



Test Report No:
ATEMC00045

**EMC Test Report
for**

Novra Technologies Inc.
1100-330 St. Mary Avenue
Winnipeg, MB, R3C 3Z5

A75 Digital Receiver

Dated:
June 17, 2004

**IN ACCORDANCE WITH
FCC PART 15 SUBPART B
CLASS B VERIFICATION**

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REPORT NO.: ATEMC00045	

Test Lab Personnel:

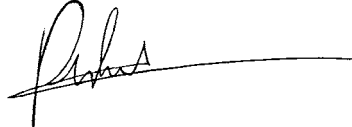
Test Performed by:	Date	Signature
Paul Eberling, CNA Electronic Technologist	March 1, 2004	

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01/31/2002	Elwood Friesen	1.0	Initial Release
04/15/2002	Paul Eberling	1.2	Reviewed

Approvals:

Date	Name	Title	Signature
March 1, 2004	Roman Wroczynski	Director; Development & Test	

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Equipment:	<i>A75 Digital Receiver</i>	<i>Page 2</i>

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1. Our Company

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1.1. General

This document details the results of radiated and conducted emissions tests performed by Arrista Technologies, Inc. on Feb 26 through 27, 2003 on the Novra Technologies Inc. A75 Digital Receiver.

1.2. Equipment Under Test Description

The EUT is sold under the following trade names:

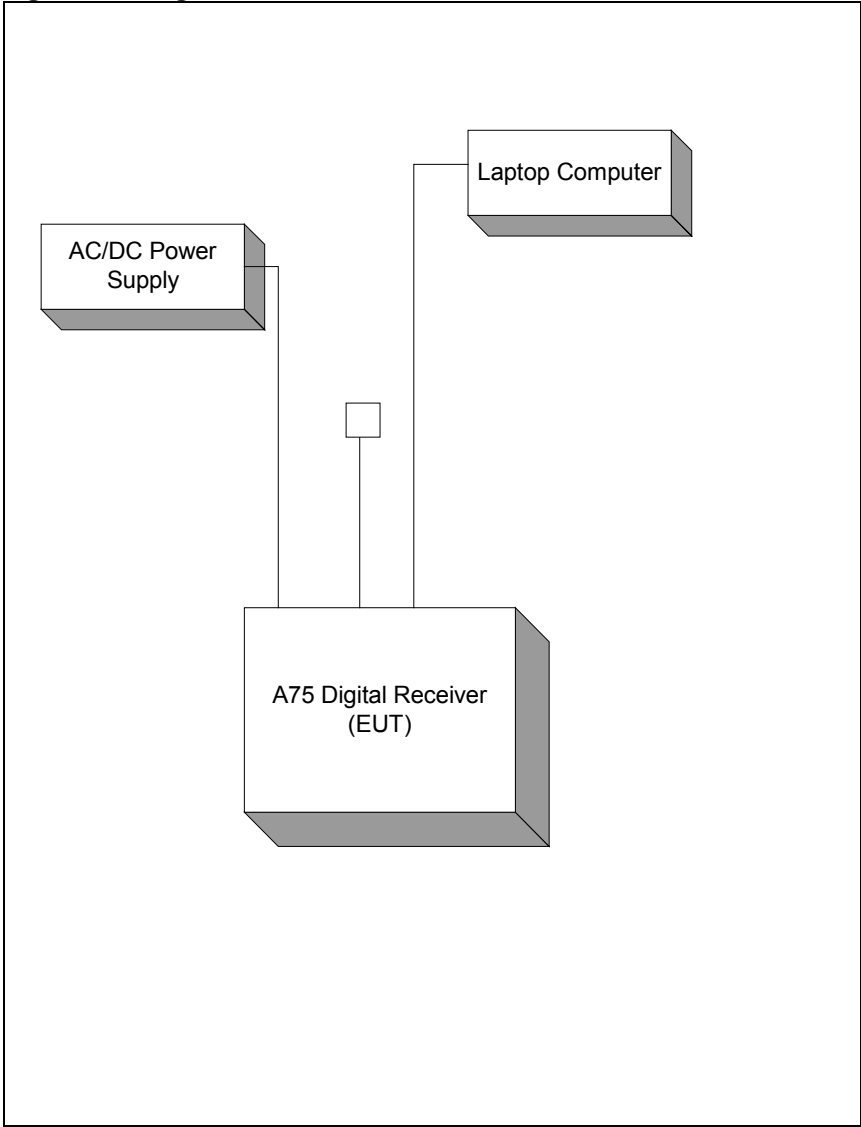
- Novra A75

The system consists of a digital terrestrial receiver configured as per typical installation. The user configures the unit via management console. The main parameter set are the channel and the network parameters. The EUT was connected to a laptop and communicating via the Ethernet port.

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Figure 1.2: Diagram of EUT



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2. Description

2.1. Application and Exceptions

All tests were performed using ANSI C63.4-1992 as the measurement standard, as required in FCC CFR 47 Part 15.

The following change was instituted to allow the EUT meet requirements:

None

The EUT was operated under the following conditions:

1. 120 VAC supply
2. Toshiba Laptop Computer, Model 2800, Serial # 1101345J
3. CUI Inc. Power Supply, Model DSA-0151A-06, Ser# DPS060200P5

This mode of operation was chosen by Novra Technologies to simulate normal use of this device.

2.2. Deviations

The following deviations from, additions to, or exclusions from the test specifications have been made:

None.

2.3. Test Requirements and Results

Testing was performed using procedures or criteria contained in the regulatory documents and standards specified below.

Table 2.3: Test Requirements

Test Reference	EUT Modifications	Results
ANSI C63.4-1992 Methods of measurement of radio-noise emissions	N/A	PASS Section 3 Test Results
FCC CFR 47 Part 15.109 Radiated Emissions Class B Limits	See Section 2	PASS Section 3

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Test Reference	EUT Modifications	Results
FCC CFR 47 Part 15.107 Conducted Emissions Class B Limits	See Section 2	PASS Section 3

2.4. Test Facilities Description

2.4.1. Internal Facilities

Arrista Technologies Product Compliance & Test (PCT) laboratory facility has test equipment for Electromagnetic Compatibility (EMC) testing i.e. ESD, EFT, Surge, and radiated emissions. The laboratory is located at 5-55 Henlow Bay, Winnipeg, Manitoba, Canada at Arrista Technologies main facility. The PCT Laboratory is registered with the FCC and has submitted the information required by Section 2.948 of the FCC Rules for measuring devices subject to Certification under Parts 15 & 18. Test equipment used to perform all measurements listed in Section 1.7 Subsection 1.7.2 and 1.7.4.

2.4.2. Radiated Emissions Test Site

Radiated Emissions testing is performed in Arrista Technologies semi-anechoic 3m test chamber. The site consists of a 28' X 20' X 20' shielded chamber with absorptive materials on the walls and ceiling. The floor of the chamber is a raised conductive ground plane and includes a 2 m conductive top turntable. The measuring antenna is mounted on a non-conductive mast, which can be raised between 1 to 4 meters. Measurement equipment is located in the adjacent control room which is a 12' X 12' X 8' shielded structure.

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Table 2.4.1: Radiated Test Equipment

Radiated Emissions Test Equipment				
Description	Model	Serial Number	Last Cal Date	Cal Interval
EMI Receiver	Dynamic Sciences DSI-2020	603	02/19/2004	Annual
Turntable and Mast Controller	EMCO 2090	9812-1384	N/A	N/A
Antenna Mast	EMCO 2075-2 Mini-Mast	9812-2208	N/A	N/A
Bilog EMC Antenna	Schaffner-Chase CBL6112A	2308	02/20/2004	Annual
Dbl-Ridged Horn Antenna	EMCO 3115	9711-5345	01/29/2003	Annual
26.5GHz Spectrum Analyzer	HP 8563E	3337A01511	02/02/04	Annual
Metal Top Turntable	EMCO 2081-2.03	N/A	N/A	N/A
Microwave Coaxial Cable	Sucoflex Blue	498	04/18/2002	Bi-Annual
Dell Desktop Computer	Optiplex GX110	GZLAL	N/A	N/A
6 dB Attenuator	Hewlett-Packard	6dB	N/A	N/A
LISN	FCC-LISN-50/250	9708	02/23/2004	Annual
LISN	Wayne Kerr IXLSN30B	000343	N/A	N/A
Microwave Coaxial Cable	Sucoflex Blue	417	04/18/2002	Bi-Annual

2.4.3. Correction Factors

The DSI-2020.exe and EMI_Receiver.vi software used to capture the data apply correction factors automatically. The following formula illustrates the application of correction factors to obtain a corrected measurement:

$$\text{Voltage}_{\text{dBuV/m}} = \text{Measured Voltage}_{\text{dBuV}} + \text{Cable Attenuation}_{\text{dB}} + \text{Additional Attenuation}_{\text{dB}} + \text{Antenna Factor}_{\text{dB/m}}$$

2.4.4. Conducted Emissions Test Site

Conducted emissions tests were performed in the shielded control room utilizing a Line Impedance Stabilization Network (LISN). The metal wall of the control room is used as the vertical conducting plane and the two LISN's are bonded to the ground plane. Measurements from the FCC-LISN-50/250 LISN are taken using the EMI receiver in the control room. The second LISN is used to power peripheral equipment and is not used for measurements.

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3. Test Results

3.1. Radiated Emissions: 30MHz to 2GHz

Radiated Emission limits for FCC compliance are listed in the tables below. Frequency was investigated up to 5000 MHz. Measurements were taken using low, mid and high frequency of operation; more specifically low Channel 10 (239 MHz), mid Channel 19 (547 MHz) and high Channel 69 (847 MHz). Scans are shown for worst case of each channel band in horizontal and vertical.

