0.73
1804.0530	306	110	H	67.0	66.5	-25.1	-24.6	5.5	-19.1	-21.25	-13	-8.25	
1804.0240	350	100	V	71.6	72.0	-22.3	-22.7	6.9	-15.8	-17.95	-13	-4.95	
2705.9930	1	168	H	71.7	70.6	-21.6	-20.7	5.0	-15.7	-17.85	-13	-4.85	
2705.9560	56	196	V	61.6	62.0	-28.6	-29.0	5.0	-24.0	-26.15	-13	-13.15	

Emissions were investigated up to 10 GHz. All unreported emissions were found to be more than 20 dB below the applicable limit.

ERP limit per Part 24.132 = 7 Watts

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

4.4 FREQUENCY STABILITY (§ 2.1055, 90.213)

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: David Raynes Test Date: n/a	Product: Location Tag
Test Result, Location Tag: **Not Applicable**	
The EUT was not tested for frequency stability. The RF section is a pre-approved module, issued FCC ID O33AR100.	

.

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

5.0 TEST FACILITY

5.1 LOCATION

The EUT was tested for Electromagnetic Compatibility at the Electronics Test Centre, located in Airdrie, Alberta, Canada.

The RF Anechoic Chamber (RFAC) is identified as Chamber 1, located in the main building complex at the Electronics Test Centre. Its usable working space measures 10.6 m long x 7.3 m wide x 6.5 m high.

This test site is listed with the FCC under Registration Number 99541. Measurements taken at this site are accepted by Industry Canada per file number IC 2046-1.

The floor, walls and ceiling consist of annealed steel panels. The walls and ceiling are covered with ferrite tile, augmented by RF absorbant foam material on the end wall nearest the turntable, and on the adjacent walls and the ceiling. The chamber floor supports a 15 cm high internal floor, constructed of annealed steel panels, that forms the ground plane, and is bonded to the chamber walls.

The 3-m diameter turntable is flush-mounted with the floor. A sub-floor cable-way is provided to route cables between the turntable pit and EUT support equipment. Cables reach the EUT through an opening in the centre of the turntable.

Test instrumentation and EUT support equipment is located in two shielded vestibules located at the side of the main room. Cables are routed through bulkhead panels between the rooms as required. Power feeds are routed into the main room and vestibules through line filters providing at least 100 dB of attenuation between 10 kHz and 10 GHz.

5.2 GROUNDING PLAN

The EUT was located on a wooden table 80 cm above the ground plane.

In accordance with CSI Wireless Inc. specifications, the EUT was not grounded.

5.3 POWER

AC power was supplied via an Underwriter's Laboratories ULW100-69, 100 dB, 100 Ampere wall mounted filter. Bonding to ground is implemented at the chamber wall.

5.4 EMISSIONS PROFILE

Ambient conducted and radiated electromagnetic emission profiles were generated throughout the tests and are included in the test data.

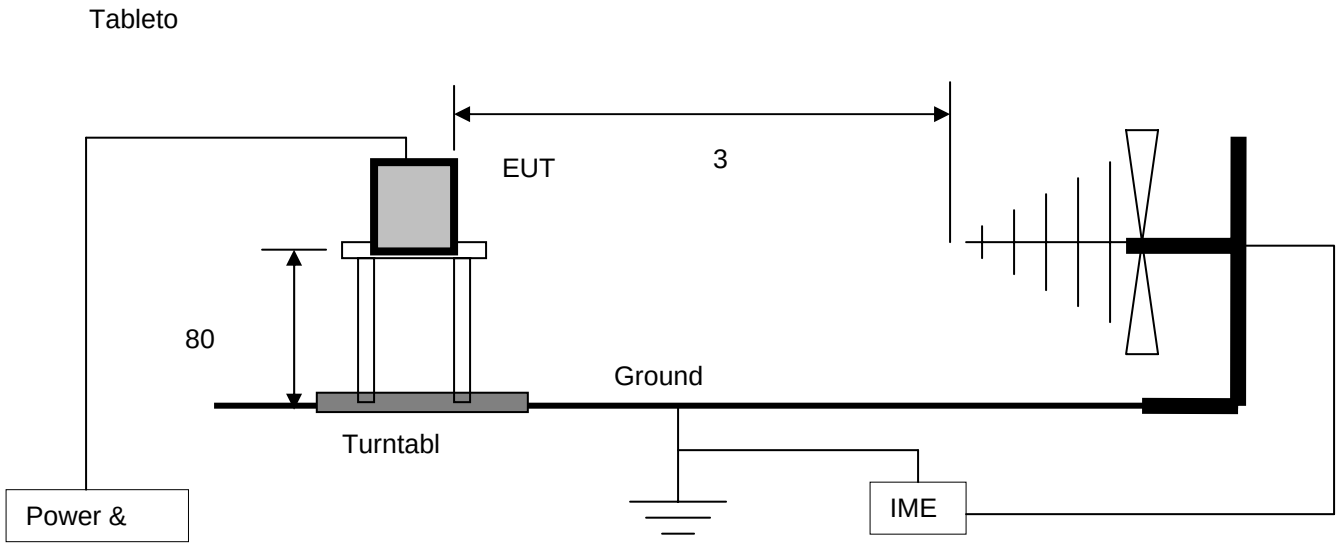
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

