



UL International EMC Services
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September 8, 2003

WAV, Inc.
Attn: Mr. Chuck D. Bolvin
245 West Roosevelt Road
Building 7, Suite 48
West Chicago, IL 60185

UL Reference: File MC1343, Project 03NK27735

Subject: EMC Test and Measurement Report for
Model SPT1800

Dear Mr. Bolvin:

We have provided with this letter your EMC Test Report for the above referenced model. The product was determined to comply with the requirements noted in the report.

Please review the attached report and direct any questions or comments to me. Samples were returned following testing.

We appreciate your interest in UL's EMC Services, and encourage you to contact us in the future should you need EMC test services. This closes Project 03NK27735.

Best regards,

Reviewed by:

A handwritten signature in black ink, appearing to read 'Lou Madjarov', with a checkmark at the end.

Lou Madjarov (Ext 43957)
EMC Sr. Project Engineer
International EMC Services

A handwritten signature in black ink, appearing to read 'Eric Parent', with a horizontal line at the end.

Eric Parent
EMC Staff Engineering Associate
International EMC Services

EMC – TEST REPORT

Issue Date: September 8, 2003

√ EMISSIONS IMMUNITY

Test Report File No. : MC1343
 Project No. : 03NK27735
 Model / Type : **Model SPT1800**
 Kind of Product : **Wrist-worn data terminal with integrated
Cisco Aironet AIR-LMC352 PCMCIA
WLAN Module**

Applicant : WAV, Inc.

Address : 245 West Roosevelt Road
 : Building 7, Suite 48
 : West Chicago, IL 60185

Manufacturer : Same as Applicant

Test Result : COMPLIANT

This report without appendices consists of 9 pages. Appendix A contains test photos, Appendix B contains original test data, Appendix C contains sample calculations and Appendix D contains an Antenna Calibration Schedule.

The data contained in this report reflects only the items tested in the configurations and mode of operations described. An attempt has been made to arrange the EUT, with the equipment provided, into a test configuration which maximizes the observed emissions of the EUT while simulating, as close as practical, a typical end-use installation. The photos and data provided in this report document that configuration.

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REPORT DIRECTORY

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EMISSIONS

- | | |
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- | | |
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| C | Sample Calculations |
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1.0 GENERAL PRODUCT DESCRIPTION

The EUT is a wrist-worn data terminal with integrated Cisco Aironet AIR-LMC352 PCMCIA WLAN Module, FCC ID: LDK102040.

1.0.1 Equipment Mobility:

Wrist-worn (portable)

1.0.2 Test Voltage and Frequency:

<u>Voltage (V)</u>	<u>Frequency (Hz)</u>
3.6V	DC

1.1 MODEL DIFFERENCES

Any other model(s) represented by the models tested in this investigation will be documented by the manufacturer.

1.2 ENVIRONMENTAL CONDITIONS IN TEST LAB

Temperature:	20-25 °C
Relative Humidity:	30-60% RH
Atmospheric Pressure:	860-1060 mbar

1.3 CALIBRATION OF EQUIPMENT USED FOR MEASUREMENT

All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less.

All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST), therefore, all test data recorded in this report is traceable to NIST.

1.4 EUT CONFIGURATION(s)

See Appendix A for individual set-up configuration(s). In addition to the EUT, the following peripheral devices and/or cables were connected during the measurement:

Device	Manufacturer	Model	Serial #	FCC ID
EUT	Symbol Technologies	SPT1800	SA0040K11U	PB2SPT1800
Modular Transmitter	CISCO	AIR-LMC352	VEM062807MW	LDK102040

1.5 ANTENNA CONFIGURATIONS COVERED

Antenna	EUT Output Power	Antenna Gain	Total EIRP	Exposure Category
OMNI	20dBm (100mW)	0 dBi	20dBm (100mW)	Hand Held

1.6 EUT OPERATING MODE(s)

The equipment under test was operated during the measurements under the following conditions:

Continuous operation.

1.7 DEVICE MODIFICATIONS

The following modifications were necessary for compliance:

None.

2.0 EMISSIONS TEST REGULATIONS

47 CFR Part 15 Subpart B: 2002 + ANSI C63.4 – 1992

The device was evaluated to 15.247 of CFR 47, Part 15

Since the EUT is identical to a previously certified device except as noted in Section 1.0, only a limited test program was required. Testing was covered / required as noted below:

Test / Requirement	CFR 47, Part 15 Reference	Test Required	Notes
Conducted emission	15.207	Not Applicable	EUT is battery-operated device with no provision for direct connection to AC mains.
6dB Bandwidth	15.247(a)(2)	No	Considered covered by tests performed on previously certified device. (Cisco)
RF Conducted Peak Output Power	15.247(b)	No	Considered covered by tests performed on previously certified device. (Cisco)
Reduced output if directional gain exceeds 6dBi	15.247(b)(3)	No	Considered covered by tests performed on previously certified device. (Cisco)
RF Safety (SAR for portable devices)	15.247(b)(4)	No	Per manufacturer's specifications there are no provisions to body –worn and it is only intended to be used as hand-held device.
Spurious emissions (RF conducted & radiated)	15.247(c)	*Radiated Only	Conducted spurious emissions considered covered by tests performed on previously certified device. Radiated spurious measurements were performed as part of this investigation.
Power spectral density	15.247(d)	No	Considered covered by tests performed on previously certified device.
Processing gain	15.247(e)	No	Considered covered by tests performed on previously certified device.

- Since the transmitter operates over a frequency range greater than 10MHz, measurements must be performed on low, mid and high channels per 15.31(m).

RADIATED ELECTRIC FIELD EMISSIONS, 30 -1000MHz

Test Location

10 Meter Semi-Anechoic Chamber

UL Procedure

3014ANBK-LPG-002

Test Instruments

Spectrum Analyzer / Quasi-peak Adapter / Preamplifier / Preselector

Hewlett Packard Model 8566B Spectrum Analyzer

Model 85650A Quasi-peak Adapter

Miteq AM-3A-000110-N Preamp No. FCA4003, EMC4016, EMC4151

Model 85685A RF Preselector No. EMC4015

Antennas

Chase EMC Ltd., Biconical Antenna Model VBA6106A

S/N 1246

Chase EMC Ltd., Log Periodic Antenna Model UPA6108

S/N 1120

Frequency Range of Measurement

30MHz-1000MHz

Measurement Distance

10 meters

Test Results

The requirements are:

MET

Remarks

See App. B for complete test results.

RADIATED ELECTRIC FIELD EMISSIONS, 1 - 26.5 GHz

Test Location

10 Meter Semi-Anechoic Chamber

UL Procedure for using UL BOMS (Band Optimized Measurements System.)

3014ANBK

Test Instruments

Measurement Software

UL-EMC Program, Version V90

Spectrum Analyzer

Rhode & Schwarz, Model FSEK20, EMC No. 4182

Last Cal. 1-14-03, Next. Cal. 1-14-04

Antennas refer to Appendix D for list and calibration dates

Frequency Range of Measurement

1 to 26.5 GHz

Measurement Distance

3 meters

Test Results

The requirements are:

MET

Remarks

See App. B for complete test results.

3.0 IMMUNITY TEST REGULATIONS

Immunity testing was not performed.