Radiated Emission limits for FCC compliance are listed in the tables below. Frequency was investigated up to 5.0 GHz as per Part 15.33(b) of FCC rules and shown in the following table:

Radiated Emission Measurement Range

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705–108	1000.
108–500	2000.
500–1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

Limits of Radiated Emission Measurement

Frequency of emission (MHz)	Field strength (microvolts/meter)
30–88	100
88–216	150
216–960	200
Above 960	500

Limits of Radiated Emission Measurement

Frequency (MHz)	Class B (at 3m)
	dBuV/m
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
Above 960	54.0

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3.2. EUT Orientations

Pre-scans of the product are taken using peak detector sweeps in four EUT orientations and using both vertical and horizontal polarization of the measuring antenna. Azimuth angles are spaced by 90 degrees of turntable rotation, more specifically 0, 90, 180, 270 Degrees respectively. See Appendix A; [Equipment Setup for Radiated Emissions](#). Sampling time is optimized for maximum speed.

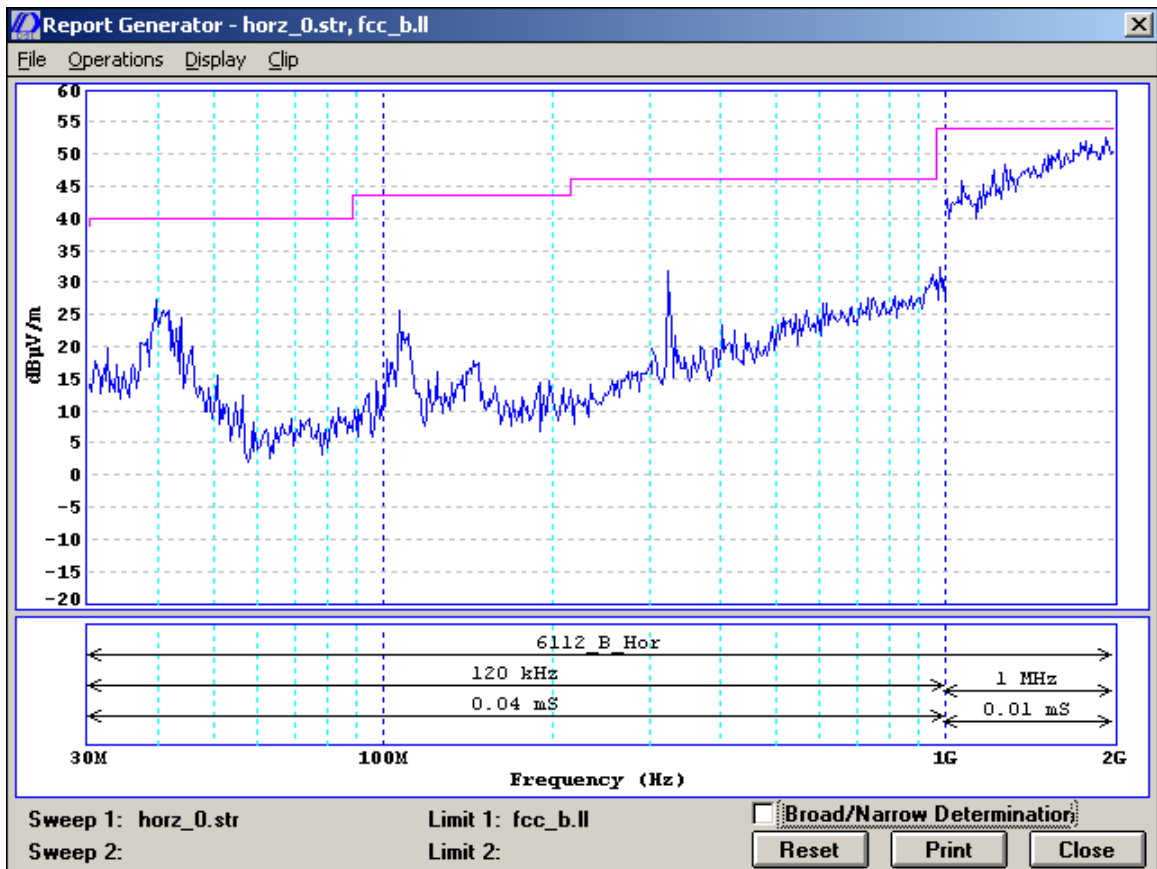
Equipment Under Test is configured as per **Fig 9(c) Test Configuration – Tabletop Equipment Radiated Emissions** in **ANSI C63.4-1992**.

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3.2.1. Horizontal 0 Degrees

Scan	Horizontal
Polarization:	
Antenna Height:	150cm
Turntable Position:	0 degrees
Detector Type:	Peak
Limit Line:	FCC Class B
Voltage Supply:	120 VAC

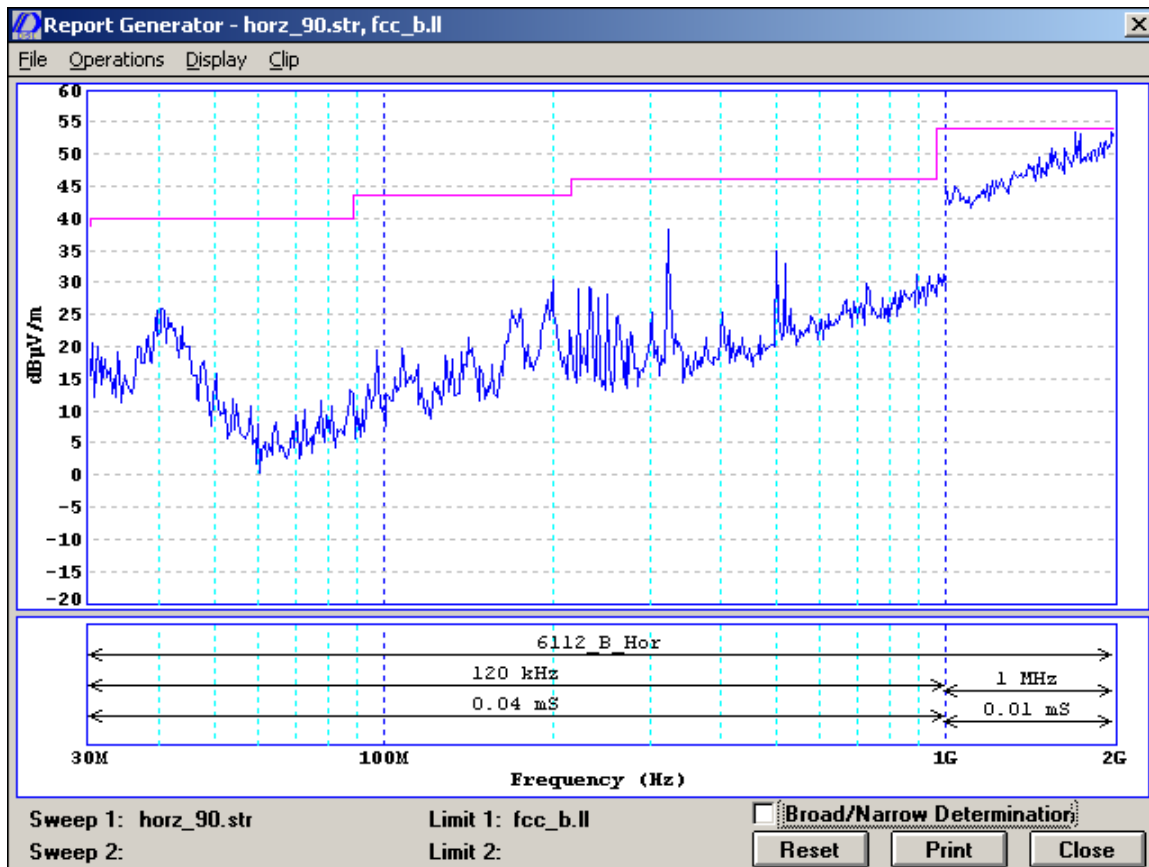


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3.2.2. Horizontal 90 Degrees

Scan Polarization:	Horizontal
Antenna Height:	150cm
Turntable Position:	90 degrees
Detector Type:	Peak
Limit Line:	FCC Class B
Voltage Supply:	120 VAC

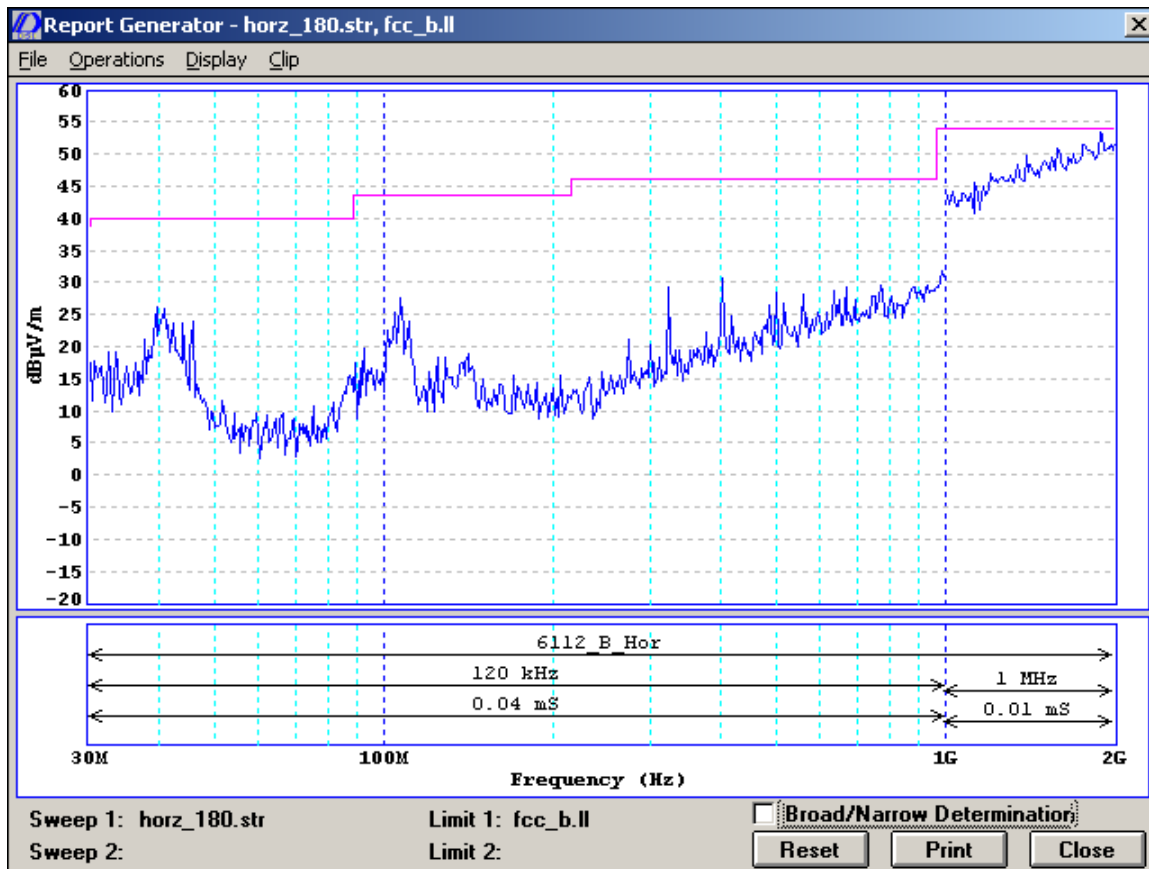


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3.2.3. Horizontal 180 Degrees