5.5 TEST CONFIGURATION

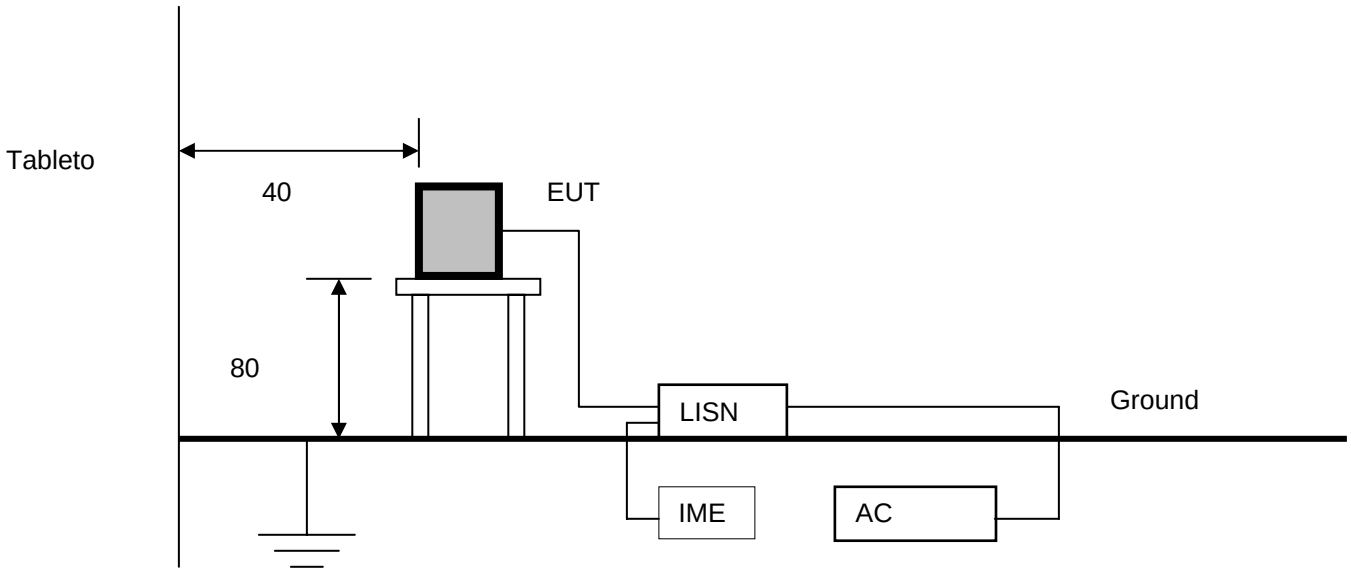
5.5.1 Tabletop Equipment

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

Radiated



Conducted

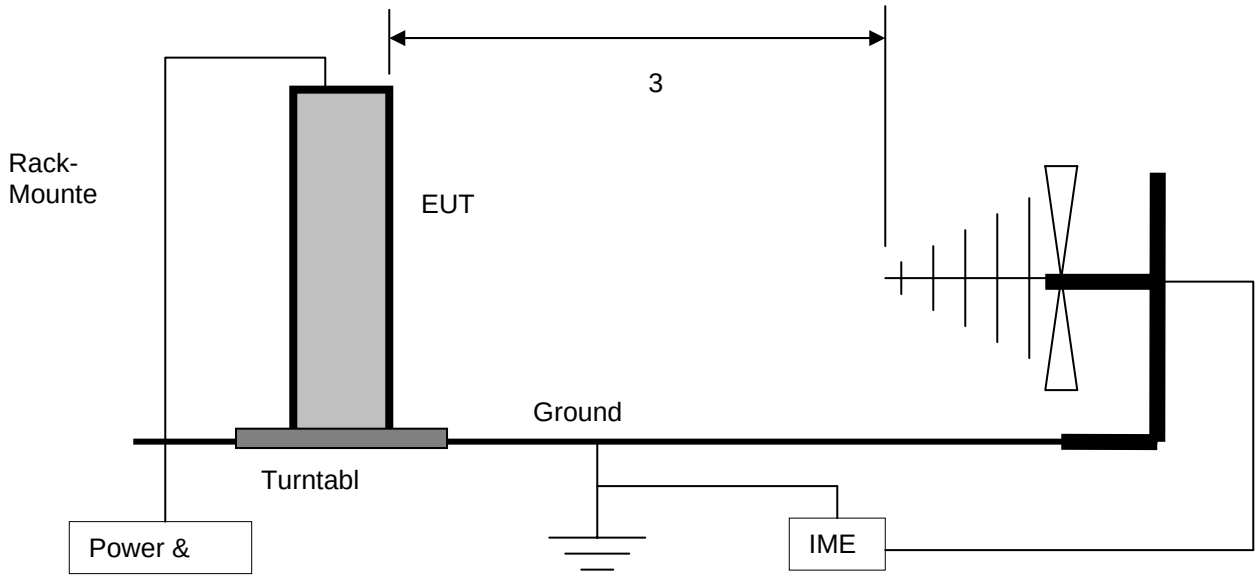


This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

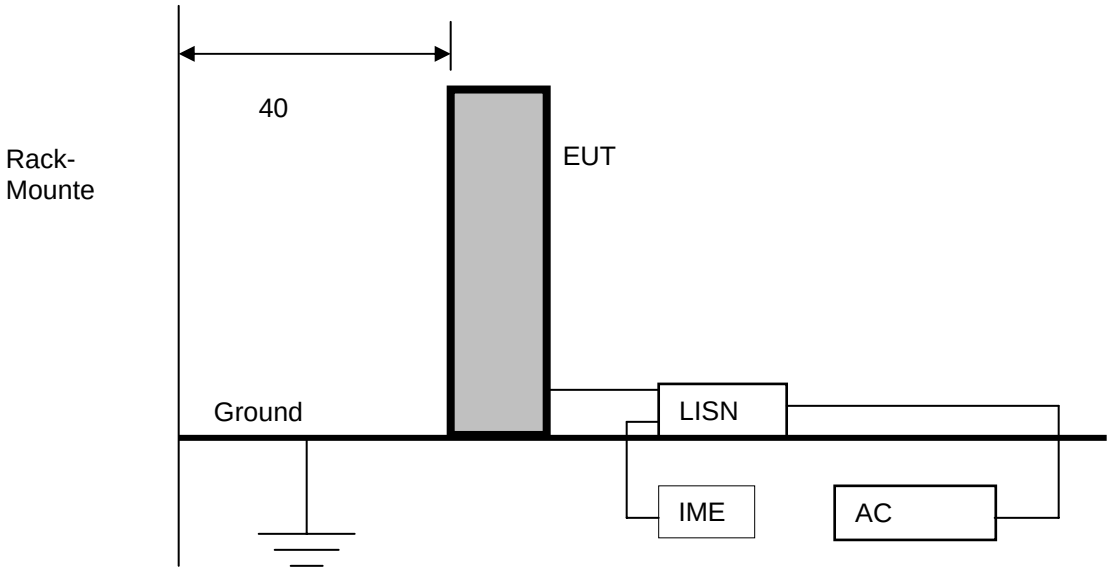
5.5.2 Rack Mount

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

Radiated



Conducted



This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

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) DRG horn antenna (1 – 18 GHz)
f) Antenna mast positioner and controller
g) Flush-mounted turntable and controller
h) 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) Power Isolation Transformers
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

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

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 & Display	Hewlett Packard	8566B & 85662	9565	20 April 2005
Spectrum Analyzer & Display	Hewlett Packard	8566B & 85662	9168	17 August 2005
RF Preselector	Hewlett Packard	85685A	9728	19 August 2005
Quasi-Peak Adapter	Hewlett Packard	85650A	4411	20 August 2005
Measurement System Software	Underwriters Laboratories	Version 6.0	4443	n/a
Line Impedance Stabilization Network	EMCO	3825/2r	9331	2 November 2005
Line Impedance Stabilization Network	EMCO	3825/2r	9259	2 November 2005
Biconilog Antenna	ARA	Lpb-2520/A	4318	2 August 2005