4.0 GENERAL REMARKS

Sample Receipt Date : August 28, 2003

Test Dates

Start : August 28, 2003

End : August 28, 2003

4.1 SUMMARY

The requirements according to the technical regulations are:

MET

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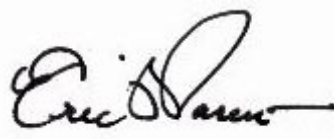
FCC Site Number: 31040/SIT 1300F2

Test Engineer:

Reviewed by:

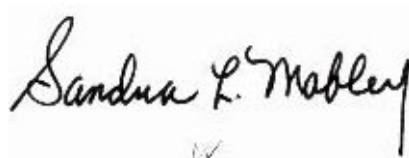


Lou Madjarov (Ext 43957)
Senior Project Engineer
International EMC Services



Eric P. Parent (Ext. 42939)
Staff Engineering Associate
International EMC Services

Report writer:



Sandra L. Mobley
Project Handler III
International EMC Services

APPENDIX A

PHOTOS



Radiated Emissions



Radiated Emissions



**Radiated Emissions
X-AXIS**



**Radiated Emissions
Y-AXIS**

APPENDIX B

TEST DATA

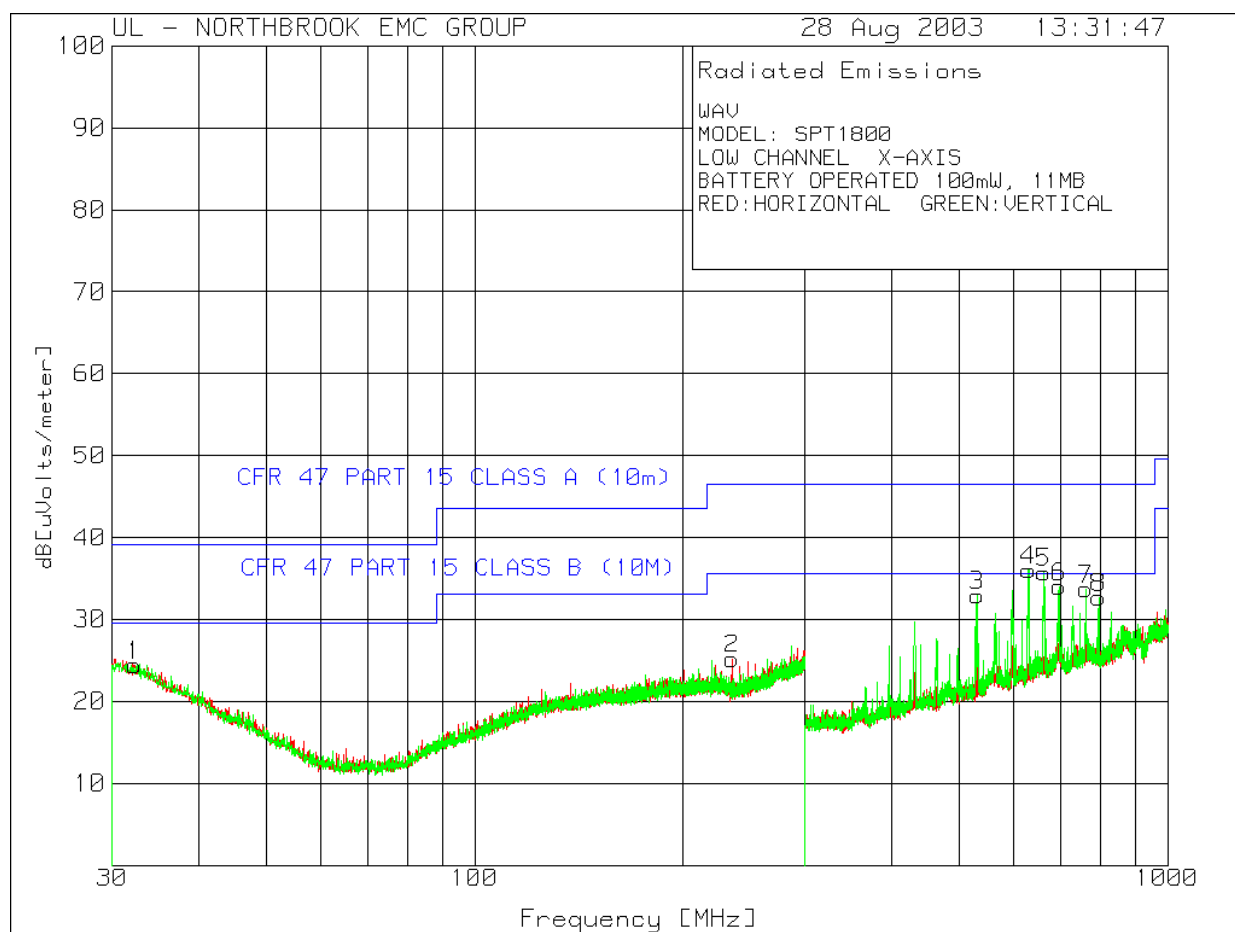
EMISSIONS

Radiated Electric Field Emissions

UNDERWRITERS LABORATORIES INC.**Radiated Emissions**

Date Tested: 8-28-2003

Manufacturer : WAV
Equipment Under Test : SPT1800 Modular Transmitter
Requirement : CFR47 Part 15 B, (Battery Operated)
Detection Mode : QP,
Bandwidth : 120 kHz
Measurement Distance : 10 meter
Antenna Type : 30 - 300 MHz, Biconical
 300 - 1000 MHz, Log-Periodic



WAV
 MODEL: SPT1800
 LOW CHANNEL X-AXIS
 BATTERY OPERATED 100mW, 11MB
 RED:HORIZONTAL GREEN:VERTICAL

No.	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 - 300MHz -----									
1	32.2933	35.79 pk	-30.19	18.8	24.4	40	30	39.08	29.54
	Azimuth:262	Height:300	Horz	Margin [dB]		-15.6	-5.6	-14.68	-5.14
2	235.1811	38.68 pk	-29.16	15.68	25.2	47	37	46.44	35.56
	Azimuth:134	Height:199	Horz	Margin [dB]		-21.8	-11.8	-21.24	-10.36
Range: 4 300 - 1000MHz -----									
3	531.1766	46.43 pk	-31.54	18.01	32.9	47	37	46.44	35.56
	Azimuth:11	Height:299	Vert	Margin [dB]		-14.1	-4.1	-13.54	-2.66
4	630.3273	47.25 pk	-31.03	19.78	36	47	37	46.44	35.56
	Azimuth:39	Height:299	Vert	Margin [dB]		-11	-1	-10.44	.44
5	663.3775	46.23 pk	-30.77	20.24	35.7	47	37	46.44	35.56
	Azimuth:198	Height:198	Vert	Margin [dB]		-11.3	-1.3	-10.74	.14
6	697.302	42.97 pk	-30.77	21.8	34	47	37	46.44	35.56
	Azimuth:310	Height:198	Vert	Margin [dB]		-13	-3	-12.44	-1.56
7	762.1784	42.68 pk	-30.89	21.91	33.7	47	37	46.44	35.56
	Azimuth:87	Height:198	Vert	Margin [dB]		-13.3	-3.3	-12.74	-1.86
8	795.5783	42.14 pk	-30.92	21.48	32.7	47	37	46.44	35.56
	Azimuth:55	Height:198	Vert	Margin [dB]		-14.3	-4.3	-13.74	-2.86

LIMIT 3: CFR 47 PART 15 CLASS A (10m)

LIMIT 4: CFR 47 PART 15 CLASS B (10M)

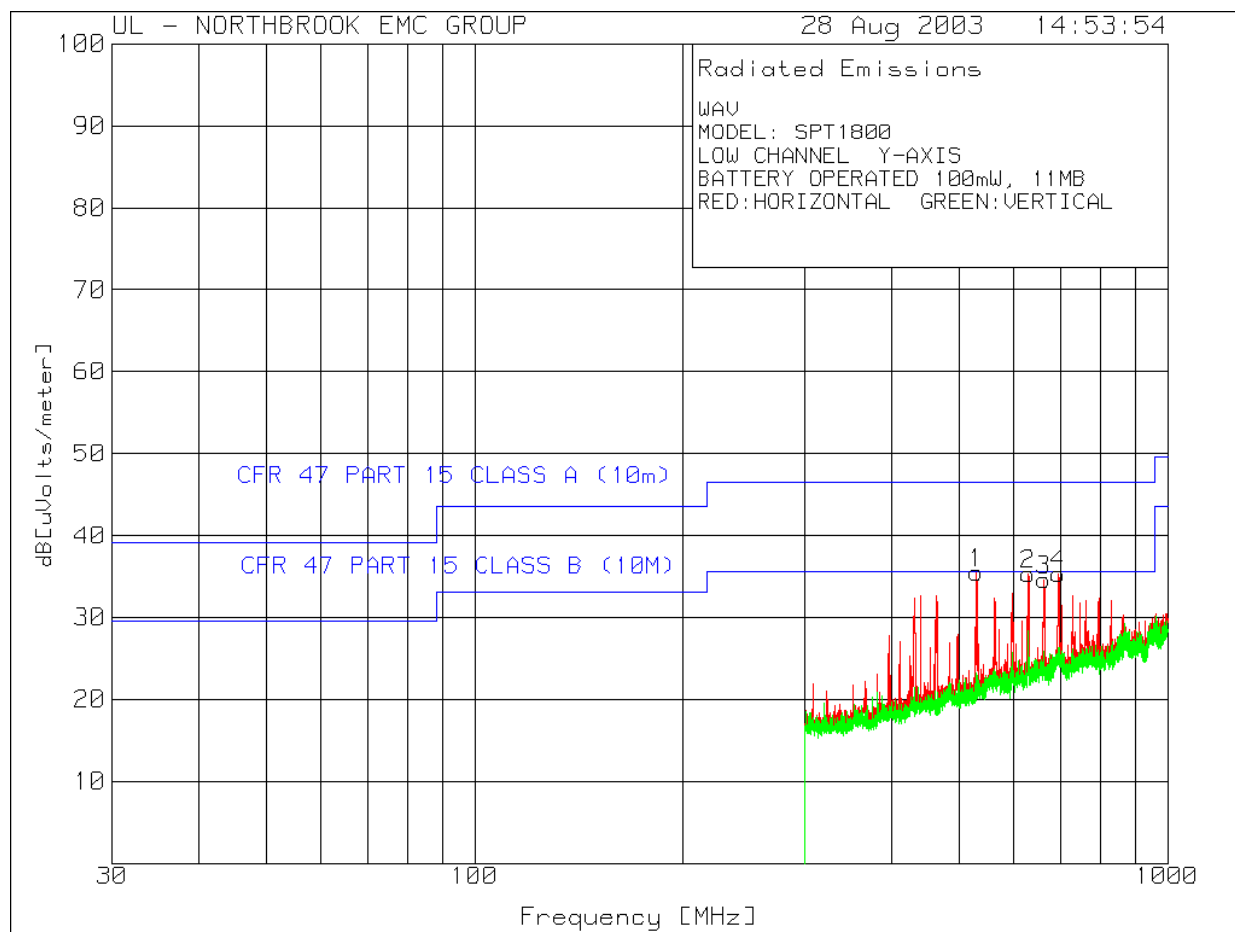
WAV
 MODEL: SPT1800
 LOW CHANNEL X-AXIS
 BATTERY OPERATED 100mW, 11MB
 RED:HORIZONTAL GREEN:VERTICAL