Scan	Horizontal
Polarization:	
Antenna Height:	150cm
Turntable Position:	180 degrees
Detector Type:	Peak
Limit Line:	FCC Class B
Voltage Supply:	120 VAC

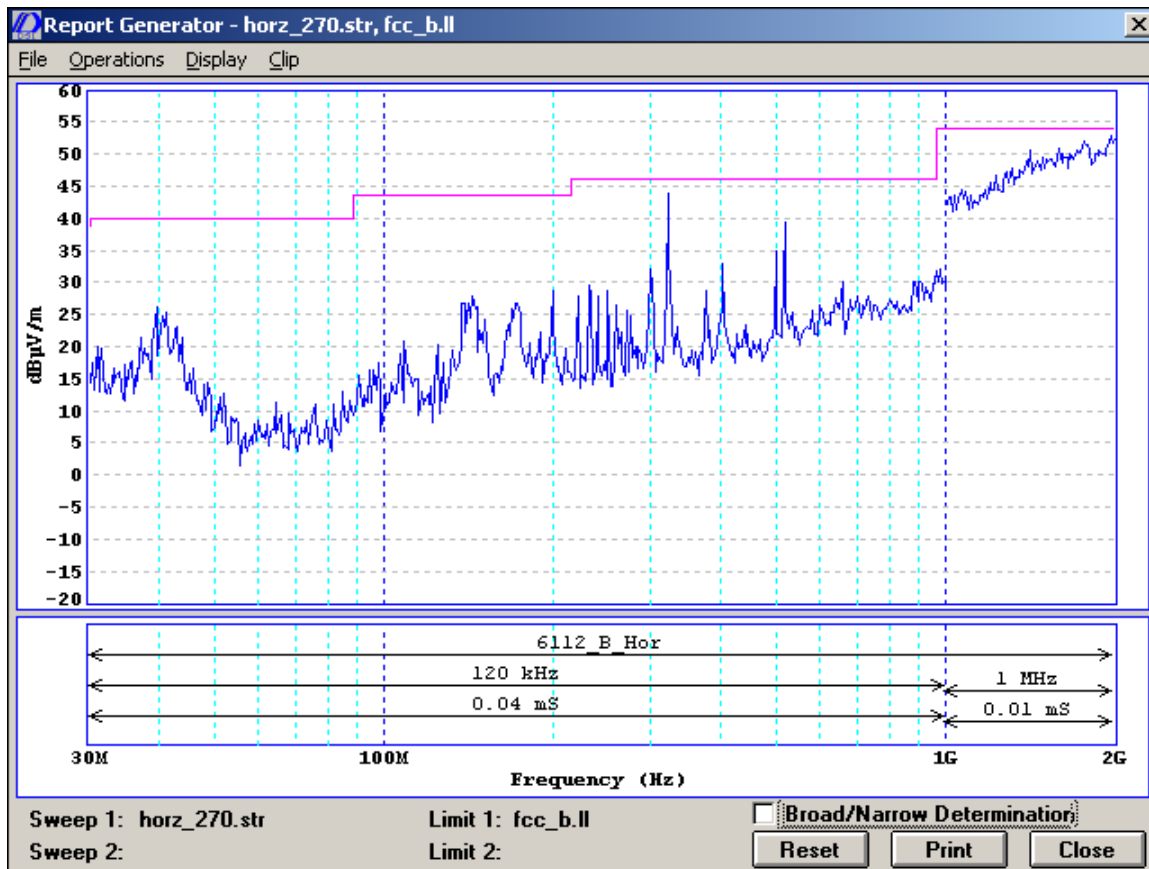


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3.2.4. Horizontal 270 Degrees

Scan	Horizontal
Polarization:	
Antenna Height:	150cm
Turntable Position:	270 degrees
Detector Type:	Peak
Limit Line:	FCC Class B
Voltage Supply:	120 VAC

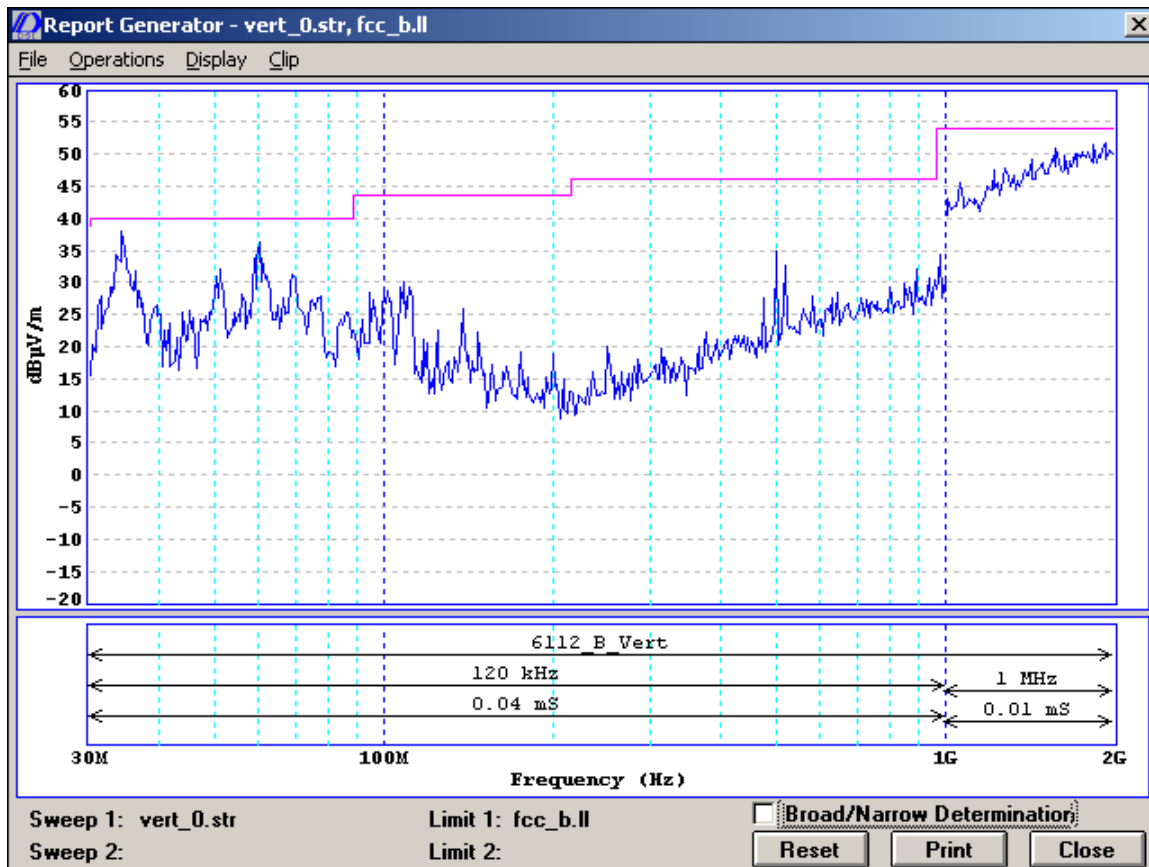


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3.2.5. Vertical 0 Degrees

Scan Polarization:	Vertical
Antenna Height:	150cm
Turntable Position:	0 degrees
Detector Type:	Peak
Limit Line:	FCC Class B
Voltage Supply:	120 VAC

