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Emissions Testing of the EUM3005 in accordance with FCC Part 15.247 (2004) Spread Spectrum Operation 902 - 928 & 2400 - 2483.5 & 5725 - 5850 MHz.

Test Personnel: Jianming Zhang, David Raynes

Prepared for: WaveRider Communications Inc.

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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 15.247 (2004), Spread Spectrum Operation 902 - 928 & 2400 - 2483.5 & 5725 – 5850 MHz.

1.2 APPLICANT

This test report has been prepared for WaveRider Communications Inc., located in Calgary, Alberta, Canada.

1.3 APPLICABILITY

All test procedures, limits, and results defined in this document apply to the WaveRider Communications Inc. EUM3005 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 EUM3005:

Product Type:	Wireless Ethernet modem
Model Number:	EUM3005
Serial Number:	N/A
Cables:	Ethernet – cross cable, power, RF to antenna
Power Requirements:	120 VAC 60Hz
Peripheral Equipment:	IBM laptop, Elpac 3875 power adaptor

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 (2004), and ANSI C63.4 (2004).

1.6.1 VARIATIONS IN TEST METHODS

There were no variations from the test procedures outlined above.

1.6.2 TEST SAMPLE CONFIGURATION & MODIFICATIONS

The EUM3005 was set up as shown in the photographs which are submitted separately. The only difference from a normal end-user installation was the Ethernet cable between the EUT and the support computer. This cable was long enough to allow the computer to be located outside the test chamber during Radiated Emission measurements.

The EUT met the requirements without modification.

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	EUM3005	nil	See § 1.6.2	**PASS**
§4.2	Conducted Emissions at Antenna Port	FCC Part 15.247	EUM3005	nil	See § 1.6.2	**PASS**
§4.3a	Radiated Emissions (Rx Mode)	FCC Part 15.109	EUM3005	nil	See § 1.6.2	**PASS**
§4.3b	Radiated Emissions (Tx Mode)	FCC Parts 2.1053, 15.205, 15.209 & 15.247	EUM3005	nil	See § 1.6.2	**PASS**

4.1 CONDUCTED EMISSIONS ON AC POWER LINES (15.107 & 15.207)

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: Jianming Zhang Test Date: 28 February 2005	Product: EUM3005

Test Result, EUM3005: **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 = 37 %	Specification: Part 15.107, Part 15.207 Frequency (MHz) QP Avg 0.150 - 0.50 66 – 56 56 - 46 0.50 – 5.0 56 46 5 – 30 60 50 Units of measurement are dBμV.

Line 1 Rx mode:

Frequency [MHz]	RF Voltage [dBμV]	Delta [dB from limit]
0.21799	46.4 qp	-6.495
0.36171	41.1qp	-7.588
0.28923	40.9 qp	-9.646

Line 2 Rx mode:

Frequency [MHz]	RF Voltage [dBμV]	Delta [dB from limit]
0.21843	58.4 qp	-4.480
0.36112	42.9 qp	-5.800
0.28999	43.4 qp	-7.12

There were more emissions measured within -10 dB of the specified limit.
Refer to the test data and plots for more detail.

Line 1 Tx mode:

Frequency [MHz]	RF Voltage [dBμV]	Delta [dB from limit]
0.21887	46.6 qp	-6.061

Line 2 Tx mode:

Frequency [MHz]	RF Voltage [dBμV]	Delta [dB from limit]
0.21852	50.6 qp	-2.273
0.29088	42.4 qp	-8.098
0.57785	37.4 qp	-8.600
0.6503	37.2 qp	-8.800
0.15295	46.9 qp	-8.928

There were more emissions measured within -10 dB of the specified limit.
Refer to the test data and plots for more detail.

Conducted Emissions Data:

The emissions data is presented in tabular form, showing the uncorrected spectrum analyzer reading, the type of detector, 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
L1								
.3052	35.6 pk	10	1.1	46.7	66	79	50.1	60.1
			Margin [dB]		-19.3	-32.3	-3.4	-13.4

⇓		The applicable Limit
L1		This reading was taken on Line 1
Test Frequency [MHz}	.3052	Test Frequency f = 0.3052 MHz (305.2 kHz)
Meter Reading [dB (uV)]	35.6 pk	The reading with Peak detector
Gain/Loss Factor [dB]	10	Net correction for preamp gain & cable loss
Transducer Factor [dB]	1.1	Correction for LISN loss
Level [dB (uVolts)]	46.7	Corrected value for voltage measurement
Limit: 1 Margin [dB]	66 -19.3	The value of Limit 1 at 0.3052 MHz The measured voltage is 19.3 dB below Limit 1
Limit: 2 Margin [dB]	79 -32.3	The value of Limit 2 at 0.3052 MHz The measured voltage is 32.3 dB below Limit 2
Limit: 3 Margin [dB]	50.1 -3.4	The value of Limit 3 at 0.3052 MHz The measured voltage is 3.4 dB below Limit 3
Limit: 4 Margin [dB]	60.4 -13.4	The value of Limit 4 at 0.3052 MHz The measured voltage is 13.4 dB below Limit 4

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

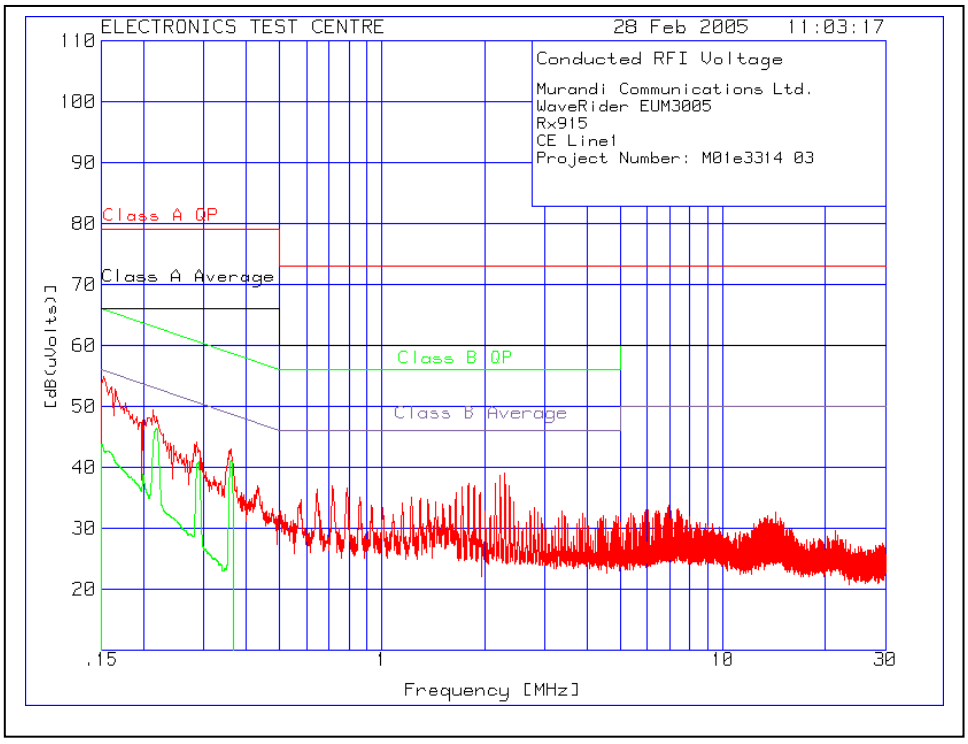
WaveRider EUM3005

Rx 915 MHz
Line1

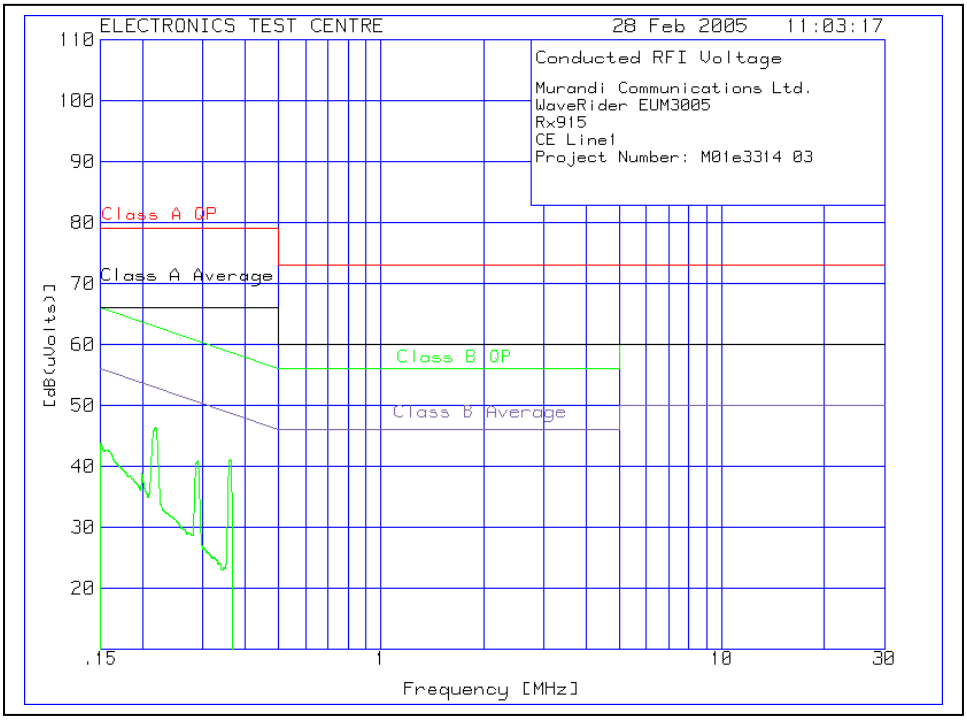
3 Quasi-PEAKS within -10 dB of the: Class B Average limit
WINDOW in range: 1 -> .15 to .3662 MHz
Peak criteria: 3 dB
Frequency Uncertainty: .00511 MHz. Minimum Separation: 0 MHz

Peak [No.]	Frequency [MHz]	Level	Limit Value [dB]	Delta
1	.21799	46.4	52.9	-6.495
2	.28923	40.9	50.55	-9.646
3	.36171	41.1	48.69	-7.588

Plot of Conducted Emissions on AC Power Lines:



Plot of Conducted Emissions on AC Power Lines:



WaveRider EUM3005

Rx 915 MHz
Line2

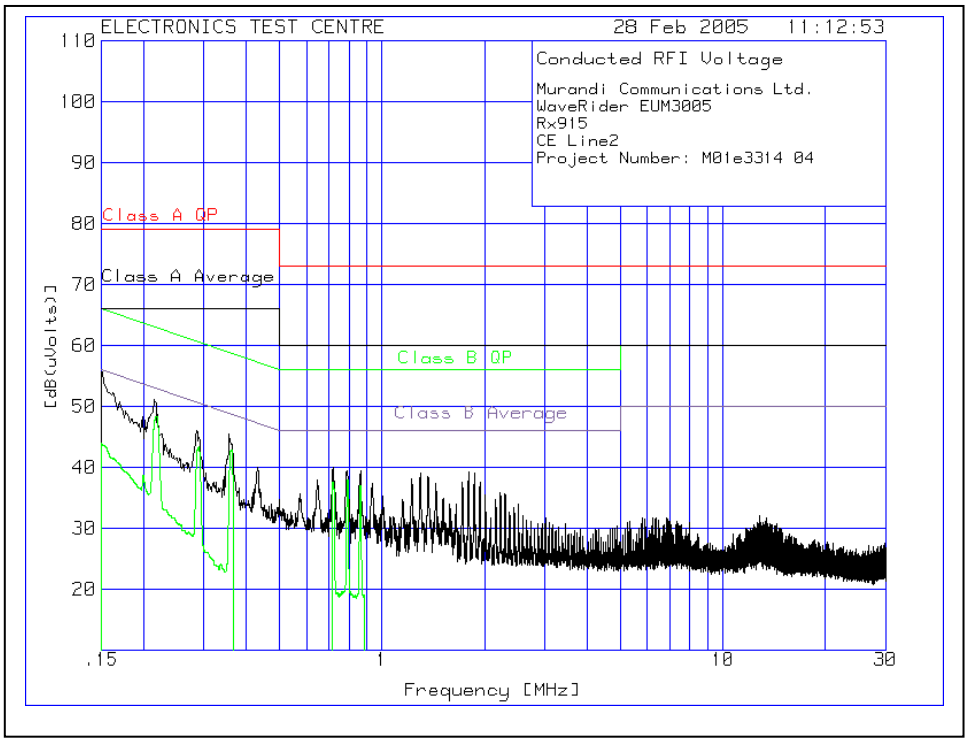
3 Quasi-PEAKS within -10 dB of the: Class B Average limit
WINDOW in range: 1 -> .15 to .3755
Peak criteria: 3 dB
Frequency Uncertainty: .00511 MHz Minimum Separation: 0 MHz

Peak [No.]	Frequency [MHz]	Level	Limit Value [dB]	Delta
1	.21843	48.4	52.88	-4.48
2	.28999	43.4	50.52	-7.12
3	.36112	42.9	48.7	-5.8