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level Limit:1 dB[uVolts/meter]	2	3	4
=====							
Range: 4 300 - 1000MHz							
530.5163	44.13 qp	-31.6	18	30.53		46.4	35.6
Azimuth: 352 Height:301 Vert				Margin [dB]:		-15.87	-5.07
630.4213	44.34 qp	-31	19.8	33.14		46.4	35.6
Azimuth: 52 Height:285 Vert				Margin [dB]:		-13.26	-2.46
663.4036	43.82 qp	-30.8	20.2	33.22		46.4	35.6
Azimuth: 341 Height:259 Vert				Margin [dB]:		-13.18	-2.38
696.4834	40.48 qp	-30.7	21.8	31.58		46.4	35.6
Azimuth: 346 Height:249 Vert				Margin [dB]:		-14.82	-4.02
762.6083	37.1 qp	-30.9	21.9	28.1		46.4	35.6
Azimuth: 44 Height:194 Vert				Margin [dB]:		-18.3	-7.5

LIMIT 1: NONE
 LIMIT 2: NONE
 LIMIT 3: CFR 47 PART 15 CLASS A (10m)
 LIMIT 4: CFR 47 PART 15 CLASS B (10M)
 LIMIT 5: NONE
 LIMIT 6: NONE

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector
 avlg - Average log detector

File: 30-1000 LOW X-AXIS.TXT



WAV

MODEL: SPT1800
 LOW CHANNEL Y-AXIS
 BATTERY OPERATED 100mW, 11MB
 RED:HORIZONTAL GREEN:VERTICAL

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
=====									
Range: 3 300 - 1000MHz -----									
1	530.3023	49.08 pk	-31.58	18	35.5			46.44	35.56
	Azimuth:4	Height:198	Horz	Margin [dB]				-10.94	-.06
2	629.8026	46.56 pk	-31.01	19.75	35.3			46.44	35.56
	Azimuth:22	Height:100	Horz	Margin [dB]				-11.14	-.26
3	663.3775	45.13 pk	-30.77	20.24	34.6			46.44	35.56
	Azimuth:354	Height:100	Horz	Margin [dB]				-11.84	-.96
4	696.4277	44.17 pk	-30.72	21.85	35.3			46.44	35.56
	Azimuth:322	Height:100	Horz	Margin [dB]				-11.14	-.26

LIMIT 1: NONE

LIMIT 2: NONE

LIMIT 3: CFR 47 PART 15 CLASS A (10m)

LIMIT 4: CFR 47 PART 15 CLASS B (10M)

LIMIT 5: NONE

LIMIT 6: NONE

pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

avlg - denotes average log detection

tm - Trace Math Result

WAV

MODEL: SPT1800

LOW CHANNEL Y-AXIS

BATTERY OPERATED 100mW, 11MB

RED:HORIZONTAL GREEN:VERTICAL

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
=====								
Range: 3 300 - 1000MHz								
530.4109	43.07 qp	-31.6	18	29.47			46.4	35.6
Azimuth: 166 Height:154 Horz					Margin [dB]:		-16.93	-6.13
530.4109	43.1 qp	-31.6	18	29.5			46.4	35.6
Azimuth: 166 Height:154 Horz					Margin [dB]:		-16.9	-6.1
630.1109	44.33 qp	-31	19.8	33.13			46.4	35.6
Azimuth: 221 Height:130 Horz					Margin [dB]:		-13.27	-2.47
663.0742	41.94 qp	-30.8	20.3	31.44			46.4	35.6
Azimuth: 218 Height:120 Horz					Margin [dB]:		-14.96	-4.16
696.4	39.95 qp	-30.7	21.9	31.15			46.4	35.6
Azimuth: 5 Height:100 Horz					Margin [dB]:		-15.25	-4.45

LIMIT 1: NONE

LIMIT 2: NONE

LIMIT 3: CFR 47 PART 15 CLASS A (10m)

LIMIT 4: CFR 47 PART 15 CLASS B (10M)