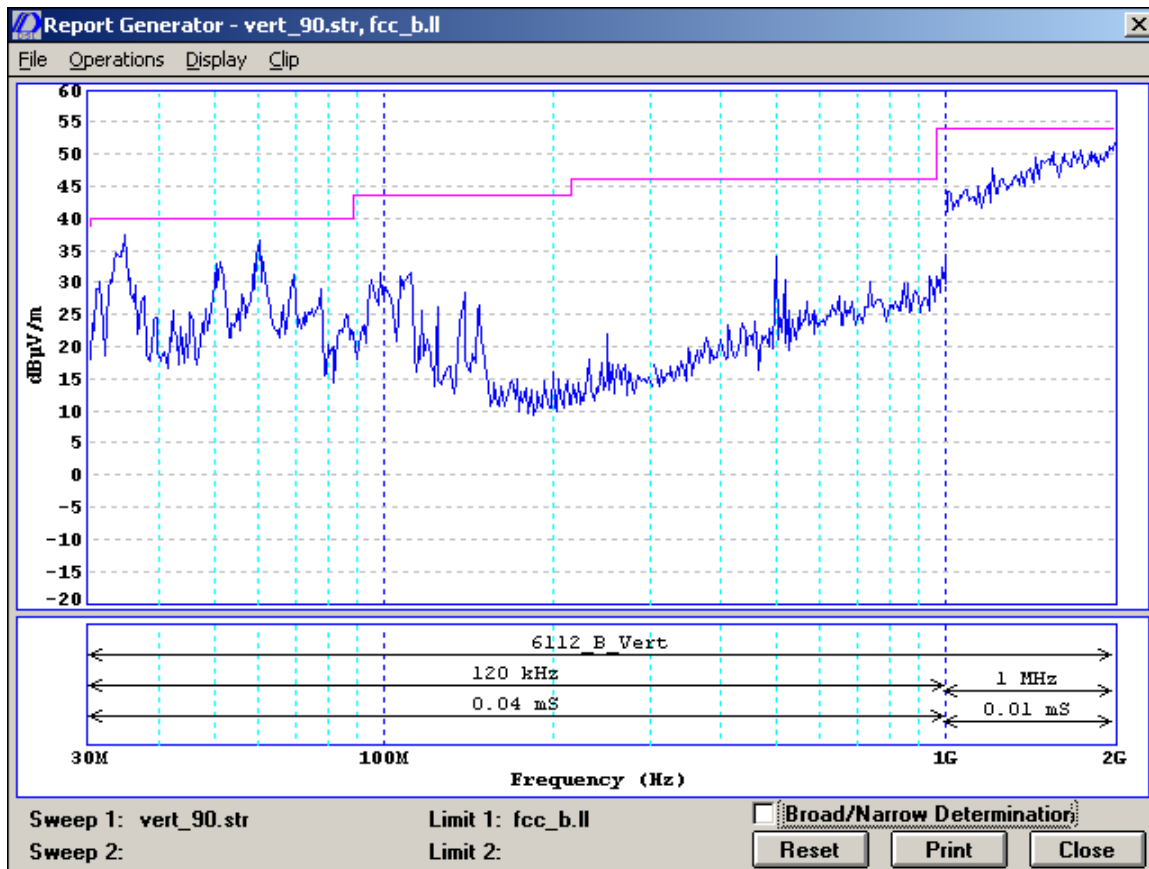


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3.2.6. Vertical 90 Degrees

Scan Polarization:	Vertical
Antenna Height:	150cm
Turntable Position:	90 degrees
Detector Type:	Peak
Limit Line:	FCC Class B
Voltage Supply:	120 VAC

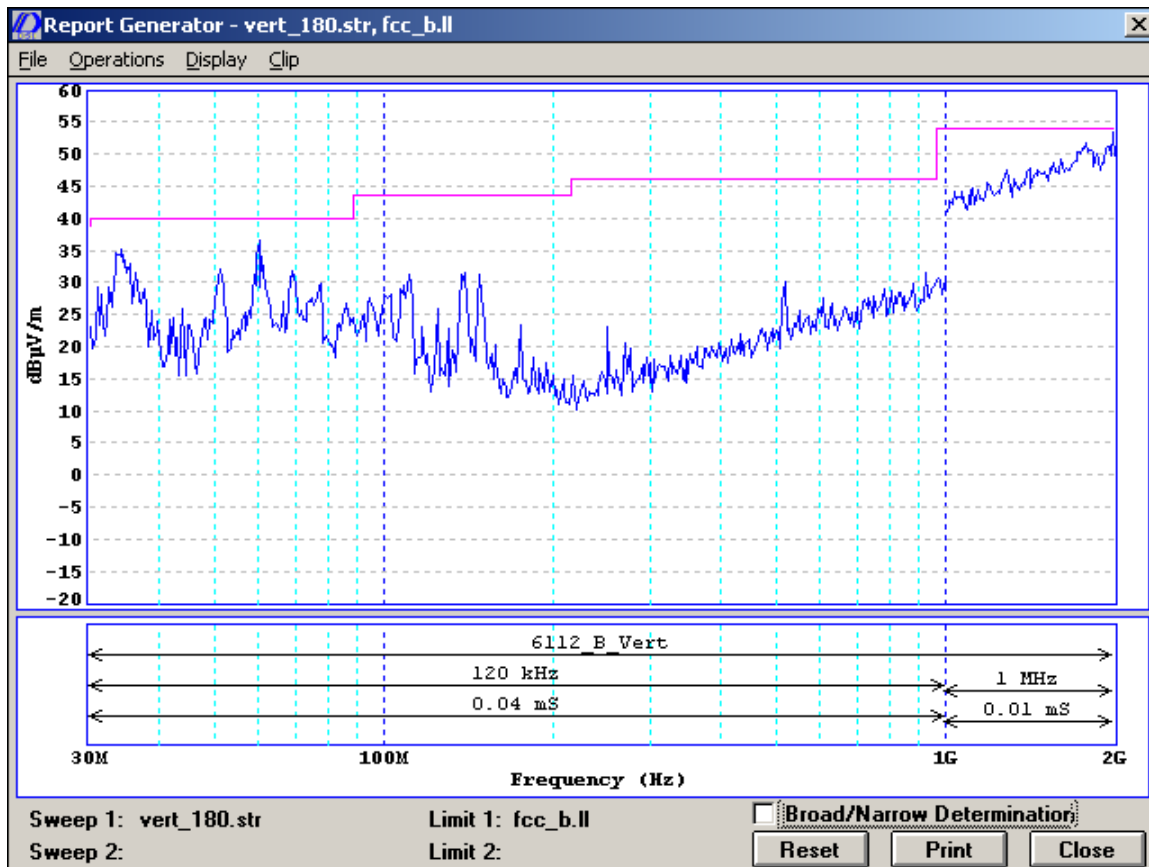


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3.2.7. Vertical 180 Degrees

Scan	Vertical
Polarization:	Vertical
Antenna Height:	150cm
Turntable Position:	180 degrees
Detector Type:	Peak
Limit Line:	FCC Class B
Voltage Supply:	120 VAC

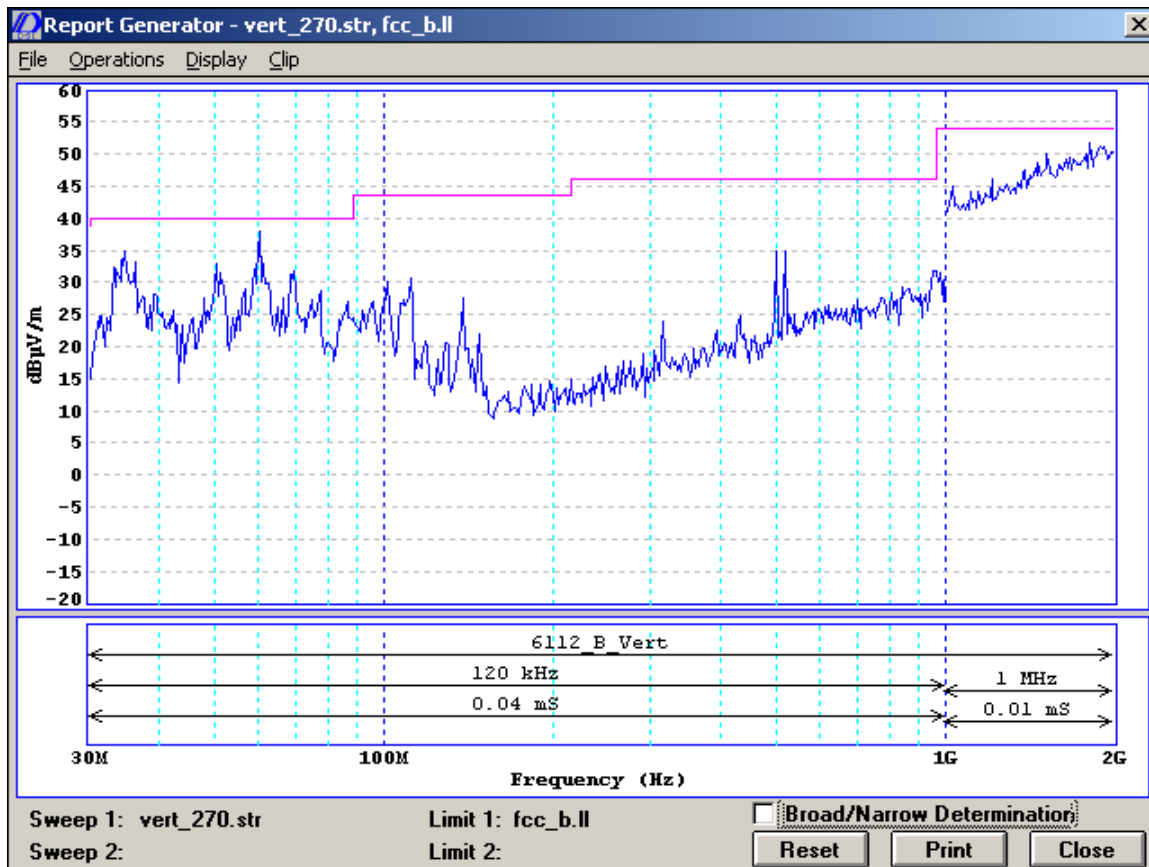


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3.2.8. Vertical 270 Degrees

Scan Polarization:	Vertical
Antenna Height:	150cm
Turntable Position:	270 degrees
Detector Type:	Peak
Limit Line:	FCC Class B
Voltage Supply:	120 VAC



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3.3. Radiated Emissions: 2GHz to 5.0GHz

Radiated Emission limits for FCC compliance are listed in the tables below. Frequency was investigated up to 5.0 GHz as per Part 15.33(b) of FCC rules and shown in the following table:

Radiated Emission Measurement Range

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705–108	1000.
108–500	2000.
500–1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

Limits of Radiated Emission Measurement

Frequency of emission (MHz)	Field strength (microvolts/meter)
30–88	100
88–216	150
216–960	200
Above 960	500

It is noted that there were no measurable emissions in the range of 2.0 – 5.0 GHz. Radiated emissions above 2 GHz were measured using the spectrum analyzer and are converted to dBuV/m using the following formula:

$$\text{Voltage}_{\text{dBuV/m}} = \text{Measured Voltage}_{\text{dBuV}} + \text{Cable Attenuation}_{\text{dB}} + \text{Antenna Factor}_{\text{dB/m}}$$

The spectrum analyzer was set to a RBW of 1MHz as per Part 15.35 and a Video BW of 1-10kHz.