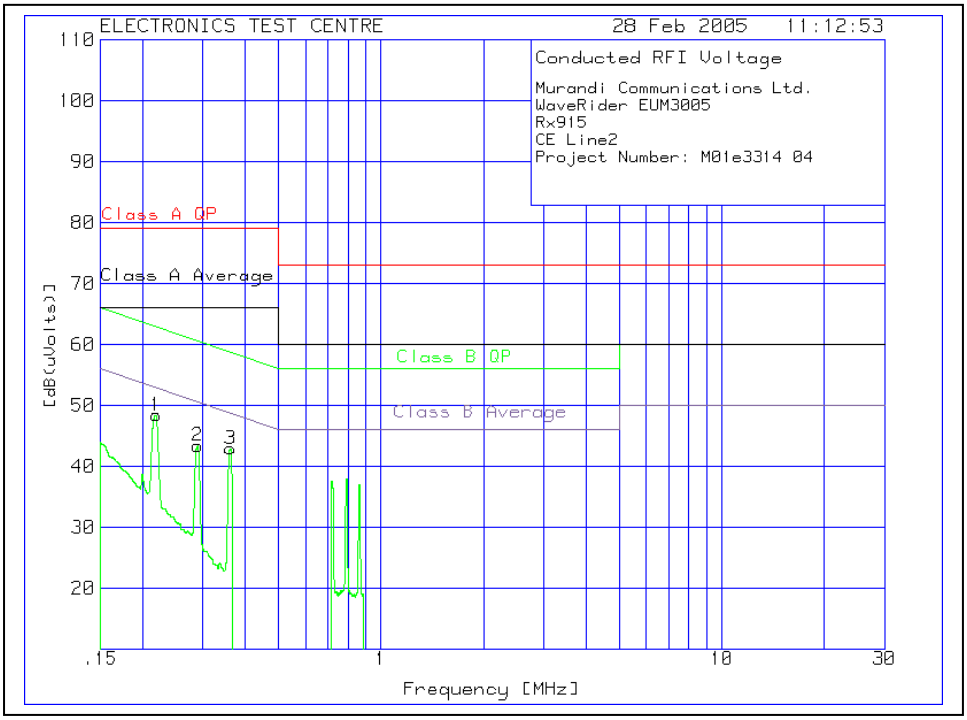
3 Quasi-PEAKS within -10 dB of the: Class B Average limit
WINDOW in range: 1 -> .7151 to .8881
Peak criteria: 3 dB
Frequency Uncertainty: .00509 MHz Minimum Separation: 0 MHz

Peak [No.]	Frequency [MHz]	Level	Limit Value [dB]	Delta
1	.71726	37.5	46	-8.5
2	.79299	38	46	-8
3	.86487	37	46	-9

Plot of Conducted Emissions on AC Power Lines:



Plot of Conducted Emissions on AC Power Lines:



WaveRider EUM3005

Tx 905 MHz
Line1

5 Quasi-PEAKS within -10 dB of the: Class B Average limit
WINDOW in range: 1 -> 1.829 to 2.3434
Peak criteria: 3 dB
Frequency Uncertainty: .00526 MHz Minimum Separation: 0 MHz

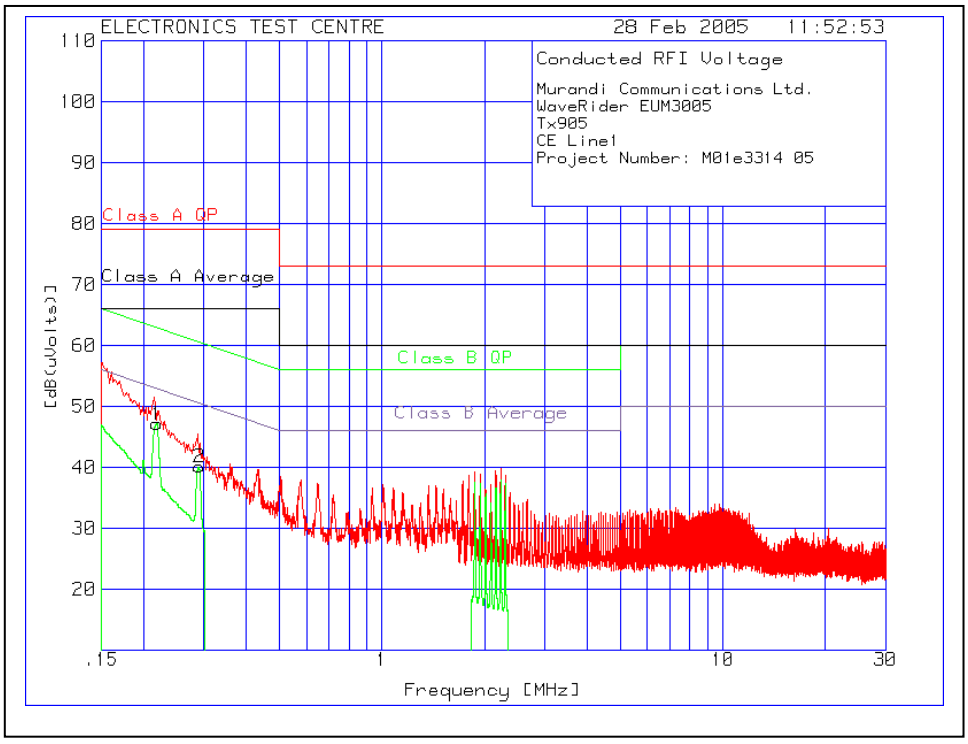
Peak [No.]	Frequency [MHz]	Level	Limit Value [dB]	Delta
1	1.87144	37.6	46	-8.4
2	1.94358	37.4	46	-8.6
3	2.15912	36.6	46	-9.4
4	2.23113	38	46	-8
5	2.30289	37.4	46	-8.6

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit: 1	2	3	4
Range: 1 .15 - 30MHz								
.2181	25.2 av	10.45	1.03	36.68	79	62.89	66	52.89
				Margin [dB]:	-42.32	-26.21	-29.32	-16.21

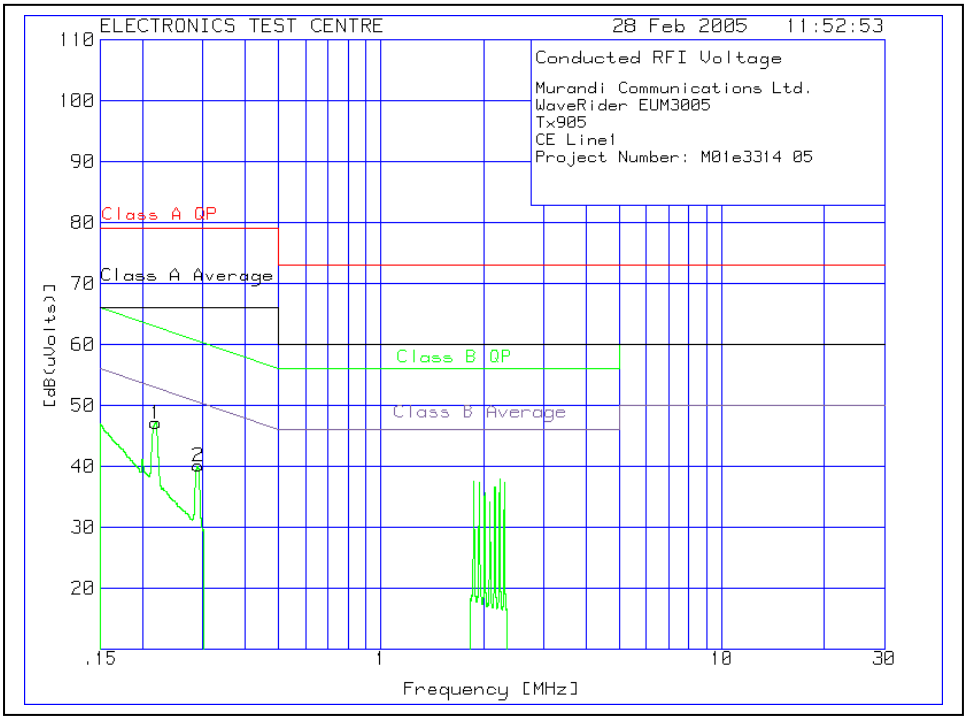
LIMIT 1: Class A QP
LIMIT 2: Class B QP
LIMIT 3: Class A Average
LIMIT 4: Class B Average

av - Average detector

Plot of Conducted Emissions on AC Power Lines:



Plot of Conducted Emissions on AC Power Lines:



WaveRider EUM3005

Tx 905 MHz
Line2

3 Quasi-PEAKS within -10 dB of the: Class B Average limit
WINDOW in range: 1 -> .15 to .2976
Peak criteria: 3 dB
Frequency Uncertainty: .00507 MHz. Minimum Separation: 0 MHz

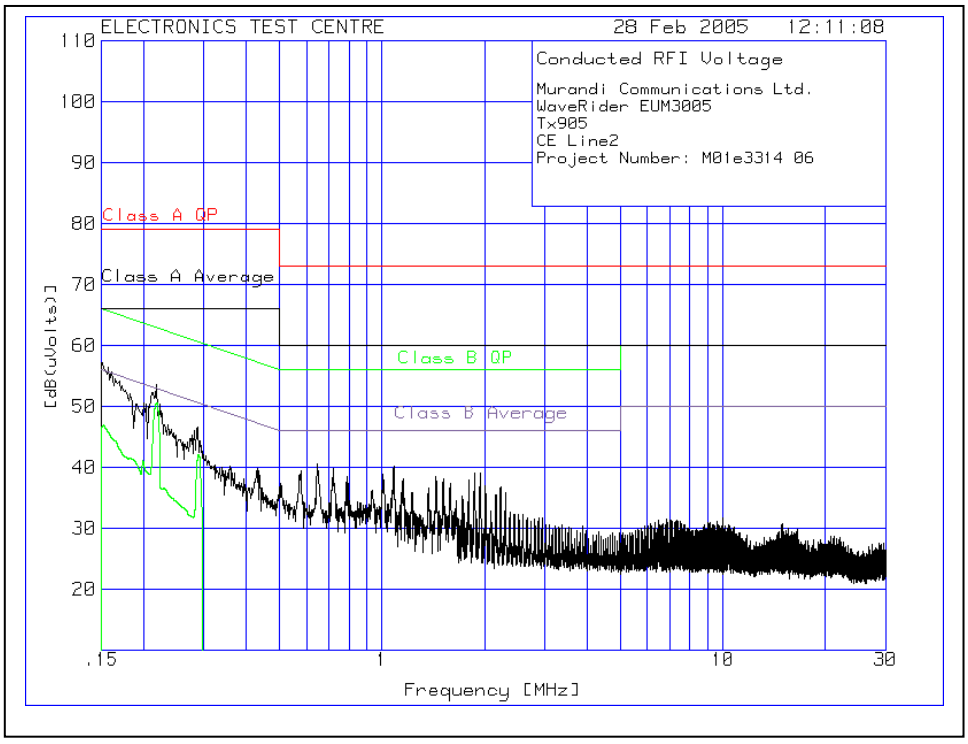
Peak [No.]	Frequency [MHz]	Level	Limit Value [dB]	Delta
1	.15295	46.9	55.84	-8.938
2	.21852	50.6	52.87	-2.273
3	.29092	42.1	50.5	-8.397

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit: 1	2	3	4
Range: 1 .15 - 30MHz								
.2186	32.2 av	10.45	1.03	43.68	79	62.87	66	52.87
				Margin [dB]:	-35.32	-19.19	-22.32	-9.19

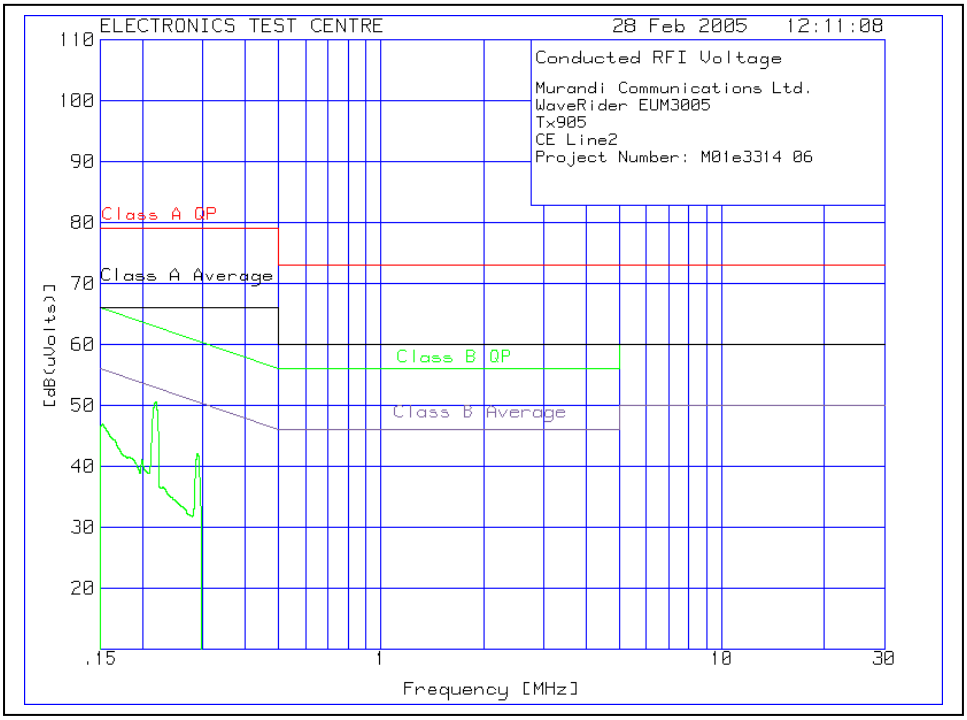
LIMIT 1: Class A QP
LIMIT 2: Class B QP
LIMIT 3: Class A Average
LIMIT 4: Class B Average

av - Average detector

Plot of Conducted Emissions on AC Power Lines:



Plot of Conducted Emissions on AC Power Lines:



WaveRider EUM3005

Tx 915 MHz
Line1

2 Quasi-PEAKS within -10 dB of the: Class B Average limit
WINDOW in range: 1 -> .15 to .2976
Peak criteria: 3 dB
Frequency Uncertainty: .00507 MHz. Minimum Separation: 0 MHz

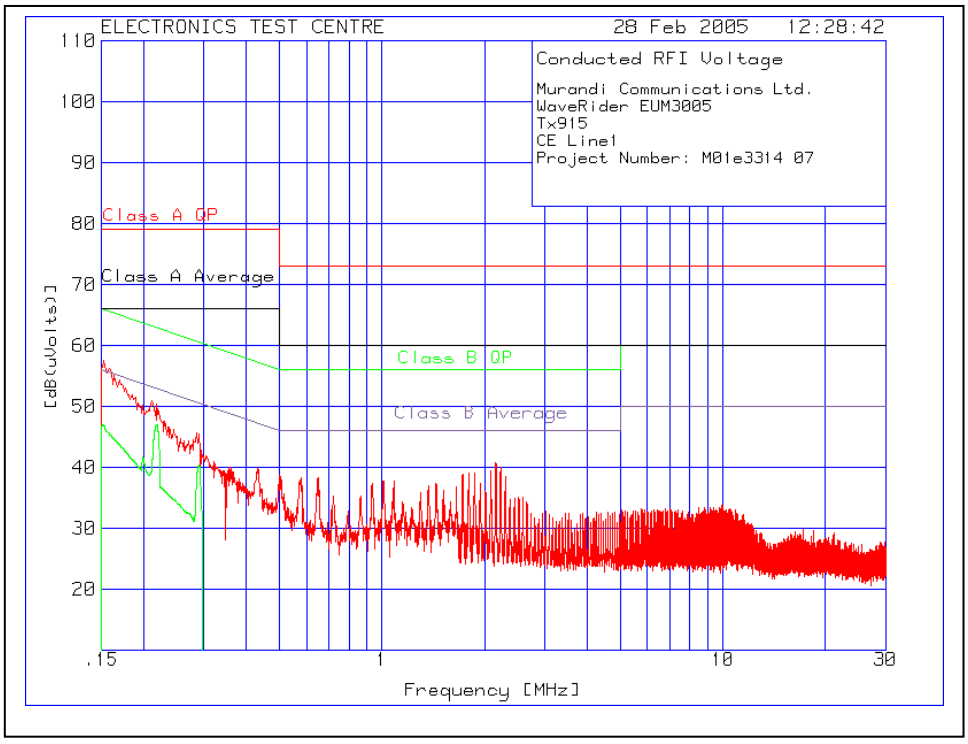
Peak [No.]	Frequency [MHz]	Level	Limit Value [dB]	Delta
1	.15273	46.9	55.85	-8.95
2	.21867	47	52.87	-5.868

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit: 1	2	3	4
Range: 1 .15 - 30MHz								
.2179	25 av	10.45	1.03	36.48	79	62.9	66	52.9
				Margin [dB]:	-42.52	-26.42	-29.52	-16.42

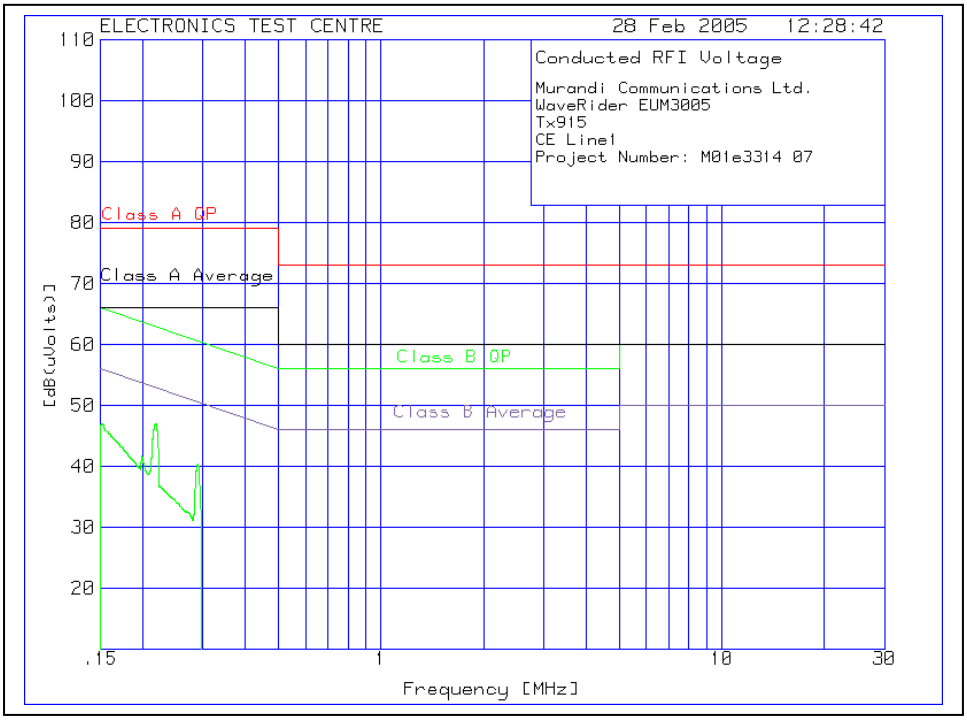
LIMIT 1: Class A QP
LIMIT 2: Class B QP
LIMIT 3: Class A Average
LIMIT 4: Class B Average

av - Average detector

Plot of Conducted Emissions on AC Power Lines:



Plot of Conducted Emissions on AC Power Lines:



WaveRider EUM3005

Tx 915 MHz
Line2

3 Quasi-PEAKS within -10 dB of the: Class B Average limit
WINDOW in range: 1 -> .15 to .3
Peak criteria: 3 dB
Frequency Uncertainty: .00508 MHz. Minimum Separation: 0 MHz

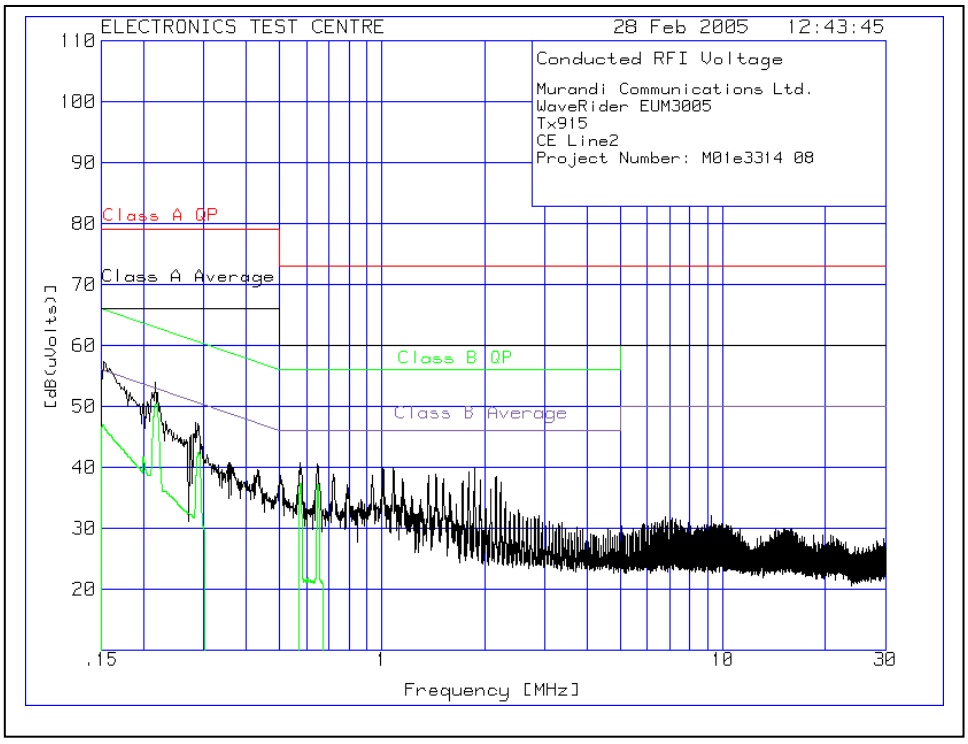
Peak [No.]	Frequency [MHz]	Level	Limit Value [dB]	Delta
1	.15243	46.9	55.87	-8.967
2	.21879	50.4	52.86	-2.463
3	.29088	42.4	50.5	-8.098
1	.57785	37.4	46	-8.6
2	.65038	37.2	46	-8.8

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit: 1	2	3	4
Range: 1 .15 - 30MHz								
.2175	33.1 av	10.45	1.03	44.58	79	62.91	66	52.91
				Margin [dB]:	-34.42	-18.33	-21.42	-8.33

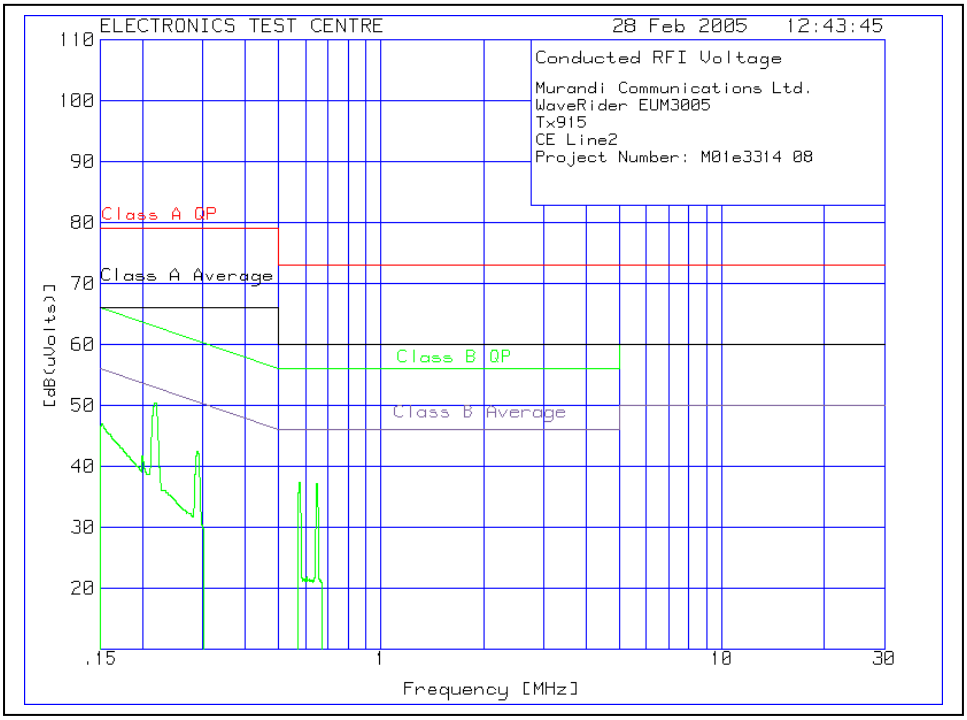
LIMIT 1: Class A QP
LIMIT 2: Class B QP
LIMIT 3: Class A Average
LIMIT 4: Class B Average

av - Average detector

Plot of Conducted Emissions on AC Power Lines:



Plot of Conducted Emissions on AC Power Lines:



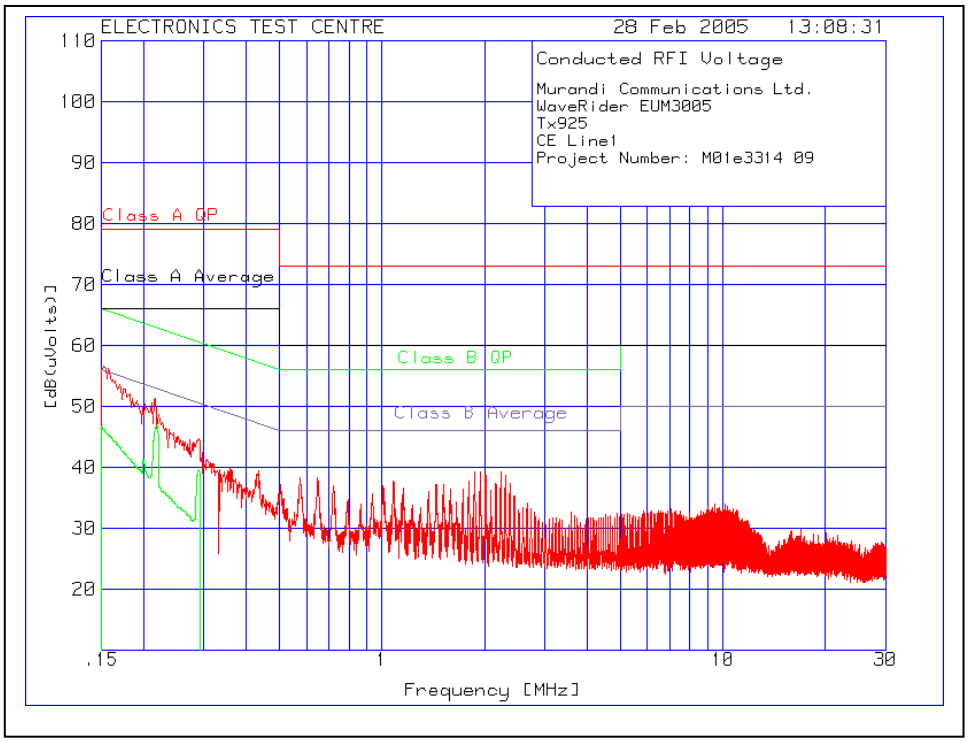
WaveRider EUM3005

Tx 925 MHz
Line1

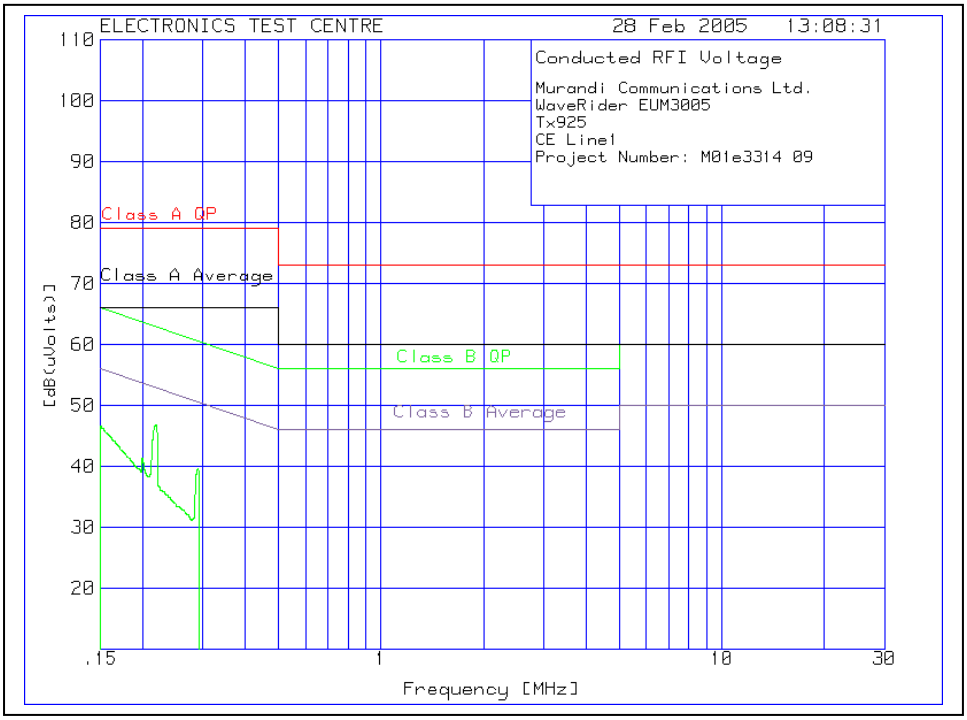
2 Quasi-PEAKS within -10 dB of the: Class B Average limit
WINDOW in range: 1 -> .15 to .2931
Peak criteria: 3 dB
Frequency Uncertainty: .00507 MHz. Minimum Separation: 0 MHz

Peak [No.]	Frequency [MHz]	Level	Limit Value [dB]	Delta
1	.15086	46.6	55.95	-9.353
2	.21887	46.8	52.86	-6.061

Plot of Conducted Emissions on AC Power Lines:



Plot of Conducted Emissions on AC Power Lines:



WaveRider EUM3005

Tx 925 MHz
Line2

3 Quasi-PEAKS within -10 dB of the: Class B Average limit
WINDOW in range: 1 -> .15 to .2931
Peak criteria: 3 dB
Frequency Uncertainty: .00507 MHz. Minimum Separation: 0 MHz

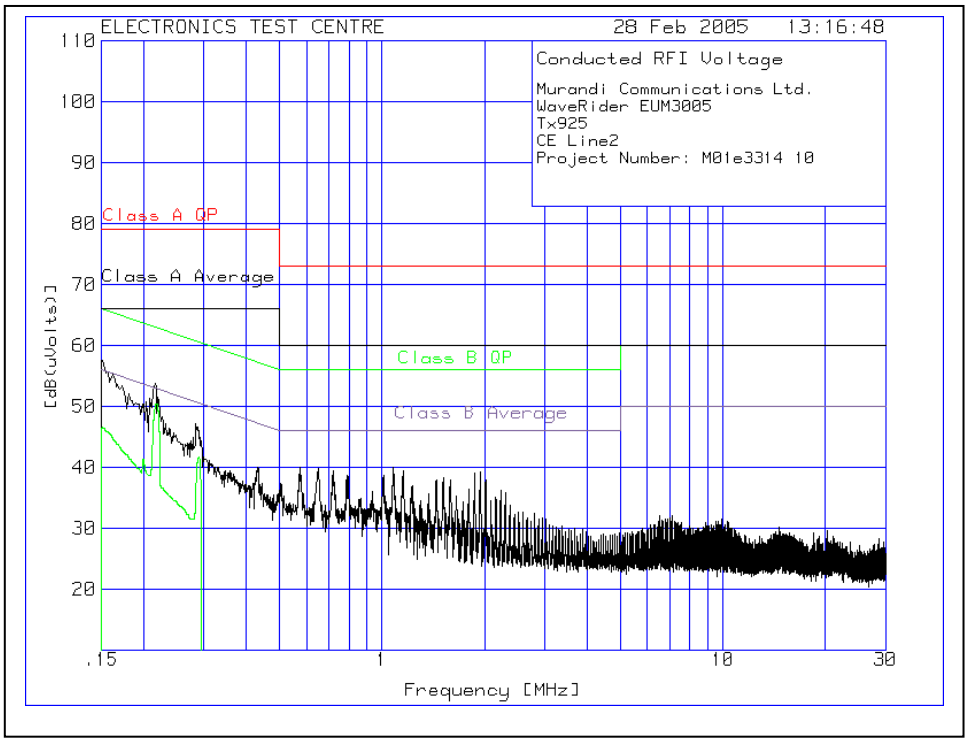
Peak [No.]	Frequency [MHz]	Level	Limit Value [dB]	Delta
1	.15166	46.6	55.91	-9.309
2	.21908	50.4	52.85	-2.452
3	.29073	41.7	50.5	-8.802

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit: 1	2	3	4
Range: 1 .15 - 30MHz								
.219	32.1 av	10.45	1.02	43.57	79	62.86	66	52.86
				Margin [dB]:	-35.43	-19.29	-22.43	-9.29

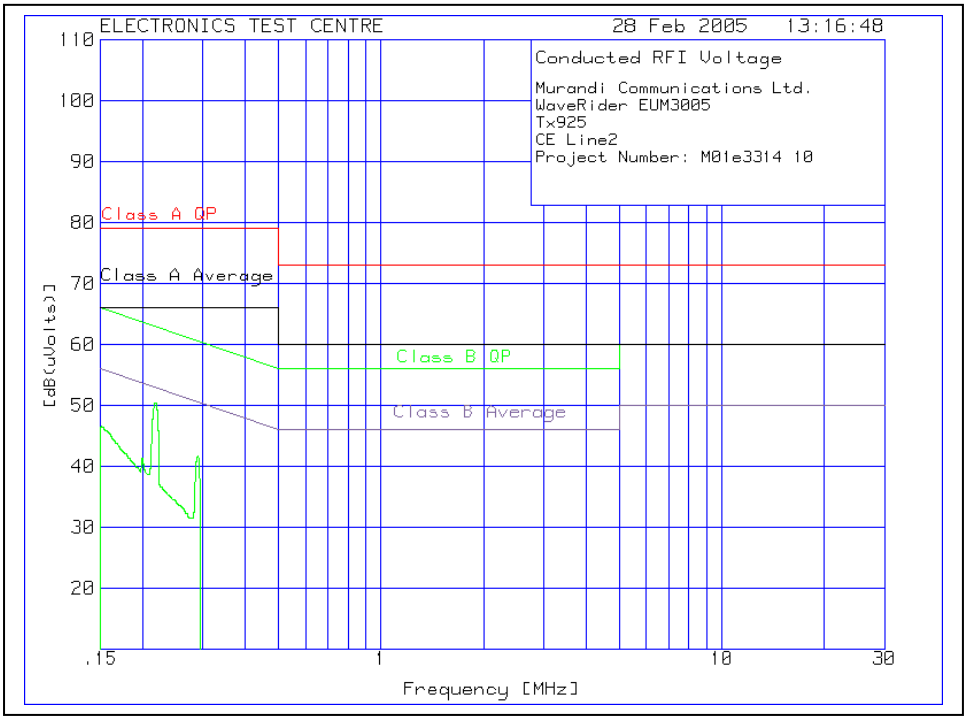
LIMIT 1: Class A QP
LIMIT 2: Class B QP
LIMIT 3: Class A Average
LIMIT 4: Class B Average

av - Average detector

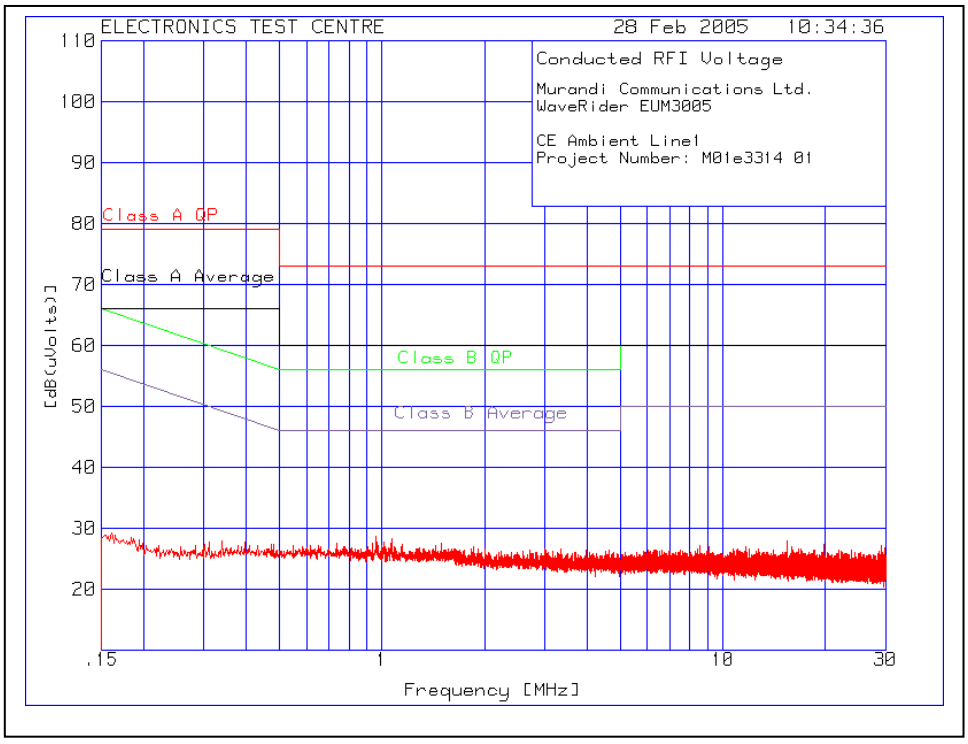
Plot of Conducted Emissions on AC Power Lines:



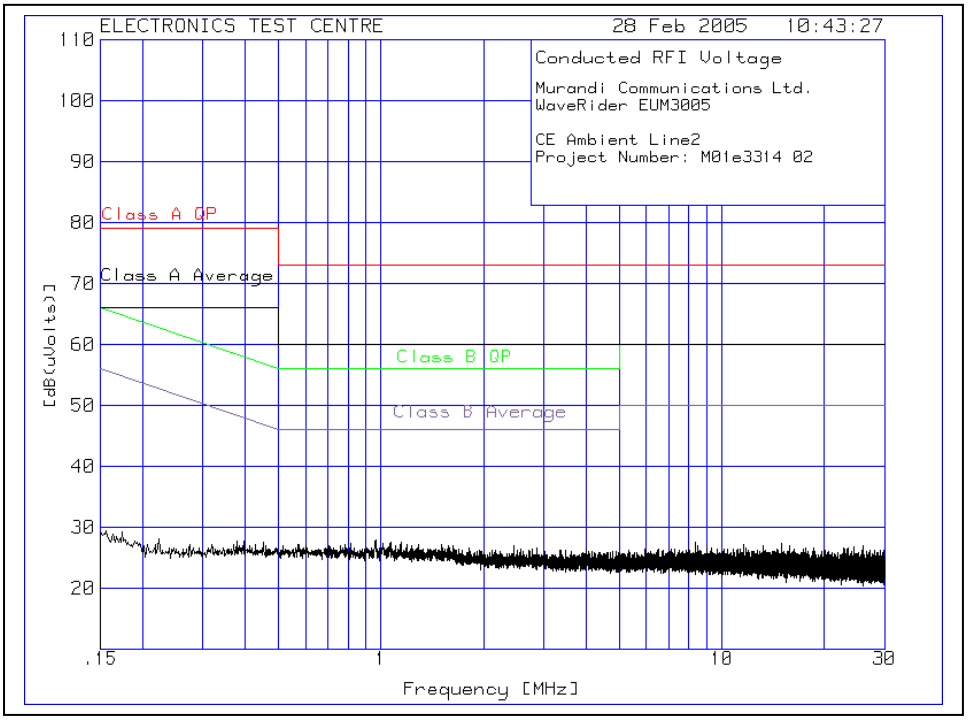
Plot of Conducted Emissions on AC Power Lines:



Plot of Conducted Emissions on AC Power Lines: Test Chamber ambient Line 1



Plot of Conducted Emissions on AC Power Lines: Test Chamber ambient Line 2



4.2 CONDUCTED EMISSIONS MEASURED AT ANTENNA PORT (PART 15.247)

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: David Raynes Test Date: 23 February 2005	Product: EUM3005
Test Result, EUM3005: **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 = 37%	Specifications: FCC Part 15.247c

15.247(a): BW ≥ 500 kHz

Carrier Frequency [MHz]	Bandwidth [MHz]	Delta from limit [MHz]
905	2.630	+2.130
915	2.595	+2.095
925	2.579	+2.079

15.247(b): 1 Watt (30 dBm)

Carrier Frequency [MHz]	RF Power [dBm] [Avg]	Delta [dB from limit]
905	25.15	-4.85
915	25.16	-4.84
925	25.22	-4.78

15.31(e) RF output @ 85% supply voltage

Carrier Frequency [MHz]	RF Power [dBm] [Avg]	Delta [dB from 100% supply]
905	25.10	-0.05
915	25.23	+0.07
925	25.20	-0.02

15.31(e) RF output @ 115% supply voltage

Carrier Frequency [MHz]	RF Power [dBm] [Avg]	Delta [dB from 100% supply]
905	25.12	-0.03
915	25.34	+0.18
925	25.25	+.03

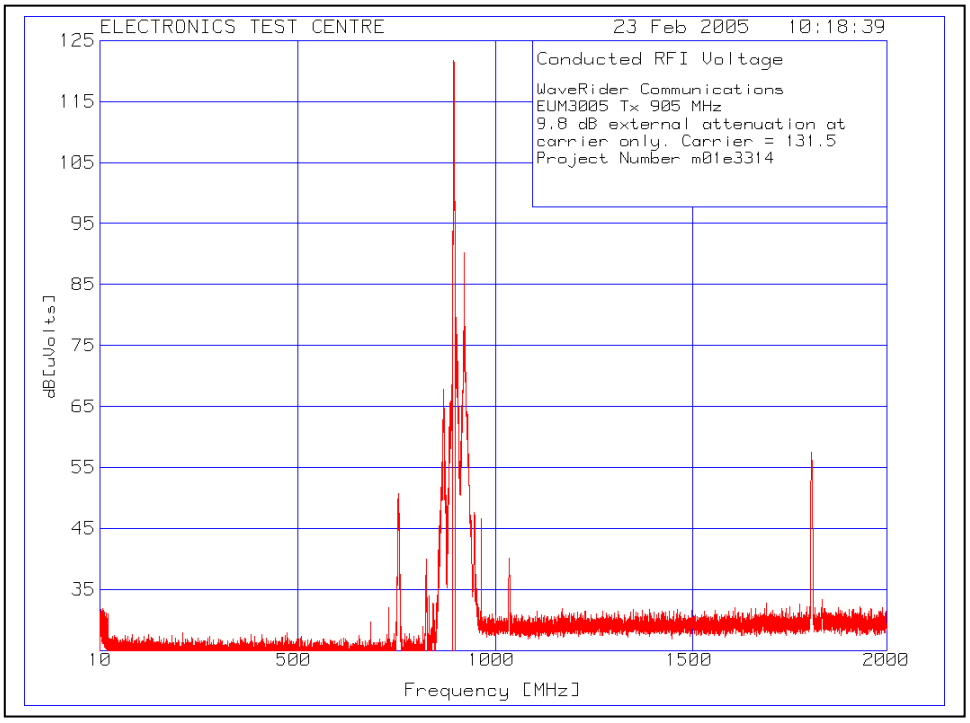
15.247(c): -20 dB **f**c

Carrier Frequency [MHz]	RF Voltage [dBμV]	Limit [dBμV]
905	131.5	111.5
915	132.4	112.4
925	131.9	111.9

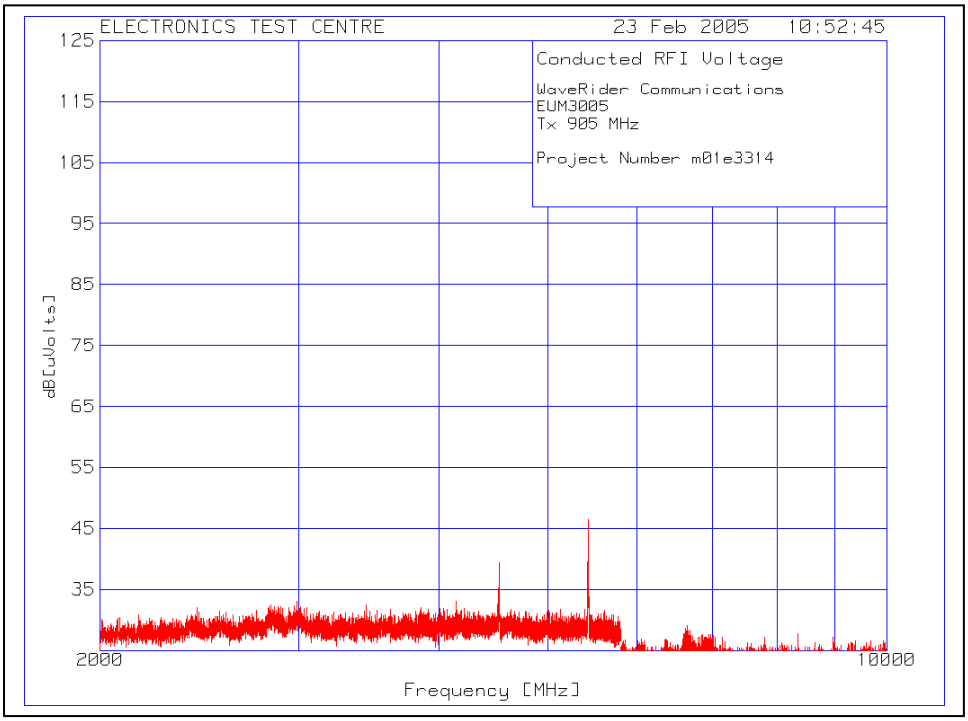
15.247(d): 8 dBm (115 dBμV)

Carrier Frequency [MHz]	RF Power [dBm] [Avg]	Delta [dB from limit]
905	7.3	-0.7
915	7.1	-0.9
925	6.4	-1.6

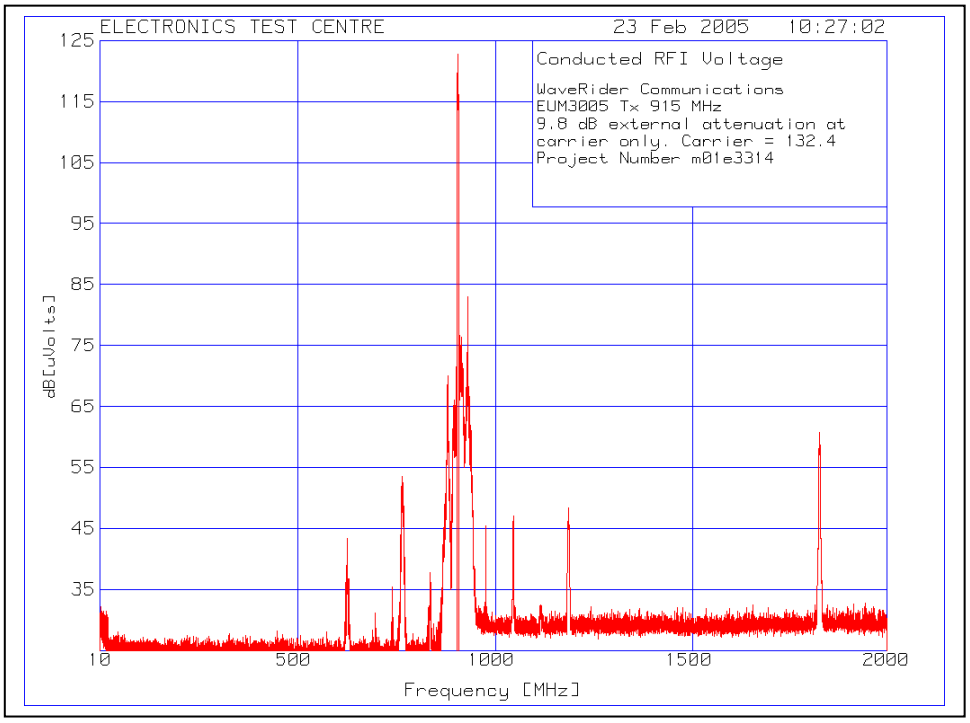
Plot of Conducted Emissions at Antenna Port: $\mathbf{f_c}$ = 905 MHz



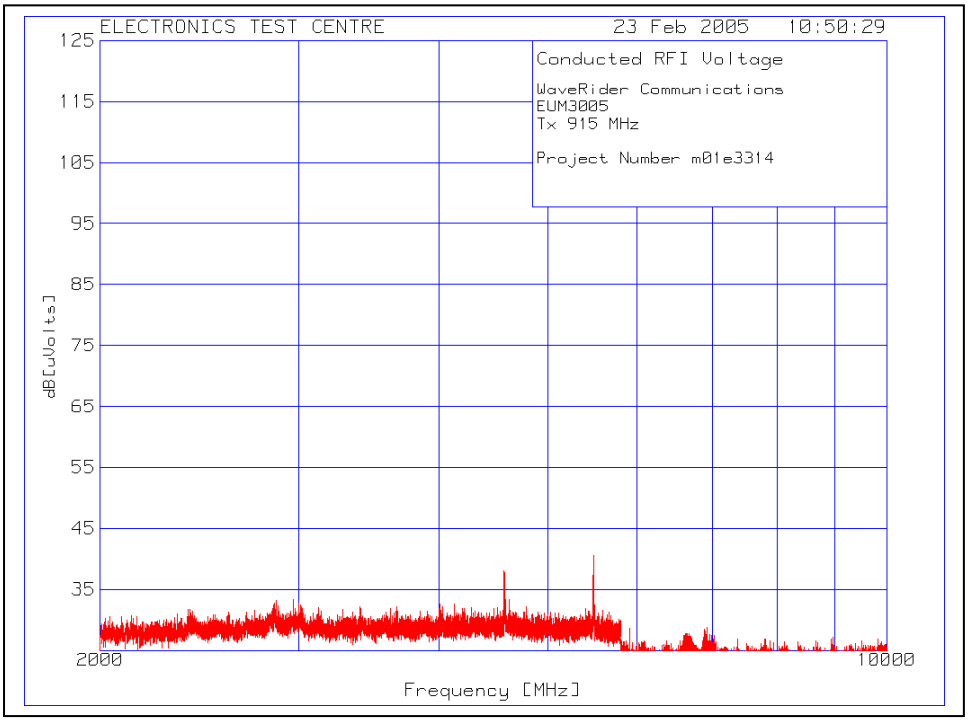
Plot of Conducted Emissions at Antenna Port: $\mathbf{f_c}$ = 905 MHz