Dual Ridged Guide Antenna	EMCO	3115	9588	2 August 2005
Low Noise Amplifier	MITEQ	JS43-01001800-21-5P	4354	3 November 2005

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Appendix A

Location Tag

Test Sample Description

(from data provided by CSI Wireless Inc.)

Product Application	Product Category
Commercial ✗ Military o	Telecommunications o Information Technology ✗ Surface Transportation o Aerospace o Test & Measurement o Other o _____
Product Name	Location Tag
Part/Model No.	LT10R
Serial Number	Test01, Test02
Power Requirements: **(Voltage, AC/DC, Hz, Current)**	Internal Battery (simulated by DC supply set to 3.8 VDC)
Ground Connection **(in addition to power cord)**	nil
Internally Generated Frequencies	GPS receiver: 13.0 MHz – Local Oscillator 16.368 MHz – Local Oscillator 1571.328 MHz derived from VCO 3142.656 MHz VCO Microprocessor 4.0 MHz – Local Oscillator 32.768 MHz – Local Oscillator
Peripheral Support Equipment	Optocoupled RS-232 board with configuration software, only used for EUT setup
Description and number of interconnecting Leads & Cables	Common, pull-up, Tx, Rx connections used for EUT setup only. No cables in actual installation.
Brief Functional Description	The Asset Tag is a ReFLEX radio tracking device used to track equipment. cargo, possessions, etc. GPS co-ordinates are transmitted via the ReFLEX radio to the service provider.

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.