3.4. EUT Orientations

Pre-scans of the product are taken using peak detector sweeps in four EUT orientations and using both vertical and horizontal polarization of the measuring antenna. Azimuth angles are spaced by 90 degrees of turntable rotation, more specifically 0, 90, 180, 270 Degrees respectively. See Appendix A; [Equipment Setup for Radiated Emissions](#). Sampling time is

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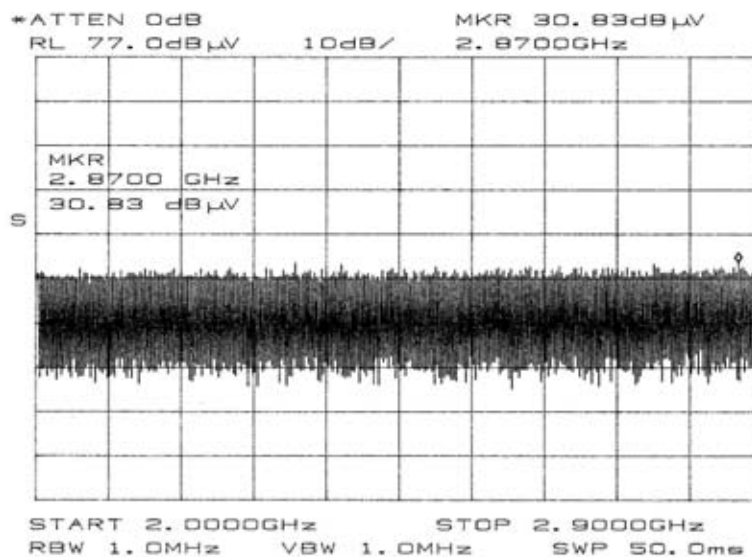
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optimized for maximum speed. Measurements were taken using low, mid and high frequency of operation; more specifically low Channel 10 (239 MHz), mid Channel 19 (547 MHz) and high Channel 69 (847 MHz). Scans are shown for worst case of each channel band in horizontal and vertical. As stated previously, there were no measurable emissions in the range of 2.0 – 5.0 GHz.

Equipment Under Test is configured as per **Fig 9(c) Test Configuration – Tabletop Equipment Radiated Emissions** in **ANSI C63.4-1992**.

3.5. Peak Scans

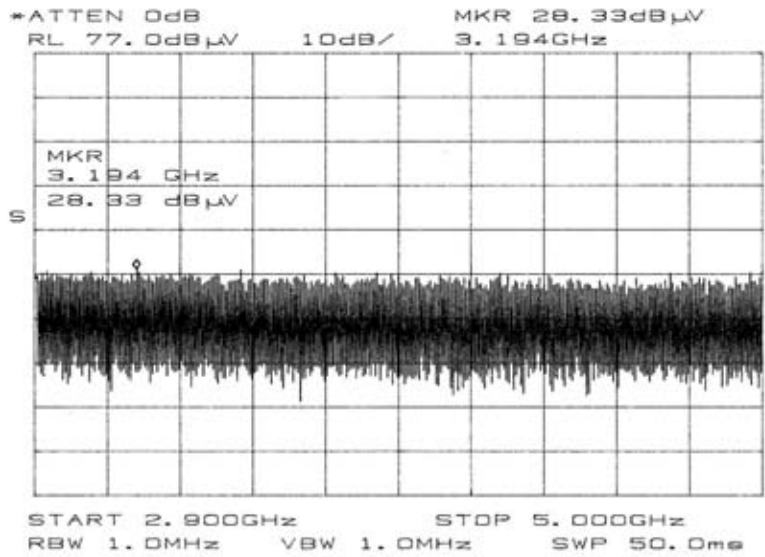
Emission Measurement; 2 GHz – 2.9 GHz Horizontal; Mid Channel



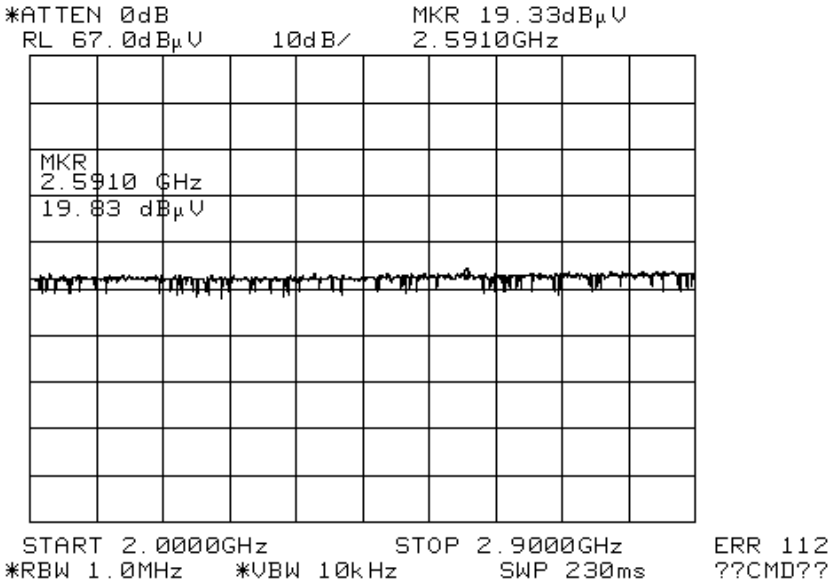
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Emission Measurement; 2.9 GHz – 5.0 GHz Horizontal; Mid Channel



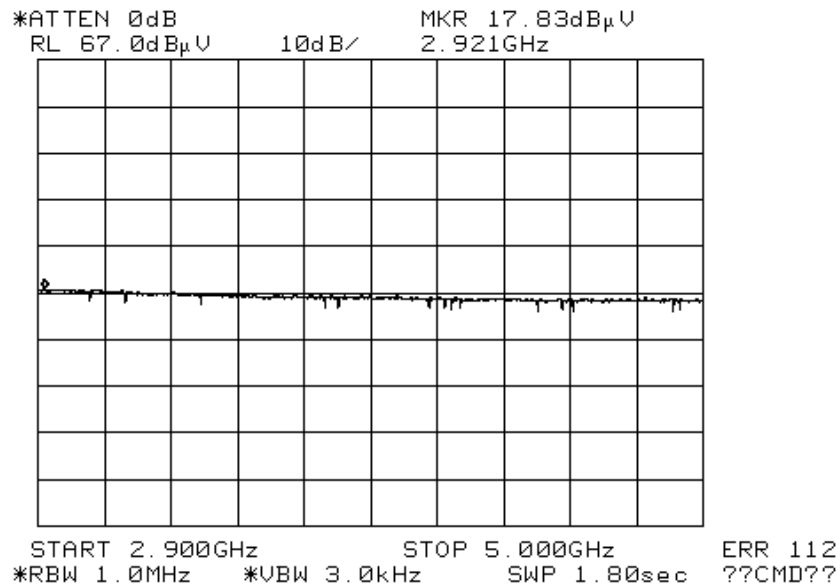
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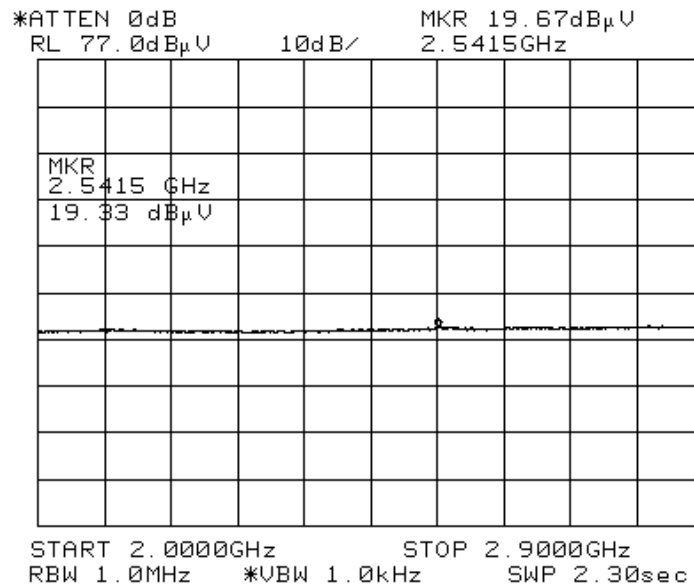
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Emission Measurement; 2.9 GHz – 5.0 GHz Horizontal; Low Channel



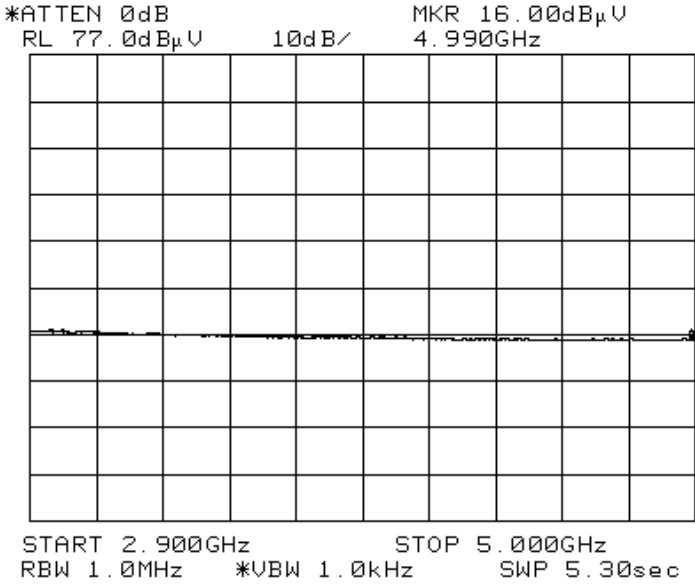
Emission Measurement; 2 GHz – 2.9 GHz Horizontal; Mid Channel