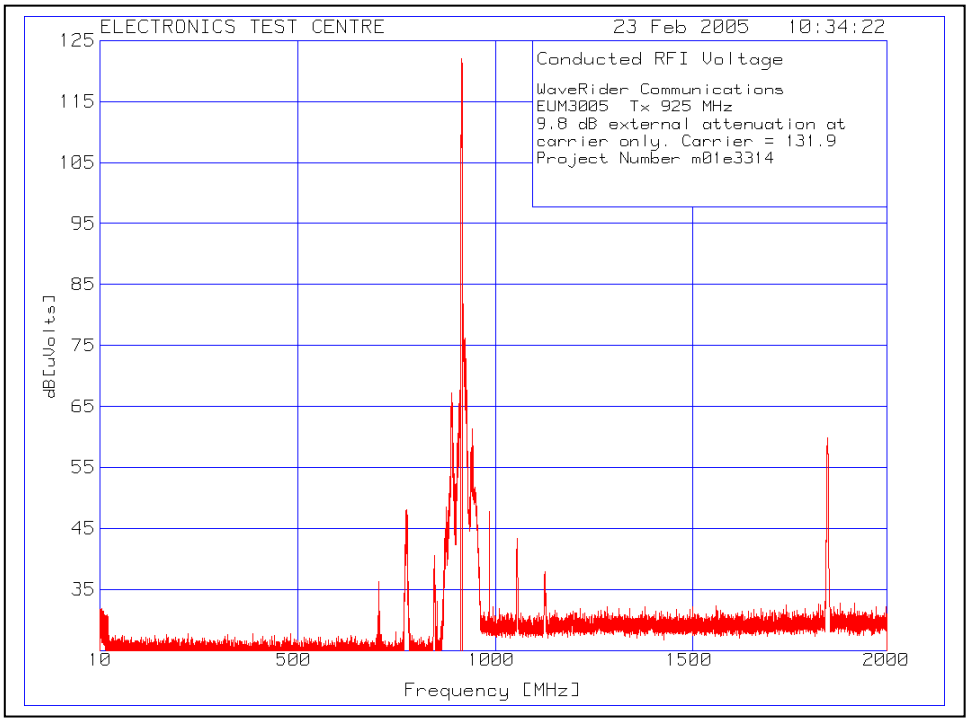
Plot of Conducted Emissions at Antenna Port: $\mathbf{f_c}$ = 915 MHz



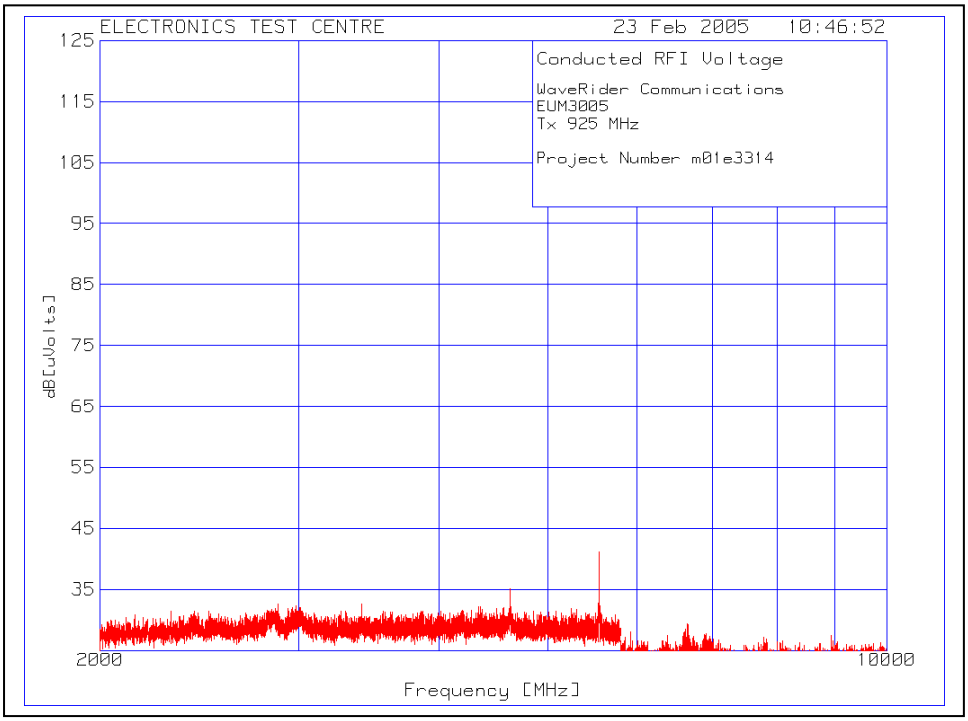
Plot of Conducted Emissions at Antenna Port: $\mathbf{f_c}$ = 915 MHz



Plot of Conducted Emissions at Antenna Port: $\mathbf{f_c}$ = 925 MHz



Plot of Conducted Emissions at Antenna Port: $\mathbf{f_c}$ = 925 MHz



4.3 RADIATED EMISSIONS INCLUDING RESTRICTED BANDS OF OPERATION
4.3a Receive Mode (Part 15.109)

Test Lab: MPB Technologies Inc. Airdrie Test Personnel: David Raynes Test Date: 4 March 2005	Product: EUM3005
Test Result, EUM3005: **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. The EUT was assessed against the requirements of **Class B**. Temperature = 19 °C Humidity = 37 %	Specification: FCC Part 15 Subpart C Frequency [MHz] / Class A QP @ 3m / Class B 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:

Frequency [MHz]	Field Strength [dBμV/m]	Delta [dB from limit]
3899.8752	52.54	-1.44

Vertical:

Frequency [MHz]	Field Strength [dBμV/m]	Delta [dB from limit]
175.9487	39.27	-4.25
548.9476	40.97	-5.05
4874.9436	48.67	-5.31
637.9472	40.37	-5.65
81.4313	34.06	-5.94

There were 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 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	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

Note: When a preamp is used, the resulting gain is compensated.

WaveRider Communications Inc.
EUM3005
Receive Mode; fc = 905 MHz
Vertical polarization
Project Number m01e3314

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uV)]	Limit: 1	2	3 ⇓	4
81.4313	25.6 qp	1.8	6.66	34.06	49.54	50.46	40	40.46
Azimuth: 192	Height: 144	Vert		Margin [dB]:	-15.48	-16.4	-5.94	-6.4
87.9501	23.3 qp	1.8	7.98	33.14	49.54	50.46	40	40.46
Azimuth: 36	Height: 131	Vert		Margin [dB]:	-16.4	-17.32	-6.86	-7.32
131.9468	23.32 qp	2.36	11.32	37	53.98	50.46	43.52	40.46
Azimuth: 15	Height: 101	Vert		Margin [dB]:	-16.98	-13.46	-6.52	-3.46
175.9487	25.01 qp	2.72	11.54	39.27	53.98	50.46	43.52	40.46
Azimuth: 166	Height: 102	Vert		Margin [dB]:	-14.71	-11.19	-4.25	-1.19
549.9476	18.06 qp	4.9	18.01	40.97	56.9	57.46	46.02	47.46
Azimuth: 339	Height: 102	Vert		Margin [dB]:	-15.93	-16.49	-5.05	-6.49
637.9472	55.51qp	5.46	19.4	40.37	56.9	57.46	46.02	47.46
Azimuth: 23	Height: 100	Vert		Margin [dB]:	-16.53	-17.09	-5.65	-7.09

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

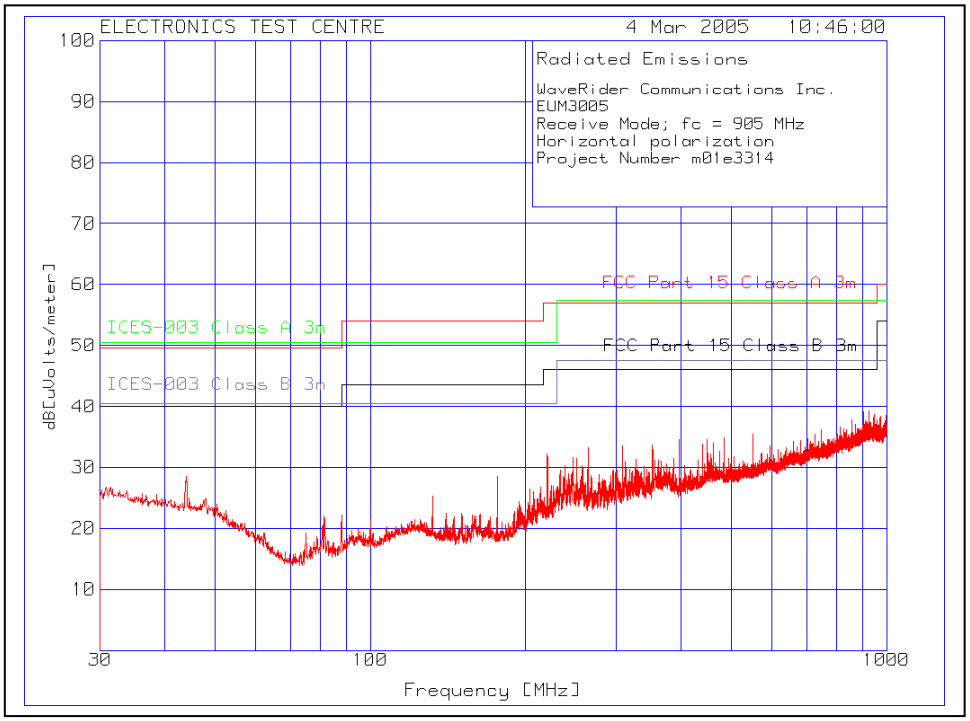
qp - Quasi-Peak detector

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uV)]	Limit: 1	2 ⇓
3899.8752	57.1av	-36.8	32.24	52.54	60	53.98
Azimuth: 38	Height: 203	Horz		Margin [dB]:	-7.46	-1.44
3900.0054	57.1av	-36.8	32.3	45.3	60	53.98
Azimuth: 68	Height: 278	Vert		Margin [dB]:	-14.7	-8.68
4874.9436	49.1av	-33.51	33.08	48.67	60	53.98
Azimuth: 225	Height: 147	Horz		Margin [dB]:	-11.33	-5.31

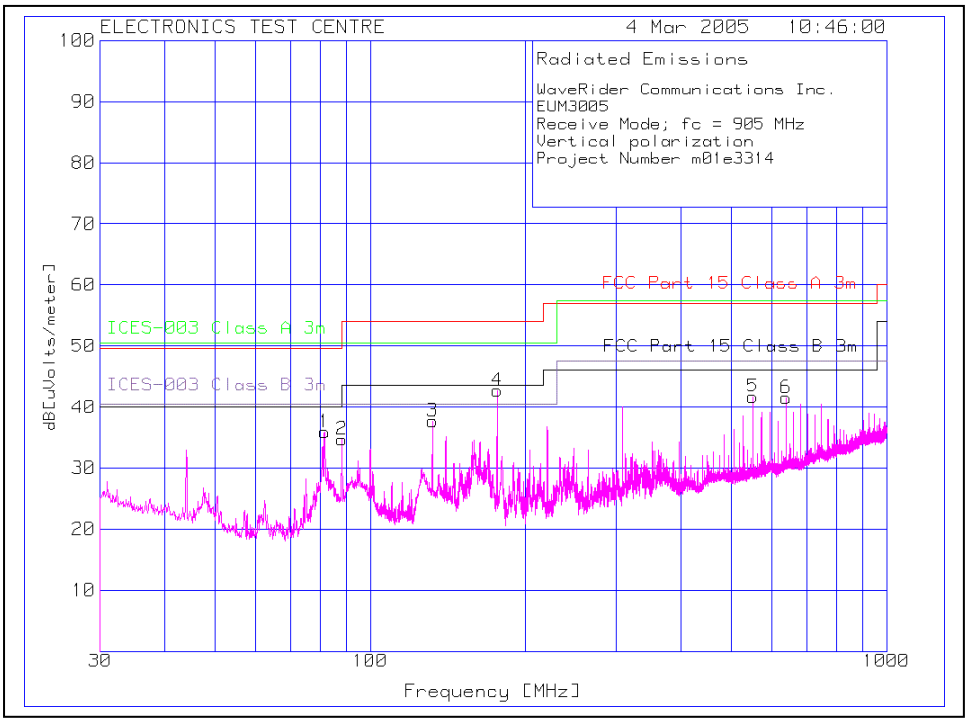
LIMIT 1: FCC Part 15 Class A 3m
LIMIT 2: FCC Part 15 Class B 3m ⇐

av - Average detector

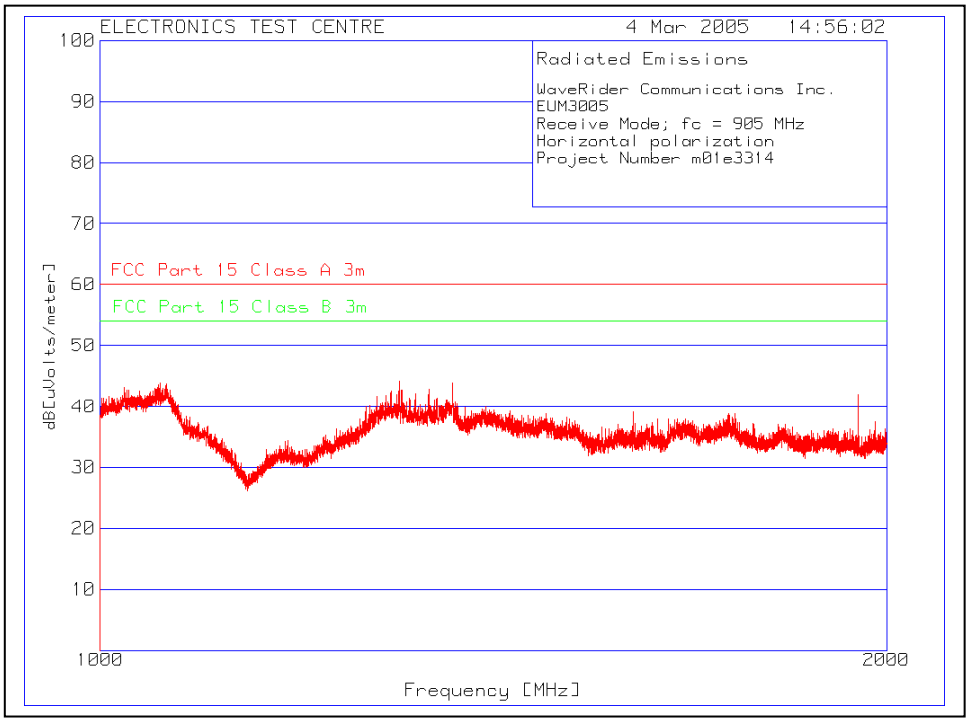
Plot of Radiated Emissions: Receive mode $\mathbf{f_c}$ = 905 MHz