LIMIT 5: NONE

LIMIT 6: NONE

pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

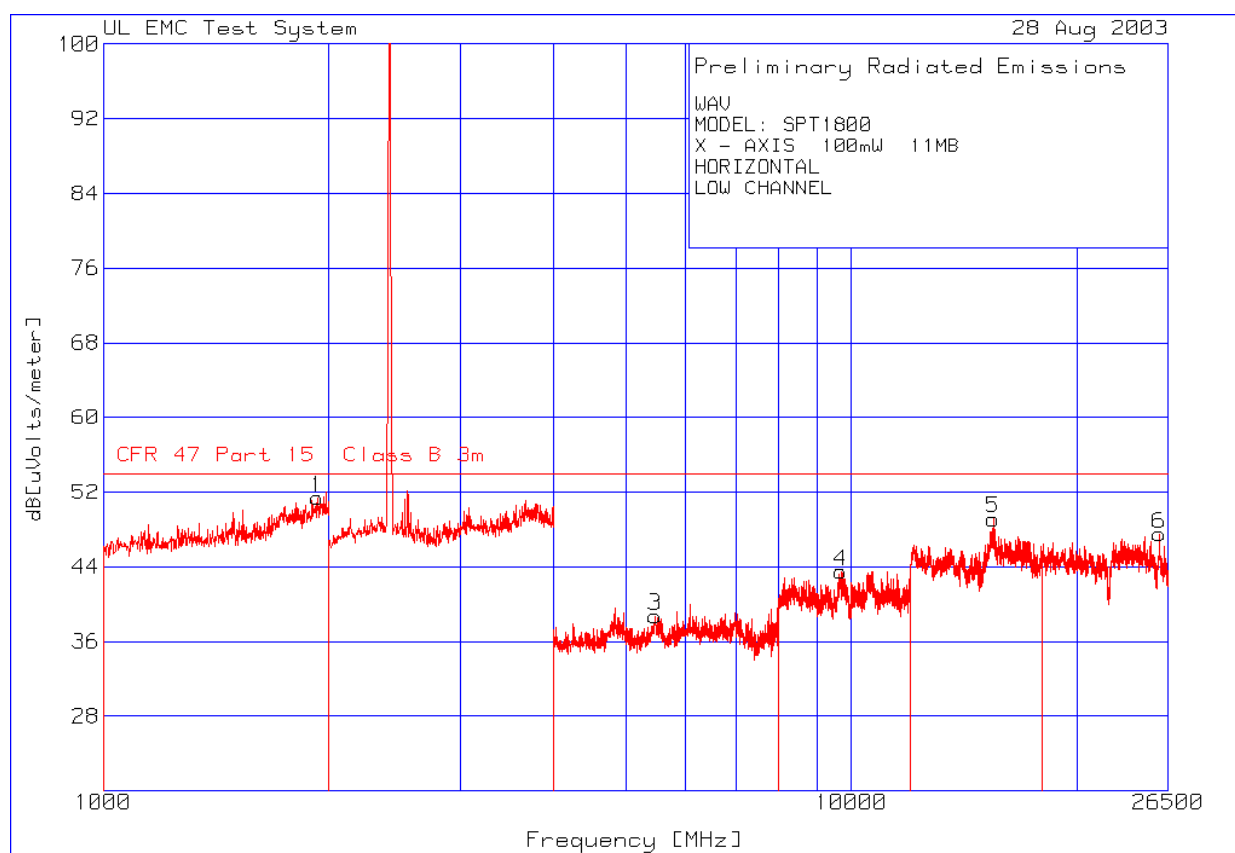
avlg - Average log detector

File: 30-1000 LOW Y-AXIS RANGES 3 4.TXT

UNDERWRITERS LABORATORIES INC.
Radiated Emissions

Date Tested: 8-28-2003

Manufacturer : WAV
Equipment Under Test : WT2270 Modular Transmitter
Requirement : CFR47 Part 15
Detection Mode : Pk, Avg
Bandwidth : 1MHz
Measurement Distance : 3 meter
Antenna Type : 1-26.5GHz – Horn Antenna, see Appendix D



WAV

MODEL: SPT1800

X - AXIS 100mW 11MB

HORIZONTAL

LOW CHANNEL

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1
1	2GHz 1000 - 2000MHz					
1	1931.864 Azimuth:214	19.69 pk Height:101	3.7 Horz	28 Margin [dB]	51.39	54 -2.61
2	4GHz 2000 - 4000MHz					
2	2408.818 Azimuth:123	75.43 pk Height:101	3.9 Horz	24.8 Margin [dB]	104.13	54 50.13
4	8GHz 4000 - 8000MHz					
3	5465.465 Azimuth:4	64.63 pk Height:200	-53.7 Horz	27.8 Margin [dB]	38.73	54 -15.27
8	12GHz 8000 - 12000MHz					
4	9681.682 Azimuth:209	50.58 pk Height:200	-43.5 Horz	36.4 Margin [dB]	43.48	54 -10.52
12	18GHz 12000 - 18000MHz					
5	15477.477 Azimuth:4	54.56 pk Height:101	-45.5 Horz	40.1 Margin [dB]	49.16	54 -4.84
18-26.5GHz	18000 - 26500MHz					
6	25810.811 Azimuth:303	67.41 pk Height:200	-60.5 Horz	40.6 Margin [dB]	47.51	54 -6.49

LIMIT 1: CFR 47 Part 15 Class B 3m

LIMIT 2: NONE

LIMIT 3: NONE

LIMIT 4: NONE

LIMIT 5: NONE

LIMIT 6: NONE

pk - Peak detector

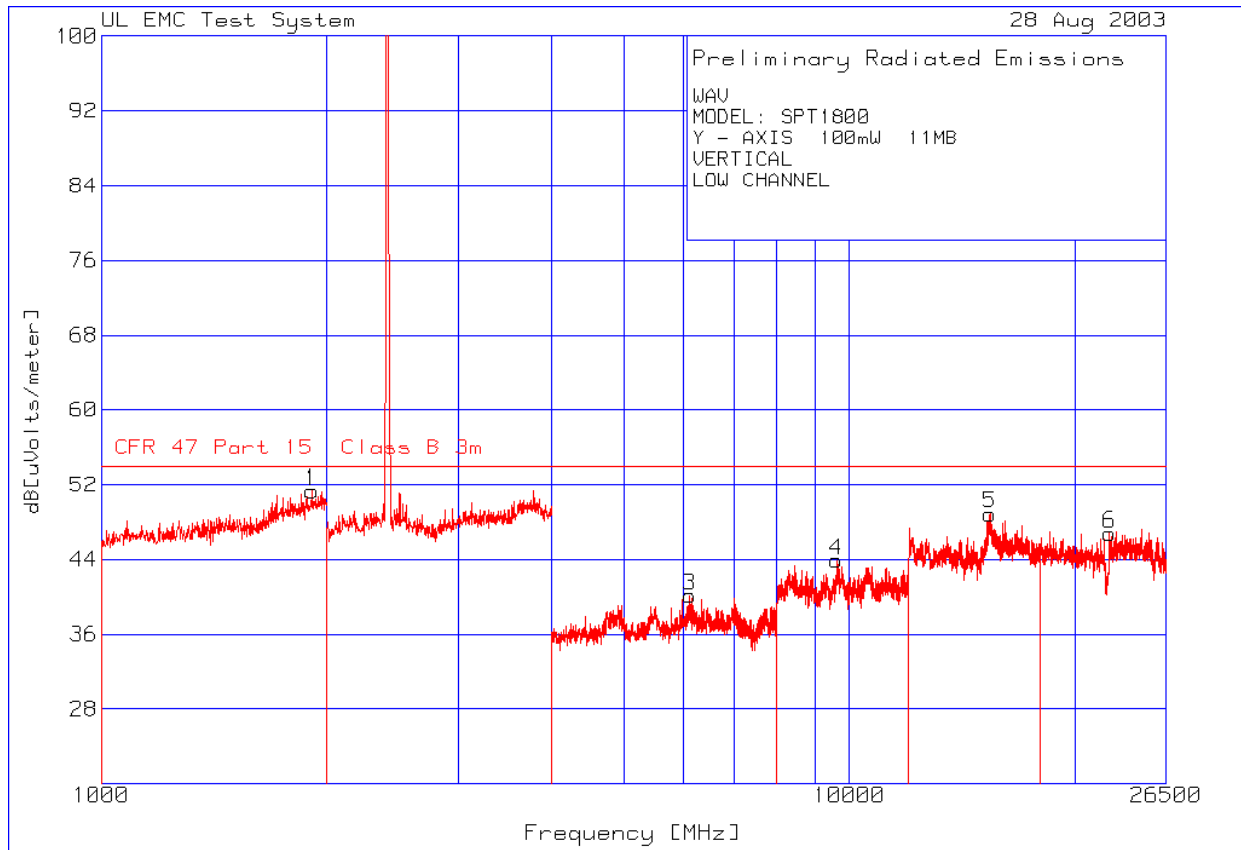
qp - Quasi-Peak detector

av - Average detector

avlg - Average log detector

avem - EMI Average detector

File: 1-26_5 LOW H X-AXIS.TXT



WAV

MODEL: SPT1800

Y - AXIS 100mW 11MB

VERTICAL

LOW CHANNEL

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1
1	2GHz 1000 - 2000MHz					
1	1911.824 Azimuth:249	19.71 pk Height:101	3.7 Vert	27.9 Margin [dB]	51.31	54 -2.69
2	4GHz 2000 - 4000MHz					
2	2408.818 Azimuth:6	77.11 pk Height:101	3.9 Vert	24.8 Margin [dB]	105.81	54 51.81
4	8GHz 4000 - 8000MHz					
3	6118.118 Azimuth:175	64.31 pk Height:200	-52.2 Vert	28 Margin [dB]	40.11	54 -13.89
8	12GHz 8000 - 12000MHz					
4	9609.61 Azimuth:243	51.59 pk Height:101	-44.1 Vert	36.4 Margin [dB]	43.89	54 -10.11
12	18GHz 12000 - 18000MHz					
5	15417.417 Azimuth:60	55.11 pk Height:200	-46.3 Vert	40.1 Margin [dB]	48.91	54 -5.09
18-26.5GHz	18000 - 26500MHz					
6	22271.271 Azimuth:23	63.77 pk Height:200	-57.5 Vert	40.5 Margin [dB]	46.77	54 -7.23