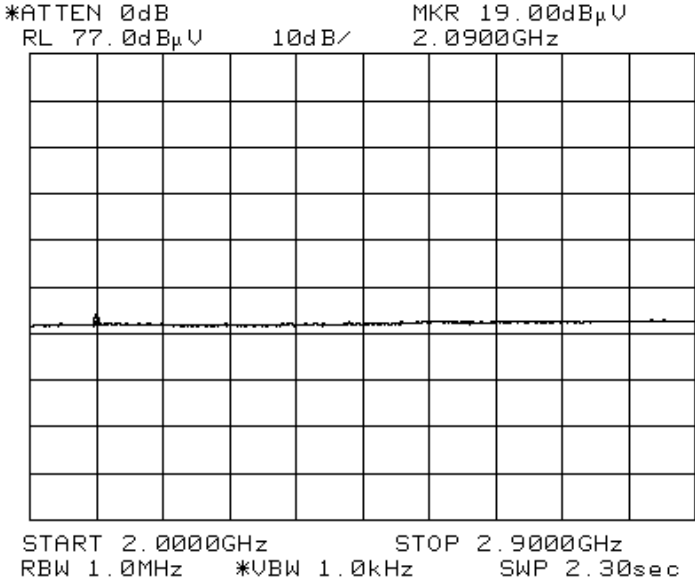
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Emission Measurement; 2.9 GHz – 5.0 GHz Horizontal; Mid Channel



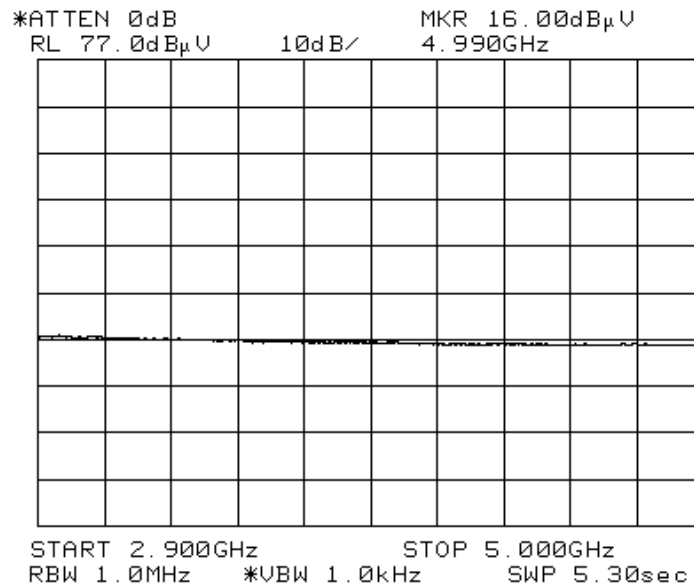
Emission Measurement; 2 GHz – 2.9 GHz Horizontal; High Channel



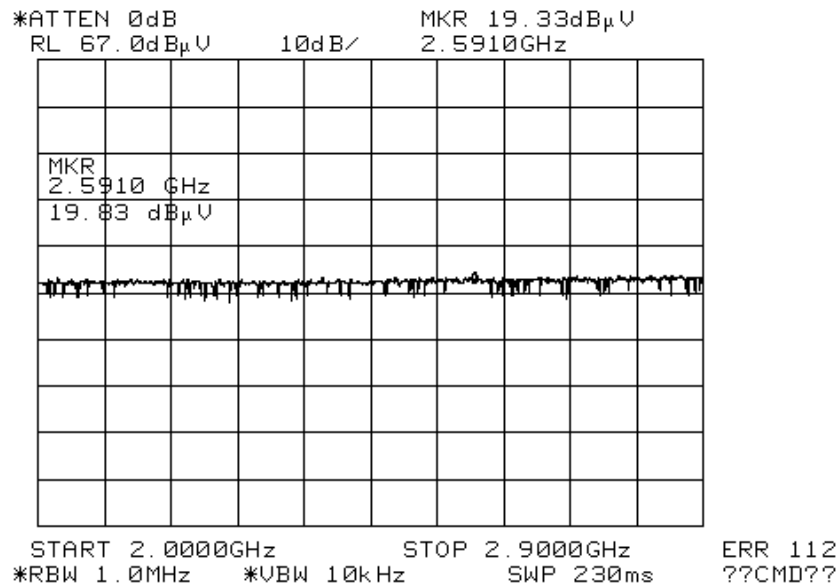
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Emission Measurement; 2.9 GHz – 5.0 GHz Horizontal; High Channel



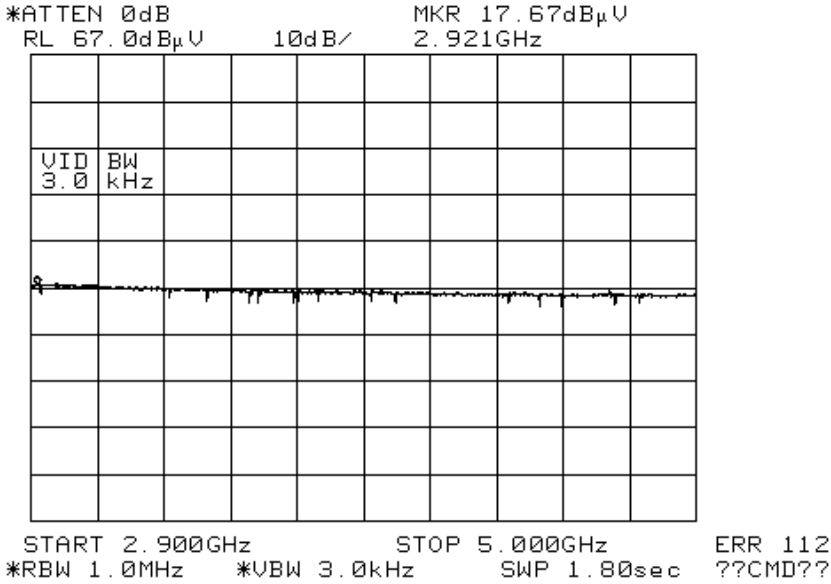
Emission Measurement; 2 GHz – 2.9 GHz Vertical; Low Channel



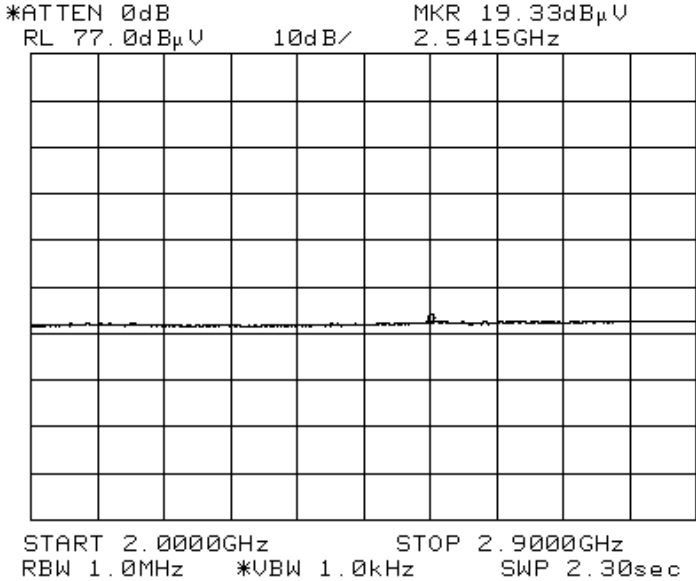
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Emission Measurement; 2.9 GHz – 5.0 GHz Vertical; Low Channel



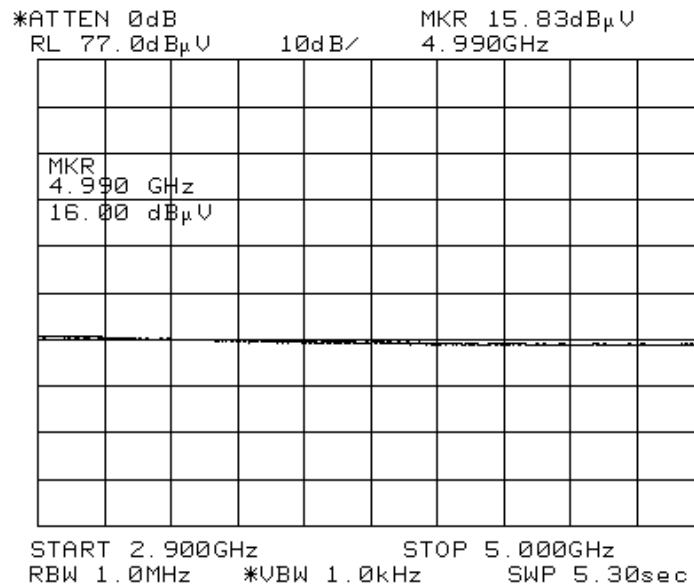
Emission Measurement; 2 GHz – 2.9 GHz Vertical; Mid Channel



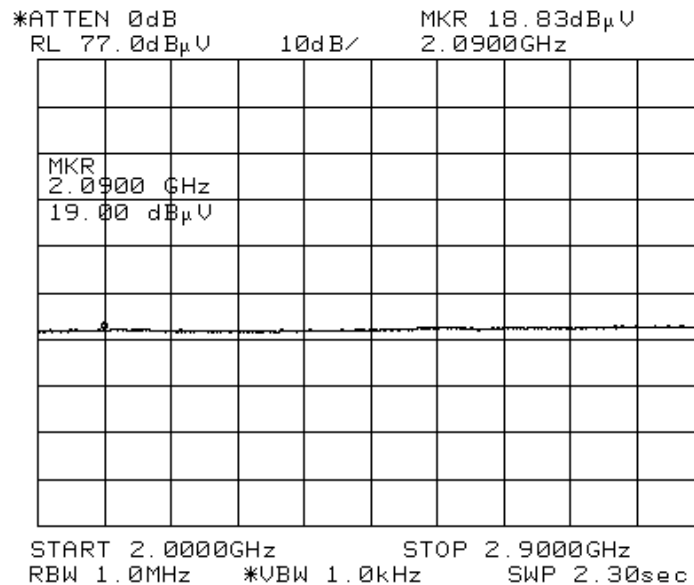
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Emission Measurement; 2.9 GHz – 5.0 GHz Vertical; Mid Channel