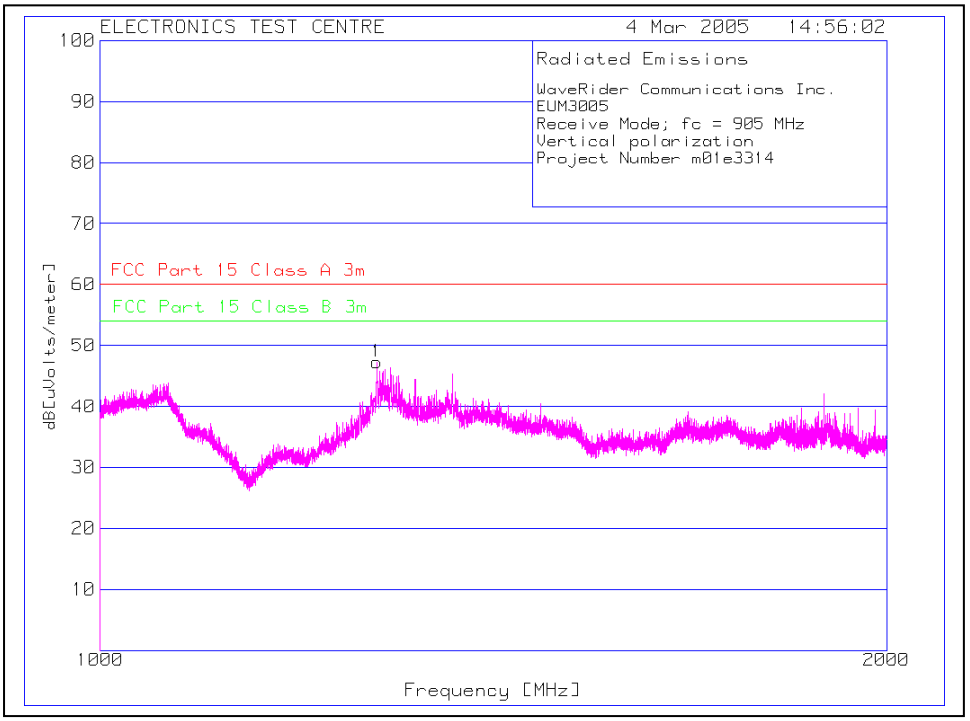
Plot of Radiated Emissions: Receive mode $\mathbf{f_c}$ = 905 MHz



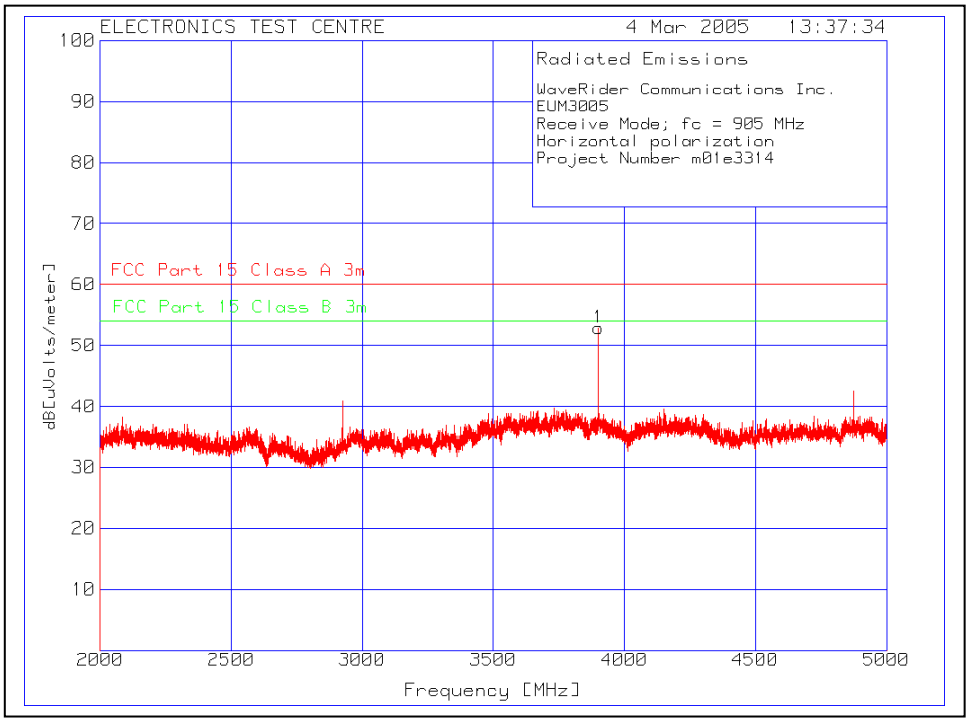
Plot of Radiated Emissions: Receive mode $\mathbf{f_c}$ = 905 MHz



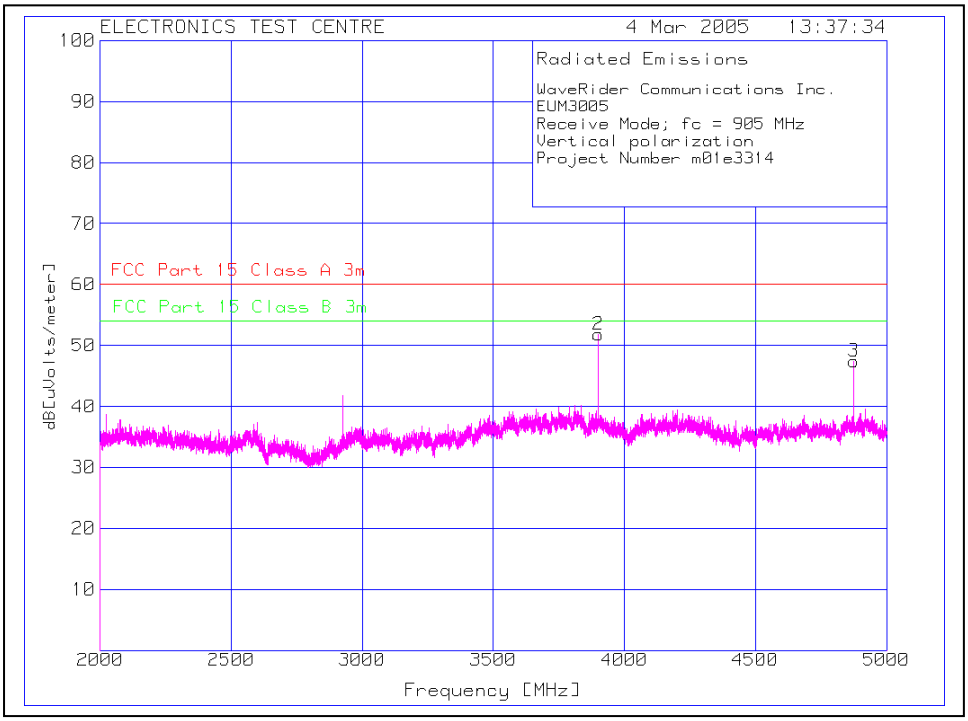
Plot of Radiated Emissions: Receive mode $\mathbf{f_c}$ = 905 MHz



Plot of Radiated Emissions: Receive mode $\mathbf{f_c}$ = 905 MHz



Plot of Radiated Emissions: Receive mode $\mathbf{f_c}$ = 905 MHz



4.3b Transmit Mode (Part 2.1053, 15.205, 15.209 & 15.247)

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: Jianming Zhang David Raynes Test Date: 23 February – 4 March 2005	Product: EUM3005
Test Result, EUM3005: **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. **Emission levels should meet the requirements with a margin of 6dB.**	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

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)
905	974.9980	44.66	53.98	-9.32	V	120	265
905	2715.0417	27.87	53.98	-26.11	H	110	143
905	2713.2293	37.30	53.98	-16.68	V	100	253
905	3899.9406	44.44	53.98	-9.54	H	179	6
905	3899.9602	46.40	53.98	-7.58	V	101	80
905	4524.8797	31.65	53.98	-22.34	H	147	181
905	4525.1238	38.20	53.98	-15.78	V	129	261
905	4874.9361	38.77	53.98	-15.21	H	151	175
905	4874.9488	44.77	53.98	-9.21	V	159	18
905	5430.0781	29.40	53.98	-24.58	V	149	296
915	3659.9674	39.44	53.98	-14.54	H	124	98
915	3659.9456	37.85	53.98	-16.13	V	110	44
915	3939.9708	50.08	53.98	-3.90	H	105	37
915	3939.9580	46.44	53.98	-7.54	V	112	67
915	4574.5843	42.90	53.98	-11.08	H	122	345
915	4575.166	32.05	53.98	-32.93	V	113	87
915	4924.9685	44.08	53.98	-9.90	H	139	266
915	4924.9537	45.50	53.98	-8.48	V	113	61
925	3699.9590	37.77	53.98	-16.21	H	103	95
925	3699.9650	35.70	53.98	-18.28	V	103	32
925	4624.8620	41.56	53.98	-12.42	H	119	341
925	4624.8494	31.11	53.98	-22.87	V	126	73
925	4974.9594	41.20	53.98	-12.78	H	135	271
925	4974.9666	39.63	53.98	-14.35	V	175	240

Carrier and spurious emissions: nominal $\mathbf{f}_c$ = 905 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)	ERP Limit (Watts)	Delta (Watts)
904.5501	284	108	H	87.3	87.3	22.28	22.28	5.90	28.18	26.03	36	-9.97	0.400	4	-3.600
904.5487	260	133	V	93.5	93.5	26.96	26.96	4.40	31.36	29.21	36	-6.79	0.822	4	-3.178
1809.3595	98	103	H							≤ -33	-13	≥ -20			
1810.0137	95	107	V							≤ -33	-13	≥ -20			
2715.0417	143	110	H							≤ -33	-13	≥ -20			
2713.2293	253	100	V							≤ -33	-13	≥ -20			
3899.9406	6	179	H							≤ -33	-13	≥ -20			
3899.9602	80	101	V							≤ -33	-13	≥ -20			
4524.8797	181	147	H							≤ -33	-13	≥ -20			
4525.1238	261	129	V							≤ -33	-13	≥ -20			
4874.9361	175	151	H							≤ -33	-13	≥ -20			
4874.9488	18	159	V							≤ -33	-13	≥ -20			
5430.0781	296	149	V							≤ -33	-13	≥ -20			
5849.9398	328	155	V							≤ -33	-13	≥ -20			

Investigation was conducted to 9500 MHz. All other emissions were beneath the measuring system noise floor.

Carrier and spurious emissions: nominal $\mathbf{f}_c$ = 915 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)	ERP Limit (Watts)	Delta (Watts)
914.5513	287	107	H	89.3	89.3	23.84	23.84	5.8	29.64	27.49	36	-8.51	0.561	4	-3.439
914.8618	84	140	V	93.6	93.6	27.21	27.21	4.3	31.51	29.36	30	-6.64	0.824	4	-3.176
1829.9537	189	115	H							≤ -33	-13	≥ -20			
1829.8228	11	109	V							≤ -33	-13	≥ -20			
2954.9732	348	103	H							≤ -33	-13	≥ -20			
2954.9705	40	108	V							≤ -33	-13	≥ -20			
3659.9674	98	124	H							≤ -33	-13	≥ -20			
3659.9456	44	110	V							≤ -33	-13	≥ -20			
3939.9708	37	105	H							≤ -33	-13	≥ -20			
3939.9580	67	112	V							≤ -33	-13	≥ -20			
4574.5843	345	122	H							≤ -33	-13	≥ -20			
4575.1660	87	113	V							≤ -33	-13	≥ -20			
4924.9685	266	139	H							≤ -33	-13	≥ -20			
4924.9537	61	113	V							≤ -33	-13	≥ -20			
5489.9493	6	124	H							≤ -33	-13	≥ -20			
5489.6208	67	117	V							≤ -33	-13	≥ -20			
5909.9556	178	109	H							≤ -33	-13	≥ -20			
5909.9545	220	159	V							≤ -33	-13	≥ -20			
6894.9448	230	127	V							≤ -33	-13	≥ -20			
7879.9504	176	148	V							≤ -33	-13	≥ -20			

Investigation was conducted to 9500 MHz. All other emissions were beneath the measuring system noise floor.