LIMIT 1: CFR 47 Part 15 Class B 3m

LIMIT 2: NONE

LIMIT 3: NONE

LIMIT 4: NONE

LIMIT 5: NONE

LIMIT 6: NONE

pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

avlg - denotes average log detection

avem - denotes EMI average detection

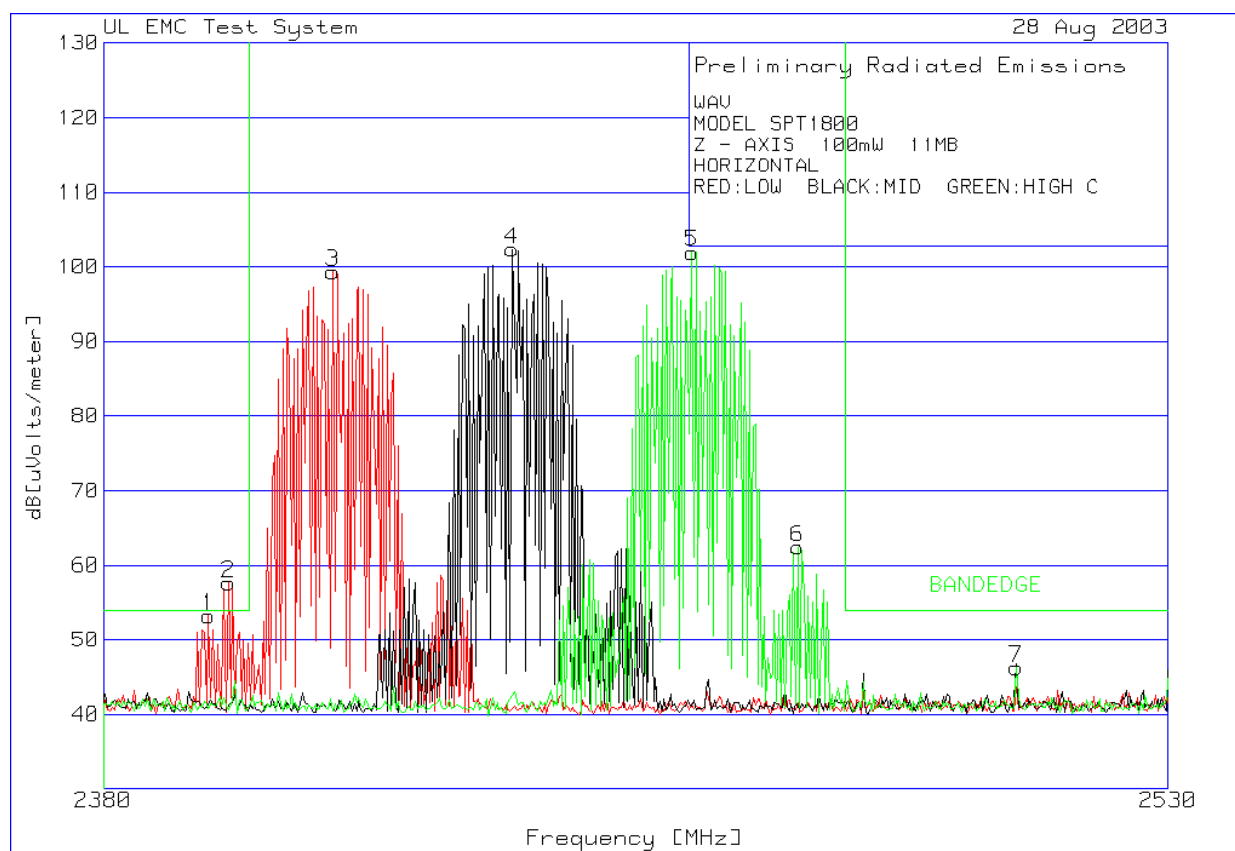
tm - Trace Math Result

UNDERWRITERS LABORATORIES INC.
Radiated Emissions

Date Tested: 8-28-2003

Manufacturer : WAV
Equipment Under Test : WT2270 Modular Transmitter
Requirement : CFR47 Part 15
Detection Mode : Pk, Avg
Bandwidth : 100KHz
Measurement Distance : 3 meter
Antenna Type : 1-26.5GHz – Horn Antenna, see Appendix D

Center Frequency and Band Edge Measurements



WAV

MODEL SPT1800

Z - AXIS 100mw 11MB

HORIZONTAL

RED:LOW BLACK:MID GREEN:HIGH C

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1 2
=====						
2	- 4GHz 2380	- 2530MHz	-----			
-						
1*	2394.429	24.44 pk	4	24.8	53.24	54
	Azimuth:308	Height:114	Horz	Margin [dB]		-.76
2*	2397.134	28.81 pk	4	24.8	57.61	54
	Azimuth:308	Height:114	Horz	Margin [Db]		3.61
3	2411.563	70.6 pk	3.9	24.8	99.3	999
	Azimuth:308	Height:114	Horz	Margin [Db]		-899.7

2	- 4GHz 2380	- 2530MHz	-----			
-						
4	2436.513	73.63 pk	3.9	24.8	102.33	999
	Azimuth:355	Height:101	Horz	Margin [Db]		-896.67

2	- 4GHz 2380	- 2530MHz	-----			
-						
5	2461.764	73.28 pk	3.9	24.8	101.98	999
	Azimuth:305	Height:101	Horz	Margin [Db]		-897.02
6	2476.794	33.71 pk	3.9	24.8	62.41	999
	Azimuth:305	Height:101	Horz	Margin [Db]		-936.59
7	2508.056	17.45 pk	4	24.8	46.25	54
	Azimuth:305	Height:101	Horz	Margin [Db]		-7.75

LIMIT 1: NONE

LIMIT 2: BANDEDGE

LIMIT 3: NONE

LIMIT 4: NONE

LIMIT 5: NONE

LIMIT 6: NONE

pk - Peak detector

qp - Quasi-Peak detector

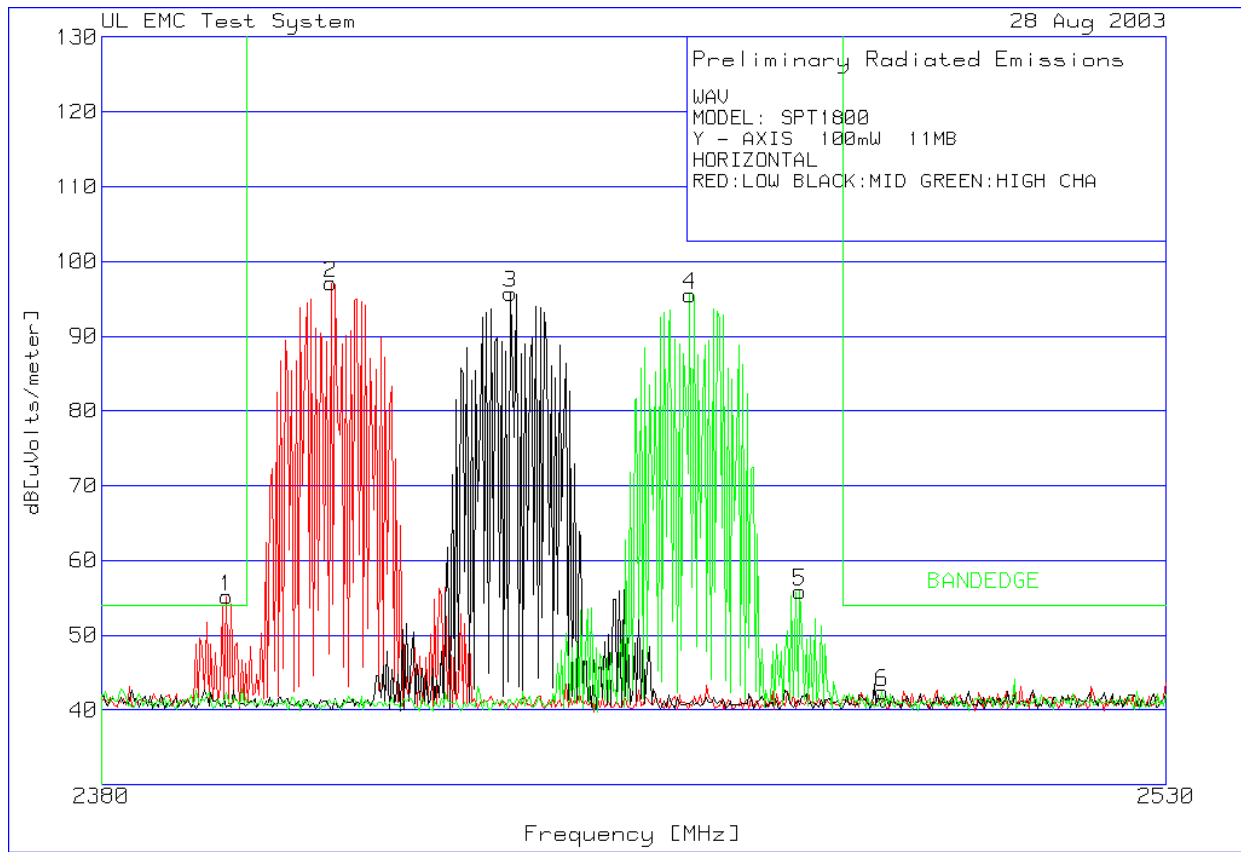
av - Average detector

avlg - Average log detector

avem - EMI Average detector

File: BAND EDGE H Z-AXIS 11MB.TXT

*Note: restricted band limit is at 2400MHz instead at 2390MHz as shown on the plot and data above.