Emission Measurement; 2 GHz – 2.9 GHz Vertical; High Channel

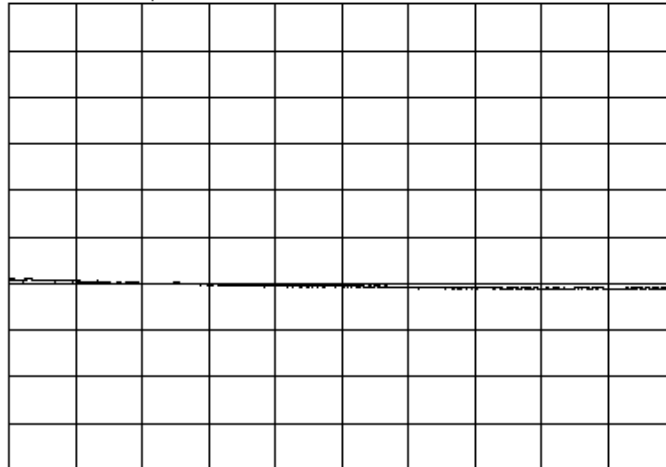


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Emission Measurement; 2.9 GHz – 5.0 GHz Vertical; High Channel

*ATTEN 0dB MKR 16.00dBμV
 RL 77.0dBμV 10dB/ 4.990GHz



START 2.900GHz STOP 5.000GHz
 RBW 1.0MHz *VBW 1.0kHz SWP 5.30sec

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3.6. Final Measurements: Radiated Emissions; 30 MHz – 2GHz

Final Measurements are made by measuring emissions observed in the pre-scan results. At each frequency of measurement, the antenna height and polarity and EUT azimuth are varied to obtain the maximum emission. The measurements are recorded using the antenna polarization that produces the highest emissions. Peak, quasi-peak and average detector readings are recorded.

The top 6 emissions within the 20 dB limit have been recorded.

Arrista Technologies Product Compliance Lab									
Printed: 02/26/04 15:12:38									
Datalog file: TEST EUT - DATAHORZ.DL									
Measurement Units: dBµV/m									
	Num	Frequency	Bandwidth	Corr	Avg	Peak	QPeak	Limit	Delta
Date	Time								
02/26/04	1	40.434637 MHz	120 kHz	20.1	21.4	28.9	25.8	40.0	-14.1
	13:48:36	Notes: Ant Horz @ 145cm; Azim 0 Deg.							
02/26/04	2	143.281967 MHz	120 kHz	18.3	23.0	30.9	27.3	43.5	-16.1
	13:51:43	Notes: Ant Horz @ 180cm; Azim 243 Deg.							
02/26/04	3	319.726457 MHz	120 kHz	21.3	38.9	46.6	43.4	46.0	-2.6
	13:45:30	Notes: Ant Horz @ 100cm; Azim 83 Deg.							
02/26/04	4	399.868515 MHz	120 kHz	23.6	39.4	45.7	43.4	46.0	-2.5
	13:53:24	Notes: Ant Horz @ 100cm; Azim 261 Deg.							
02/26/04	5	516.613375 MHz	120 kHz	25.3	37.4	43.3	40.9	46.0	-5.0
	13:56:01	Notes: Ant Horz @ 193cm; Azim 286 Deg.							
02/26/04	1	34.648392 MHz	120 kHz	21.6	34.1	40.7	38.7	40.0	-1.1
	14:55:49	Notes: Ant Vert @ 100cm; Azimuth 0 Deg.							
02/26/04	2	60.219349 MHz	120 kHz	12.6	34.7	39.9	38.6	40.0	-1.3
	15:03:24	Notes: Ant Vert @ 100cm; Azimuth 0 Deg.							
02/26/04	3	111.605116 MHz	120 kHz	19.5	30.4	36.0	34.0	43.5	-9.5
	15:05:17	Notes: Ant Vert @ 100cm; Azimuth 150 Deg.							
02/26/04	4	138.404238 MHz	120 kHz	19.5	30.4	35.8	33.6	43.5	-9.8
	15:07:02	Notes: Ant Vert @ 100cm; Azimuth 157 Deg.							
02/26/04	5	516.584091 MHz	120 kHz	25.1	31.0	37.6	34.6	46.0	-11.3
	15:09:23	Notes: Ant Vert @ 100cm; Azimuth 157 Deg.							

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3.7. Final Measurements: Radiated Emissions; 2GHz - 5.0 GHz

Final Measurements are made by measuring emissions observed in the pre-scan results. At each frequency of measurement, the antenna height and polarity and EUT azimuth are varied to obtain the maximum emission. The measurements are recorded using the antenna polarization that produces the highest emissions.

Final Measurements; Low Channel

Low Chan	Antenna Horizontal						
	Freq (MHz)	SA Reading (dBuV)	Ant Corr (dB)	Cable Corr (dB)	Final (dBuV)	Limit (dBuV)	Delta (dB)
	2090	18.33	27.40	2.17	47.90	54.00	-6.10
	2541	18.17	28.30	2.50	48.97	54.00	-5.03
	2953	17.30	30.00	2.67	49.97	54.00	-4.03
	4280	15.50	32.20	3.34	51.04	54.00	-2.96
	4990	15.00	33.20	3.67	51.87	54.00	-2.13
	Antenna Vertical						
	Freq (MHz)	SA Reading (dBuV)	Ant Corr (dB)	Cable Corr (dB)	Final (dBuV)	Limit (dBuV)	Delta (dB)
	2090	18.33	27.30	2.50	48.13	54.00	-5.87
	2541	18.67	28.30	2.50	49.47	54.00	-4.53
	2953	17.17	30.00	2.67	49.84	54.00	-4.16
	4280	15.50	32.20	3.34	51.04	54.00	-2.96
	4990	15.00	33.20	3.67	51.87	54.00	-2.13

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Final Measurements; Mid Channel

Mid Chan	Antenna Horizontal						
	Freq (MHz)	SA Reading (dBuV)	Ant Corr (dB)	Cable Corr (dB)	Final (dBuV)	Limit (dBuV)	Delta (dB)
	2090	18.83	27.40	2.17	48.40	54.00	-5.60
	2541	19.67	28.30	2.50	50.47	54.00	-3.53
	2953	17.67	30.00	2.67	50.34	54.00	-3.66
	4280	16.00	32.20	3.34	51.54	54.00	-2.46
	4990	15.33	33.20	3.67	52.20	54.00	-1.80
	Antenna Vertical						
	Freq (MHz)	SA Reading (dBuV)	Ant Corr (dB)	Cable Corr (dB)	Final (dBuV)	Limit (dBuV)	Delta (dB)
	2090	18.33	27.30	2.50	48.13	54.00	-5.87
	2541	19.33	28.30	2.50	50.13	54.00	-3.87
	2953	17.67	30.00	2.67	50.34	54.00	-3.66
	4280	16.00	32.20	3.34	51.54	54.00	-2.46
	4990	15.33	33.20	3.67	52.20	54.00	-1.80

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Final Measurements; High Channel

High Chan	Antenna Horizontal						
	Freq (MHz)	SA Reading (dBuV)	Ant Corr (dB)	Cable Corr (dB)	Final (dBuV)	Limit (dBuV)	Delta (dB)
	2090	19.00	27.40	2.17	48.57	54.00	-5.43
	2541	19.30	28.30	2.50	50.10	54.00	-3.90
	2953	17.30	30.00	2.67	49.97	54.00	-4.03
	4280	16.17	32.20	3.34	51.71	54.00	-2.29
	4990	15.83	33.20	3.67	52.70	54.00	-1.30
	Antenna Vertical						
	Freq (MHz)	SA Reading (dBuV)	Ant Corr (dB)	Cable Corr (dB)	Final (dBuV)	Limit (dBuV)	Delta (dB)
	2090	19.00	27.30	2.50	48.80	54.00	-5.20
	2541	19.30	28.30	2.50	50.10	54.00	-3.90
	2953	17.30	30.00	2.67	49.97	54.00	-4.03
	4280	16.17	32.20	3.34	51.71	54.00	-2.29
	4990	15.83	33.20	3.67	52.70	54.00	-1.30

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3.8. Conducted Emissions

Equipment Under Test is configured as per **Fig 9(c) Test Configuration – Tabletop Equipment** in **ANSI C63.4-1992**. See Appendix B for additional information.

Conducted Emission limits for FCC compliance are listed below.