Carrier and spurious emissions: nominal $\mathbf{f}_c$ = 925 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)	ERP Limit (Watts)	Delta (Watts)
924.5428	282	103	H	90.8	90.8	20.67	20.67	5.9	26.57	24.42	36	-11.58	0.277	4	-3.723
924.5525	260	126	V	93.7	93.7	27.13	27.13	4.3	31.43	29.28	30	-6.72	0.847	4	-3.153
1849.9645	120	102	H							≤ -33	-13	≥ -20			
1849.8960	284	139	V							≤ -33	-13	≥ -20			
2984.9578	93	103	H							≤ -33	-13	≥ -20			
2984.9746	37	104	V							≤ -33	-13	≥ -20			
3699.9590	95	103	H							≤ -33	-13	≥ -20			
3699.9650	32	106	V							≤ -33	-13	≥ -20			
4624.8620	341	119	H							≤ -33	-13	≥ -20			
4624.8490	73	126	V							≤ -33	-13	≥ -20			
4974.9594	271	135	H							≤ -33	-13	≥ -20			
4974.9666	240	175	V							≤ -33	-13	≥ -20			
5549.9655	355	112	H							≤ -33	-13	≥ -20			
5549.9194	58	124	V							≤ -33	-13	≥ -20			
5969.9523	177	120	H							≤ -33	-13	≥ -20			
5969.9629	219	157	V							≤ -33	-13	≥ -20			
6964.9639	230	139	V							≤ -33	-13	≥ -20			
7959.9332	175	136	V							≤ -33	-13	≥ -20			

Investigation was conducted 9500 MHz. All other emissions were beneath the measuring system noise floor.

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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 WaveRider Communications Inc. specifications, the EUT was not grounded.

5.3 POWER

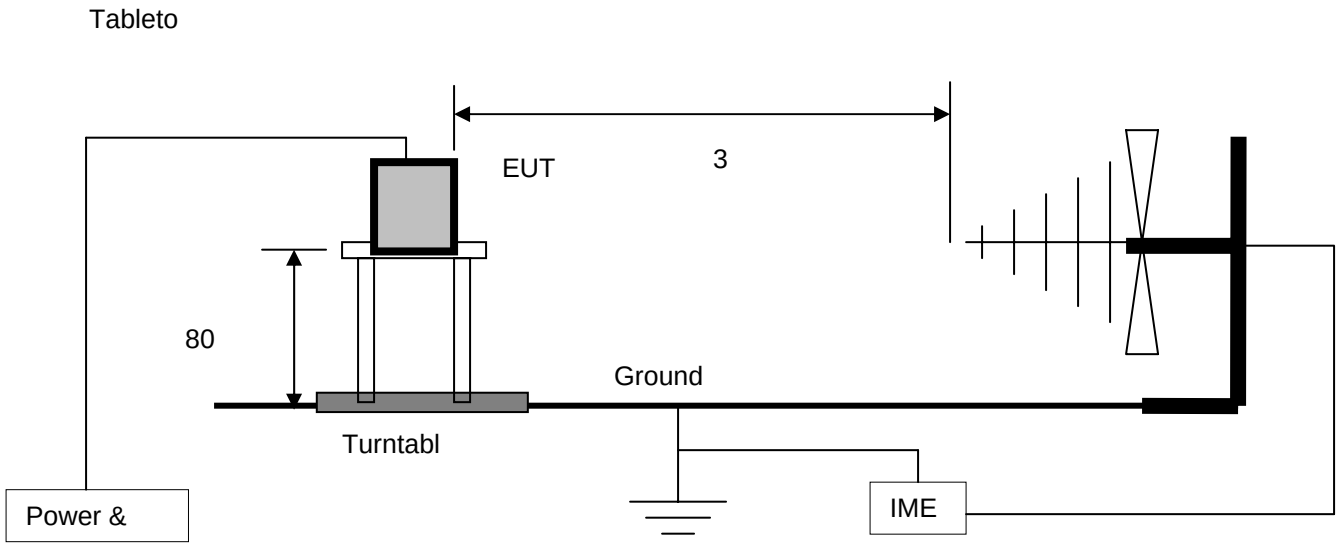
AC power was supplied via an Underwriter's Laboratories ULW100-69, 100 dB, 100 Ampere wall mounted filter. Bonding to ground is implemented at the chamber wall.

5.4 TEST CONFIGURATION

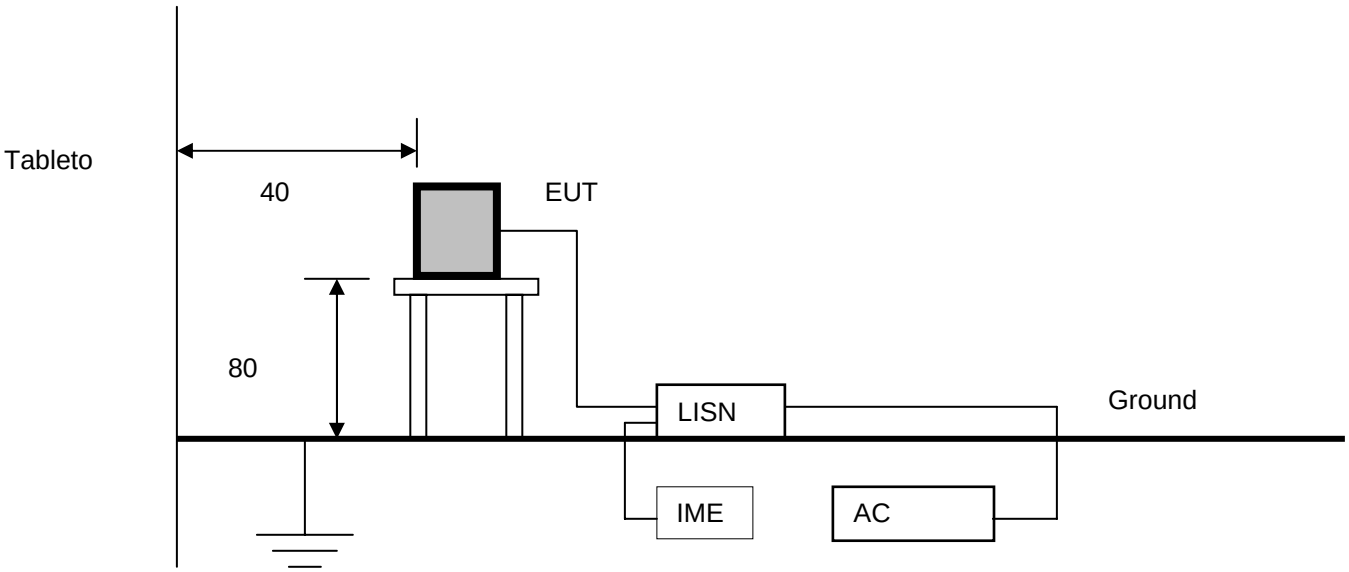
5.5.1 Tabletop Equipment

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

Radiated



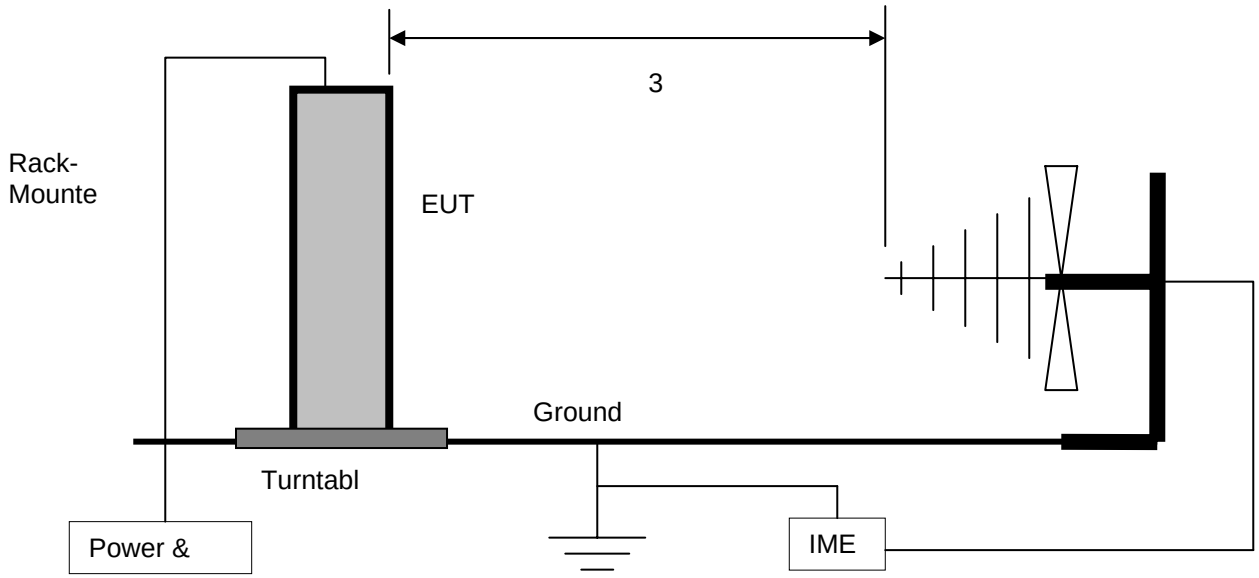
Conducted



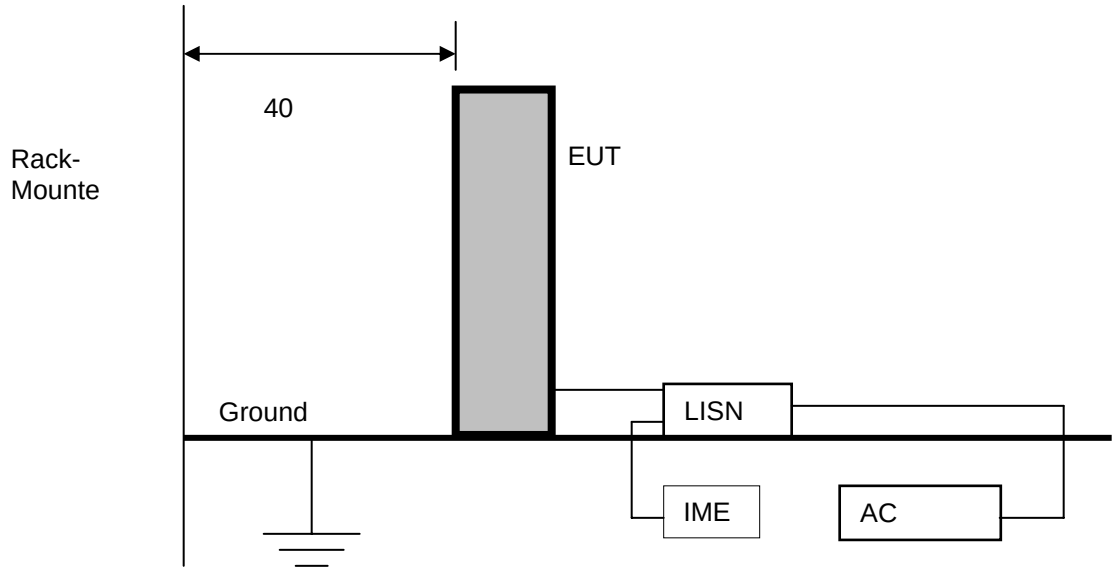
5.5.2 Rack Mount

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



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

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
RF Preselector	Hewlett Packard	85685A	9563	25 October 2005
Quasi-Peak Adapter	Hewlett Packard	85650A	4411	20 August 2005
Quasi-Peak Adapter	Hewlett Packard	85650A	9243	20 August 2005
Measurement System Software	Underwriters Laboratories	Version 6.0	4443	n/a
Line Impedance Stabilization Network	EMCO	3825/2r	9331	5 January 2006
Line Impedance Stabilization Network	EMCO	3825/2r	9259	5 January 2006
Biconilog Antenna	ARA	Lpb-2520/A	4318	7 January 2007
Biconical Antenna	EMCO	3104	9257	12 January 2007
Dual Ridged Guide Antenna	EMCO	3115	9588	5 January 2007
Log-periodic Array	EMCO	3147	20721	18 January 2007
Low Noise Amplifier	MITEQ	JS43-01001800-21-5P	4354	7 January 2007

Appendix A

EUM3005 Wireless Modem

Test Sample Description

(From data provided by WaveRider Communications Inc.)

Product Application	**Product Category**
Commercial 4 Military o	Telecommunications o Information Technology 4 Surface Transportation o Aerospace o Test & Measurement o Other o _____
Product Name	EUM3005
Part/Model No.	EUM3005
Serial Number	n/a
Power Requirements: **(Voltage, AC/DC, Hz, Current)**	100 - 240 VAC 47 - 63 Hz, 0.5A (AC-DC adapter) Elpac Power Systems 3578 (4.2VDC, 3A),Model:3578,S/N:000020 Rex.x 07/03
Typical Installation Instructions or Configuration	Connected via an Ethernet cable to a personal computer or an Ethernet router. Antenna fixed mounted at center of the turntable 20cm from the Wireless Modem.
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 One power supply cable One Antenna (Diversity Antenna) 20dB pad with dc block,1m long RF cable used during Conducted at Antenna port
Brief Functional Description	The EUM3005 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.