WAV

MODEL: SPT1800

Y - AXIS 100mW 11MB

HORIZONTAL

RED:LOW BLACK:MID GREEN:HIGH CHA

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1 2
2	4GHz 2380 - 2530MHz					
-						
*1	2397.134	26.34 pk	4	24.8	55.14	54
	Azimuth:77	Height:99	Horz	Margin [dB]		1.14
2	2411.563	68.38 pk	3.9	24.8	97.08	999
	Azimuth:153	Height:99	Horz	Margin [dB]		-901.92
2	4GHz 2380 - 2530MHz					
-						
3	2436.513	67.04 pk	3.9	24.8	95.74	999
	Azimuth:166	Height:99	Horz	Margin [dB]		-903.26
2	4GHz 2380 - 2530MHz					
-						
4	2461.764	66.85 pk	3.9	24.8	95.55	999
	Azimuth:166	Height:99	Horz	Margin [dB]		-903.45
5	2477.395	27.15 pk	3.9	24.8	55.85	999
	Azimuth:52	Height:99	Horz	Margin [dB]		-943.15
6	2489.118	13.72 pk	3.9	24.8	42.42	54
	Azimuth:355	Height:99	Horz	Margin [dB]		-11.58

LIMIT 1: NONE

LIMIT 2: BANDEDGE

LIMIT 3: NONE

LIMIT 4: NONE

LIMIT 5: NONE

LIMIT 6: NONE

pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

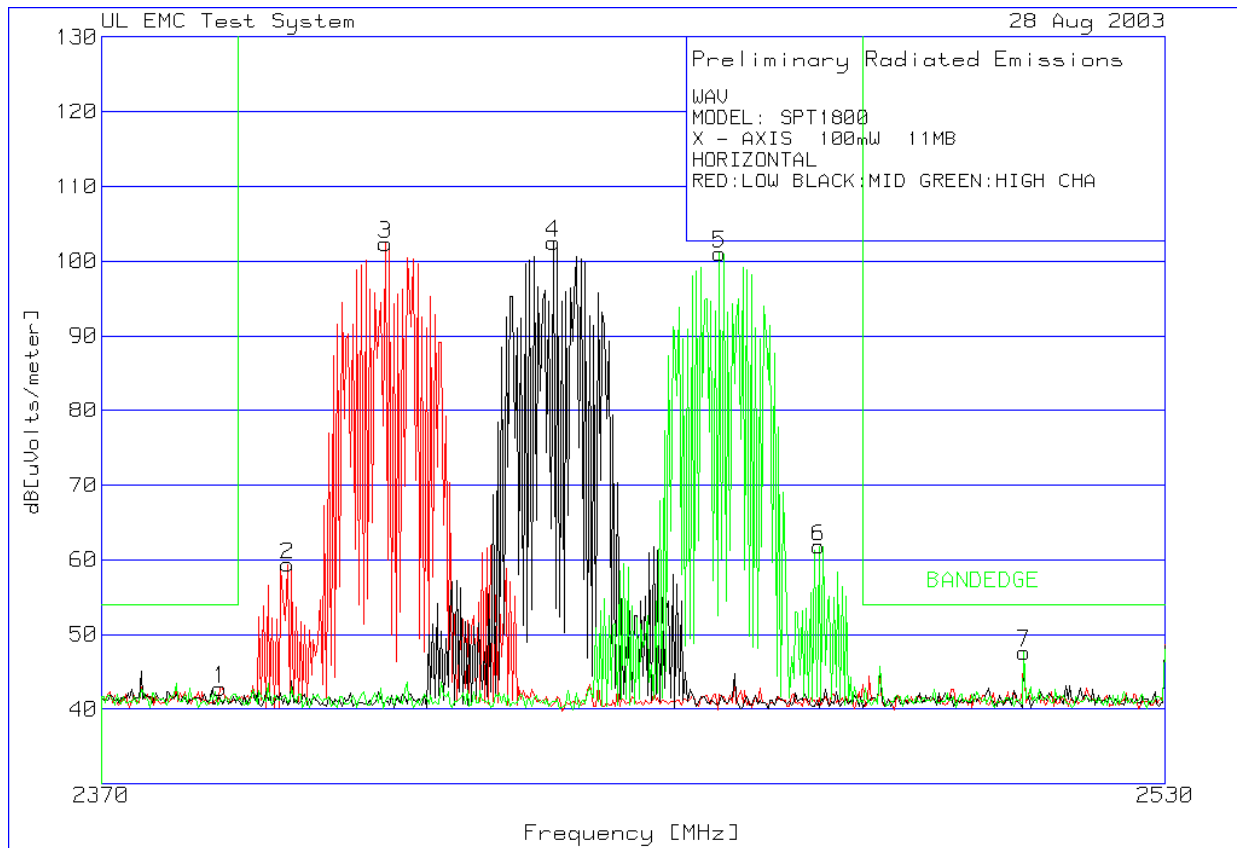
avlg - denotes average log detection

avem - denotes EMI average detection

tm - Trace Math Result

File: BAND EDGE H Y-AXIS 11MB.TXT

*Note: restricted band limit is at 2400MHz instead at 2390MHz as shown on the plot and data above.



WAV

MODEL: SPT1800

X - AXIS 100mW 11MB

HORIZONTAL

RED:LOW BLACK:MID GREEN:HIGH CHA

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1 2
=====						
2	4GHz 2370	2530MHz	-----			
-						
1	2387.315	13.99 pk	4	24.8	42.79	54
	Azimuth:2	Height:101	Horz	Margin [dB]		-11.21
2	2397.255	30.55 pk	4	24.8	59.35	999
	Azimuth:116	Height:101	Horz	Margin [dB]		-939.65
3	2411.683	73.61 pk	3.9	24.8	102.31	999
	Azimuth:155	Height:101	Horz	Margin [dB]		-896.69
2	4GHz 2370	2530MHz	-----			
-						
4	2436.693	73.78 pk	3.9	24.8	102.48	999
	Azimuth:126	Height:101	Horz	Margin [dB]		-896.52
2	4GHz 2370	2530MHz	-----			
-						
5	2461.703	72.37 pk	3.9	24.8	101.07	999
	Azimuth:121	Height:101	Horz	Margin [dB]		-897.93
6	2476.774	33.09 pk	3.9	24.8	61.79	999
	Azimuth:198	Height:101	Horz	Margin [dB]		-937.21
7	2508.196	18.85 pk	4	24.8	47.65	54
	Azimuth:198	Height:101	Horz	Margin [dB]		-6.35