Table 3.1.1: Limits of Conducted Emission Measurement for Frequency Below 30 MHz

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

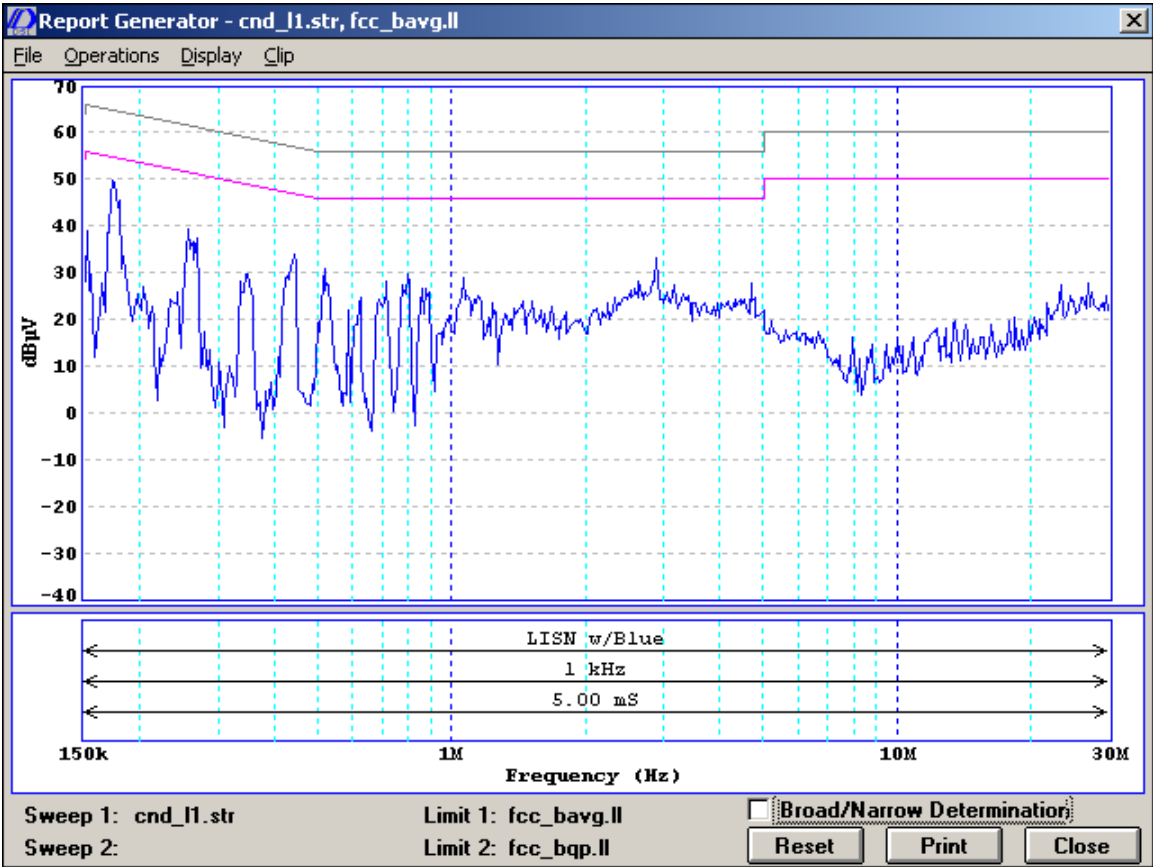
*Decreases with the logarithm of the frequency.

Pre-scan measurements are taken using a peak detector sweep of each Line-to-Ground. Sample time is optimized for sweep speed. Final measurements are taken at emission frequencies discovered in the pre-scans. Average, Peak and quasi-peak readings are recorded.

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3.8.1. Line 1

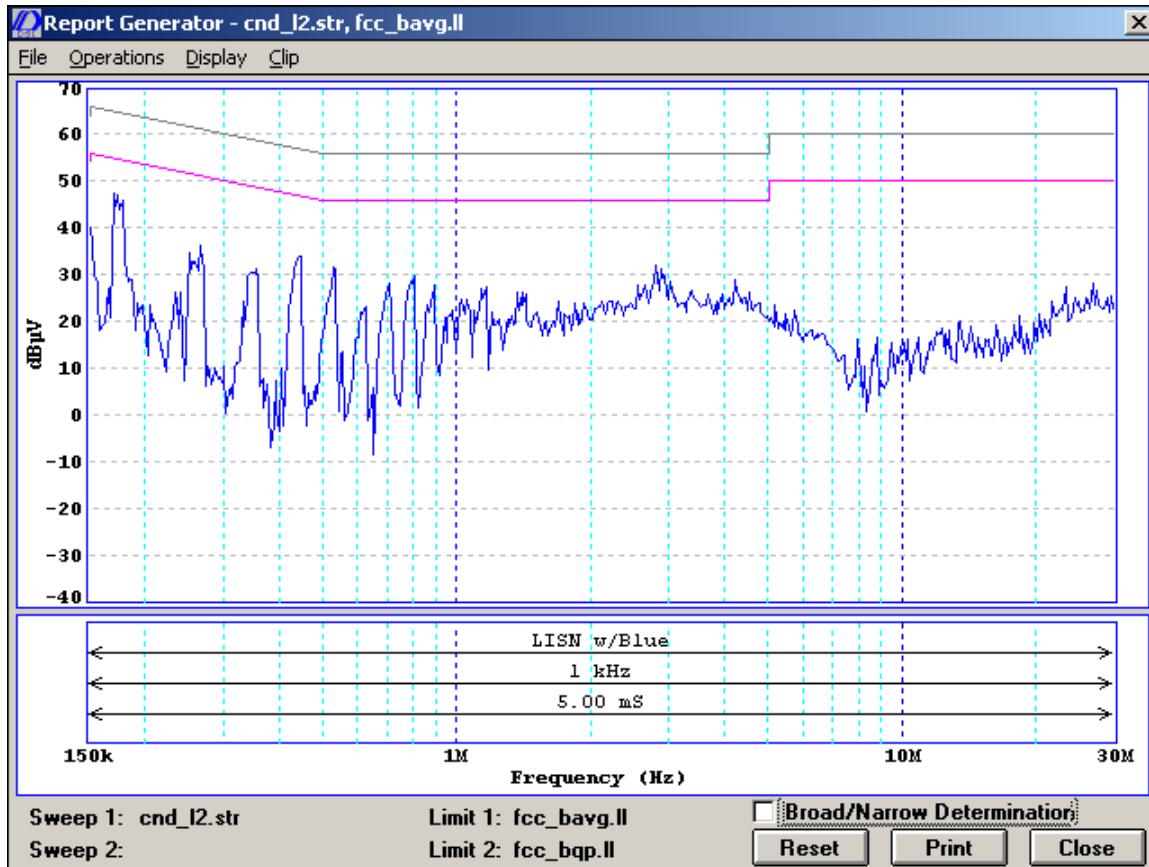
Detector Type:	Peak
Limit Line:	FCC Class B
Voltage Supply:	120 VAC
Supply Conductor	L1



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3.8.2. Line 2

Detector Type:	Peak
Limit Line:	FCC Class B
Voltage Supply:	120 VAC
Supply Conductor	L2



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3.8.3. Final Measurements: Conducted Emissions

Conducted emission peaks were located above a delta of 20 dB from the FCC limit line during the pre-scan of the EUT. The noise-floor of the measuring device, with correction factors applied is displayed in the pre-scan test results. Due to the low emissions of the EUT, final quasi-peak measurement results are shown for only those peaks, which the peak value is above the 20 dB delta from the FCC limit line.

The top 6 emissions within the 20 dB limit have been recorded.

Arrista Technologies Product Compliance Lab

Arrista Technologies Product Compliance Lab

Printed: 05/20/04 13:41:44

Datalog file: TEST EUT - CNDDATA.DL

Measurement Units: dBµV

Time	Num	Frequency	Bandwidth	Corr	Avg	Peak	QPeak	Limit	Delta	Date
14:23:08	1	171.732 kHz	9 kHz	1.8	48.5	55.8	53.6	54.8	-1.1	05/14/04
		Notes: QP signal compared to Avg Limit; Pass on both								
14:24:20	2	260.734 kHz	9 kHz	1.1	37.3	41.8	39.8	51.3	-11.4	05/14/04
		Notes: QP signal compared to Avg Limit; Pass on both								
14:24:39	3	435.309 kHz	9 kHz	0.6	31.2	36.2	34.8	47.2	-12.1	05/14/04
		Notes: QP signal compared to Avg Limit; Pass on both								
14:24:52	4	787.795 kHz	9 kHz	0.6	19.2	33.8	33.8	46.0	-12.0	05/14/04
		Notes: QP signal compared to Avg Limit; Pass on both								
14:25:12	5	2.796790 MHz	9 kHz	0.6	22.4	41.6	34.8	46.0	-11.0	05/14/04
		Notes: QP signal compared to Avg Limit; Pass on both								
14:25:29	6	4.669384 MHz	9 kHz	0.6	17.4	34.3	28.7	46.0	-17.1	05/14/04
		Notes: QP signal compared to Avg Limit; Pass on both								

3.9. Antenna Power Conduction

Antenna port power conduction was measured according to Part 15.111 of FCC Rules. The power at the antenna terminal at any frequency within the range of measurements specified in § 15.33 shall not exceed 2.0 nanowatts.

Power was measured to be 0.037 nanowatts, using a power meter (Anritsu model ML2438A with Power Sensor Model MA2474A).

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4. Photos

Radiated Emissions; 0 Degrees



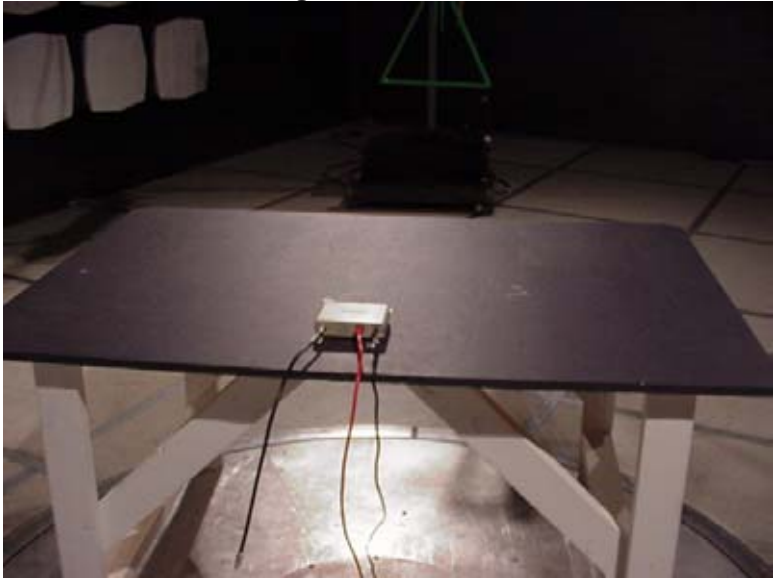
Radiated Emissions; 0 Degrees



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Radiated Emissions; 0 Degrees



Radiated Emissions; 0 Degrees



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Conducted Emissions



Conducted Emissions



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