LIMIT 1: NONE

LIMIT 2: BANDEDGE

LIMIT 3: NONE

LIMIT 4: NONE

LIMIT 5: NONE

LIMIT 6: NONE

pk - Peak detector

qp - Quasi-Peak detector

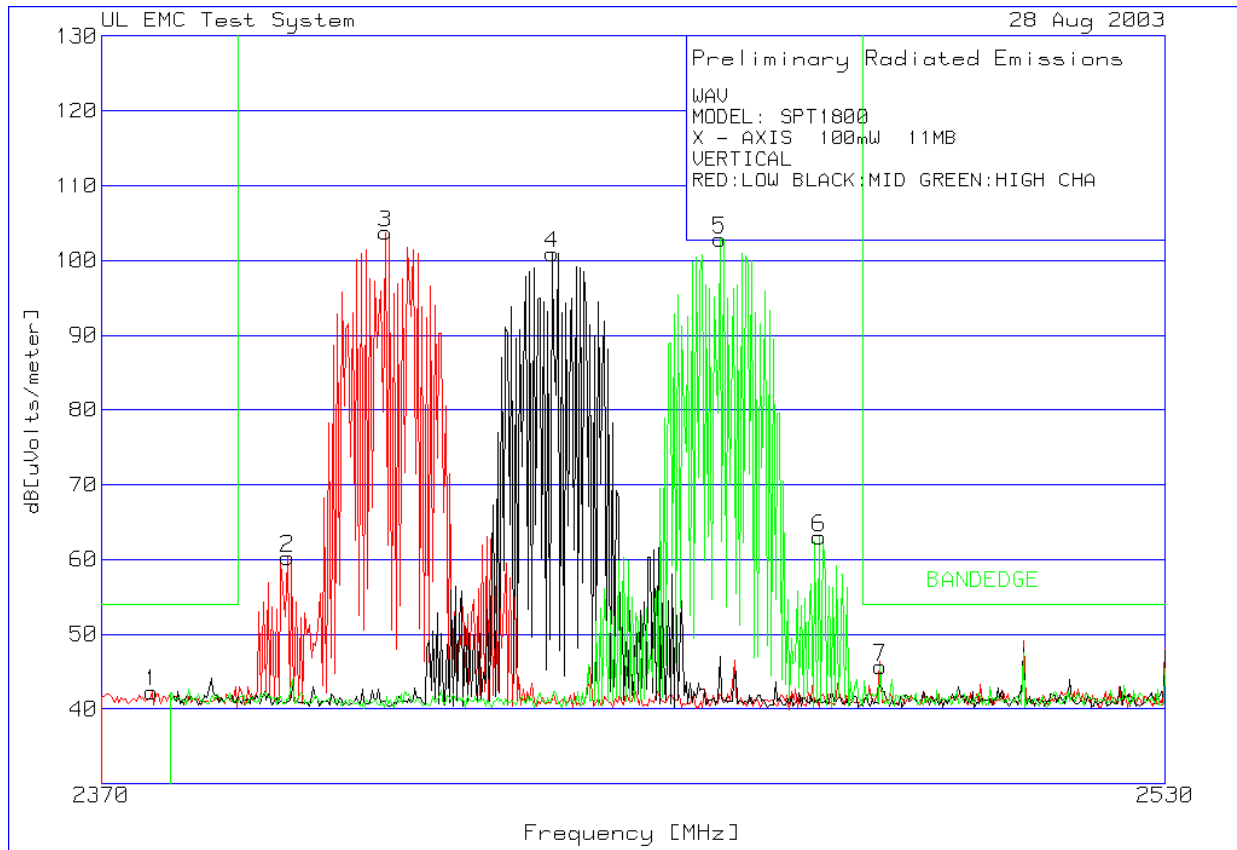
av - Average detector

avlg - denotes average log detection

avem - denotes EMI average detection

tm - Trace Math Result

File: BAND EDGE H X-AXIS 11MB HIGHEST.TXT



WAV

MODEL: SPT1800

X - AXIS 100mW 11MB

VERTICAL

RED:LOW BLACK:MID GREEN:HIGH CHA

Test		Meter	Gain/Loss	Transducer	Level	Limit:1	2
No.	Frequency	Reading	Factor	Factor	dB[uVolts/meter]		
	[MHz]	[dB(uV)]	[dB]	[dB]			
=====							
2	4GHz 2370	-	2530MHz	-	-	-	-
1	2377.375	13.54 pk	4	24.8	42.34	54	
	Azimuth:193	Height:101	Vert	Margin [dB]		-11.66	
2	2397.255	31.46 pk	4	24.8	60.26	999	
	Azimuth:231	Height:101	Vert	Margin [dB]		-938.74	
3	2411.683	75.01 pk	3.9	24.8	103.71	999	
	Azimuth:231	Height:101	Vert	Margin [dB]		-895.29	
2	4GHz 2380	-	2530MHz	-	-	-	-
4	2436.513	72.24 pk	3.9	24.8	100.94	999	
	Azimuth:279	Height:101	Vert	Margin [dB]		-898.06	
2	4GHz 2380	-	2530MHz	-	-	-	-
5	2461.764	74.13 pk	3.9	24.8	102.83	999	
	Azimuth:229	Height:101	Vert	Margin [dB]		-896.17	
6	2476.794	34.28 pk	3.9	24.8	62.98	999	
	Azimuth:267	Height:101	Vert	Margin [dB]		-936.02	
7	2486.112	17.01 pk	3.9	24.8	45.71	54	
	Azimuth:229	Height:101	Vert	Margin [dB]		-8.29	

LIMIT 1: NONE

LIMIT 2: BANDEDGE

LIMIT 3: NONE

LIMIT 4: NONE

LIMIT 5: NONE

LIMIT 6: NONE

pk - Peak detector

qp - Quasi-Peak detector

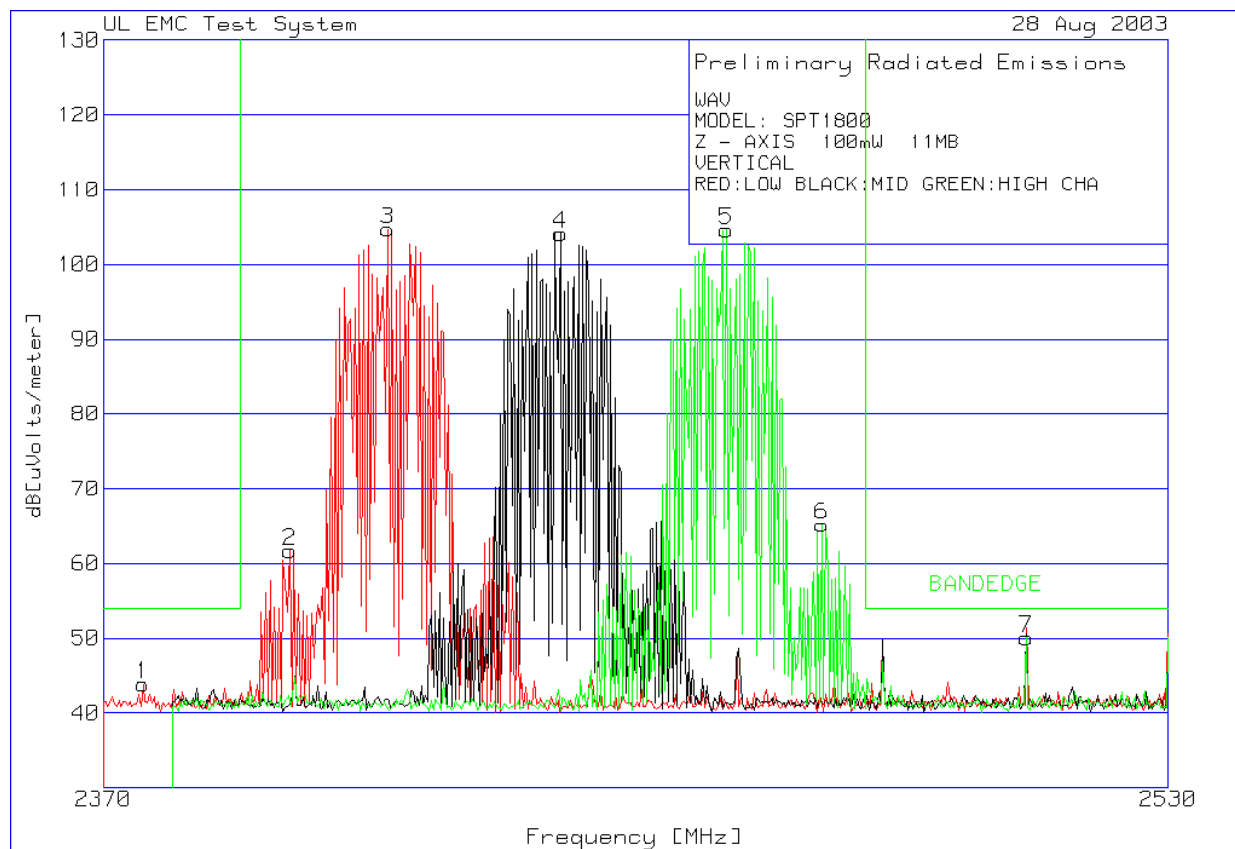
av - Average detector

avlg - denotes average log detection

avem - denotes EMI average detection

tm - Trace Math Result

File: BAND EDGE V X-AXIS 11MB.TXT



WAV
 MODEL: SPT1800
 Z - AXIS 100mW 11MB
 VERTICAL
 RED:LOW BLACK:MID GREEN:HIGH CHA

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1 2
=====						
2	4GHz 2370	2530MHz	-----			
-						
1	2375.772	15.06 pk	4	24.8	43.86	54
	Azimuth:3	Height:101 Vert		Margin [dB]		-10.14
2	2397.255	32.88 pk	4	24.8	61.68	999
	Azimuth:3	Height:101 Vert		Margin [dB]		-937.32
3	2411.683	75.98 pk	3.9	24.8	104.68	999
	Azimuth:3	Height:101 Vert		Margin [dB]		-894.32

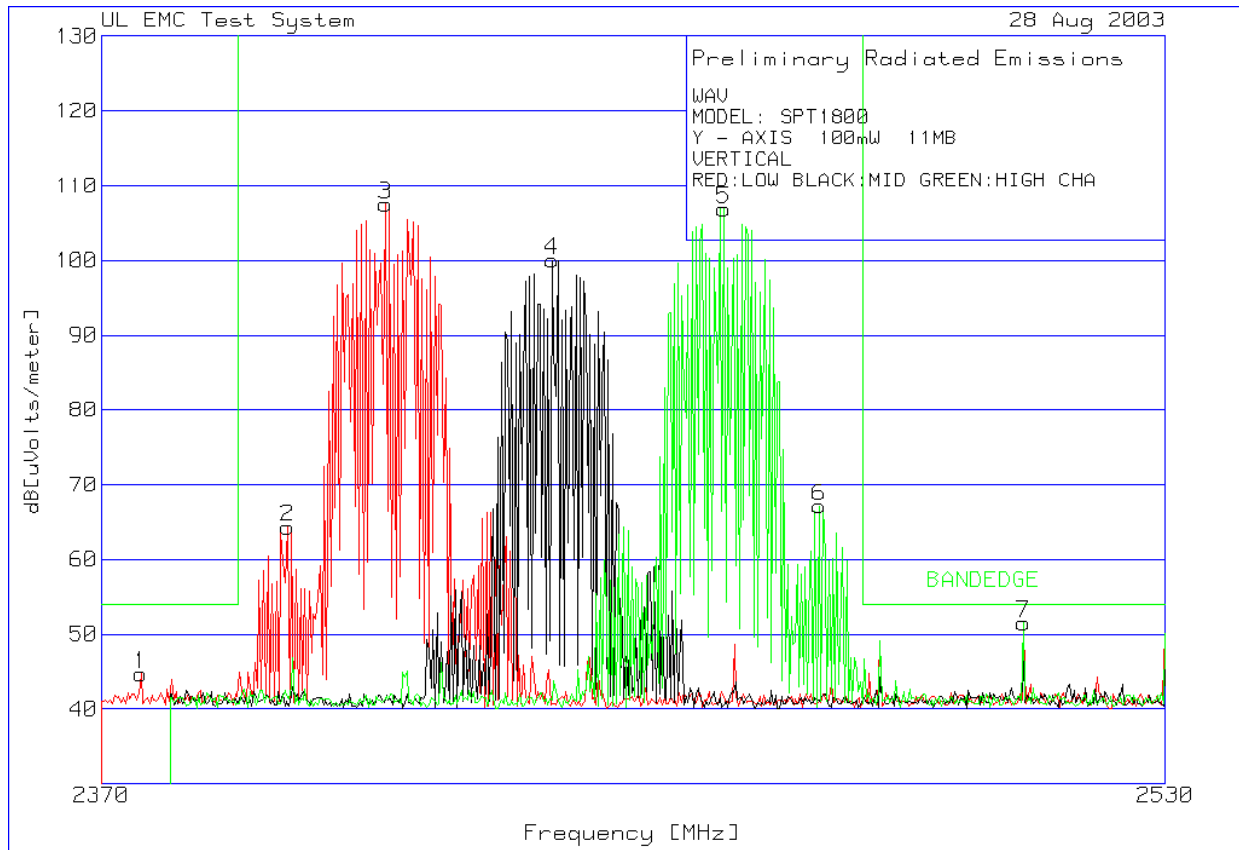
2	4GHz 2380	2530MHz	-----			
-						
4	2437.415	75.41 pk	3.9	24.8	104.11	999
	Azimuth:153	Height:101 Vert		Margin [dB]		-894.89

2	4GHz 2380	2530MHz	-----			
-						
5	2462.365	75.89 pk	3.9	24.8	104.59	999
	Azimuth:3	Height:101 Vert		Margin [dB]		-894.41
6	2476.794	36.47 pk	3.9	24.8	65.17	999
	Azimuth:3	Height:101 Vert		Margin [dB]		-933.83
7	2508.056	21.22 pk	4	24.8	50.02	54
	Azimuth:166	Height:101 Vert		Margin [dB]		-3.98

LIMIT 1: NONE
 LIMIT 2: BANDEDGE
 LIMIT 3: NONE
 LIMIT 4: NONE
 LIMIT 5: NONE
 LIMIT 6: NONE

pk - Peak detector
 qp - Quasi-Peak detector
 av - Average detector
 avlg - denotes average log detection
 avem - denotes EMI average detection
 tm - Trace Math Result

File: BAND EDGE V Z-AXIS 11MB.TXT



WAV

MODEL: SPT1800

Y - AXIS 100mW 11MB

VERTICAL

RED:LOW BLACK:MID GREEN:HIGH CHA

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1 2
=====						
2	- 4GHz 2370	- 2530MHz	-----			
-						
1	2375.772	15.92 pk	4	24.8	44.72	54
	Azimuth:78	Height:101	Vert	Margin [dB]		-9.28
2	2397.255	35.54 pk	4	24.8	64.34	999
	Azimuth:78	Height:101	Vert	Margin [dB]		-934.66
3	2411.683	78.79 pk	3.9	24.8	107.49	999
	Azimuth:78	Height:101	Vert	Margin [dB]		-891.51
2	- 4GHz 2380	- 2530MHz	-----			
-						
4	2436.513	71.33 pk	3.9	24.8	100.03	999
	Azimuth:53	Height:101	Vert	Margin [dB]		-898.97
2	- 4GHz 2380	- 2530MHz	-----			
-						
5	2462.365	78.15 pk	3.9	24.8	106.85	999
	Azimuth:78	Height:101	Vert	Margin [dB]		-892.15
6	2476.794	38.42 pk	3.9	24.8	67.12	999
	Azimuth:78	Height:101	Vert	Margin [dB]		-931.88
7	2508.056	22.69 pk	4	24.8	51.49	54
	Azimuth:78	Height:101	Vert	Margin [dB]		-2.51

LIMIT 1: NONE

LIMIT 2: BANDEDGE

LIMIT 3: NONE

LIMIT 4: NONE

LIMIT 5: NONE

LIMIT 6: NONE

pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

avlg - denotes average log detection

avem - denotes EMI average detection

tm - Trace Math Result

File: BAND EDGE V Y-AXIS 11MB HIGHEST.TXT

APPENDIX C

Sample Calculations of Field Strengths

Basic Equation:

The field strength is calculated by adding the Meter Reading, Cable Set Gain/Loss and Transducer (Antenna or LISN) Factor. The basic equation is as follows:

$$FS = MR + GL + TF$$

Where:

FS = Calculated Field Strength in dB(uV)/meter

MR = Meter Reading of receiver amplitude in dB(uV)

GL = Gain/Loss factor of cable set in dB

A negative Gain/Loss indicates signal amplification (gain)

A positive Gain/Loss indicates signal attenuation (loss)

TF = Transducer Factor of antenna or LISN in dB

Sample Calculation:

The measured receiver amplitude is 52.7 dB(uV).

The gain/loss factor is -30.2 dB (indicating a preamplifier is included in the cable set).

The transducer factor (antenna factor) is 6.6 dB.

These factors are added ($52.7 + (-30.2) + 6.6$) resulting in a calculated field strength of 29.1 dB(uV)/meter.

APPENDIX D**Antenna Calibration Schedule**

Antenna	Model Number	Last Calibration Date	Next Calibration Date	Manufacturer
1-2 GHz Antenna	3161-01	12/19/2002	12/19/2003	ETS
2-4 GHz Antenna	3161-02	12/19/2002	12/19/2003	ETS
4-8 GHz Antenna	3161-03	6/5/2003	6/5/2004	ETS
8-12 GHz Antenna	3160-07	3/14/2003	3/14/2004	ETS
12-18 GHz Antenna	3160-08	3/15/2003	3/15/2004	ETS
18-26.5 GHz Antenna	3160-09	3/7/2003	3/7/2004	ETS
26.5-40 GHz Antenna	3160-10	3/7/2003	3/7/2004	ETS