Lab Code: 200167-0

FCC PART 15 SUBPART B
MEASUREMENT AND TEST REPORT

For

AOR U.S.A., Inc.

20655 S. Western Ave., Suite 112,
Torrance, CA 90501, USA

FCC ID: NVJSR2000A
Model: SR2000A

Report Type: ☒ Original Report	**Product Type:** Frequency Monitor
Test Engineer:	Stella Cao
Report Number:	R0712032
Testing Date(s):	2008-04-08 and 2008-04-09
Report Date:	2008-04-10
Reviewed By:	Samuil Lisinker, Engineering Manager
Prepared By: **(S9)**	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Ave Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732 9164

Note: This test report is for the customer shown above and their specific product only. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government

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1 General Description

1.1 Product Description for Equipment under Test (EUT)

This measurement and test report has been compiled on behalf of the company *AOR U.S.A., Inc.* and their product model: *SR2000A* which is a *Frequency Monitor*, henceforth referred to in this report as the EUT (Equipment under Test). The EUT is a digital frequency monitor with a built-in high grade front end for professional users. The digitally processed IF signals of this RF unit are combined with FFT technology covering 25 MHz – 3 GHz continuous.

** All test data gathered is from a production sample provided by the manufacturer, serial number: 550003, assigned by the manufacturer.*

1.2 Mechanical Description

The EUT is of metallic construction that measures approximately 220 mm (L) x 120 mm (W) x 195 mm (H) and weighs approximately 3.3 kg. It is typically powered by 12.0 VDC provided by an AC/DC adapter.

1.3 EUT Photo

Please see additional photos in exhibit C

1.4 Objective

This report is prepared on behalf of *AOR U.S.A., Inc.* in accordance with Part 2, Subpart J, and Part 15, Subparts B of the Federal Communications Commission rules, and Canadian ICES-003, Interference – Causing Equipment Standards for Digital Apparatus.

The objective is to determine compliance with FCC Part 15 Standard, Subpart B, and Canadian ICES-003 Standard, Class B limits for conducted and radiated emission requirements for unintentional radiators, and requirements for Scanning Receivers.

1.5 Related Submittal(s)/Grant(s)

No related submittals.

1.6 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp.

1.7 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values ranging from $\pm$2.0 dB for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

Detailed instrumentation measurement uncertainties can be found in BACL Corp. report QAP-018.

1.8 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11, 1997 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the test methods and procedures set forth in ANSI C63.4-2003 & TIA/EIA-603.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: R-2463 and C-2698. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is a National Institute of Standards and Technology (NIST) accredited laboratory under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm.

2 SYSTEM TEST CONFIGURATION

2.1 Justification

The system was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the normal (native) operating mode to represent the *worst*-case results during the final qualification test.

2.2 Internal EUT Configuration

Name of Board	Number	Description
SR2000A Controller	040607-3	Controller unit
SR2000A Panel	040607-3	Front Panel display, control board
SR2K-OSC2	N/A	RF unit loacl oscillator
SR2K-IFCP3	N/A	RF unit controller
SR2K-FRMX2	N/A	RF unit frontend, Mixer
APCO P25 Board	041025-0	APCO25 (P25) decoder

2.3 Equipment Modifications

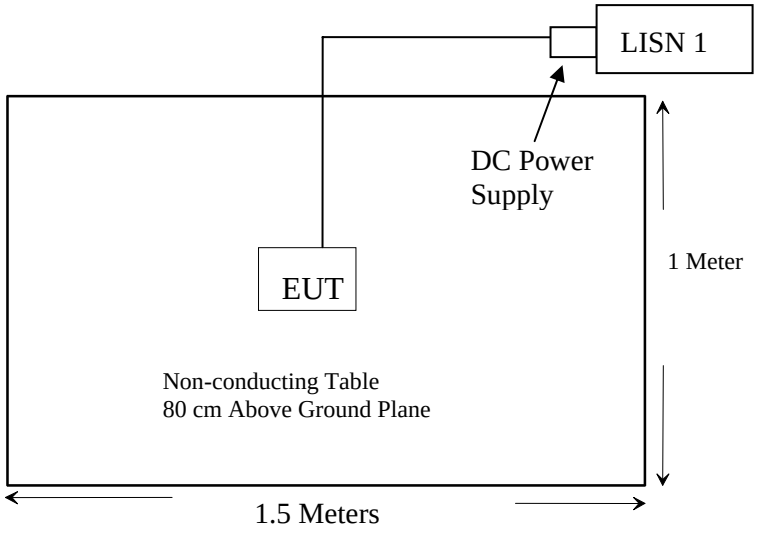
No modifications were made to the EUT.

2.4 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Helper Instrument	SINAD Meter	SL-105	56800
R & S	Signal Generator	SMIQ 03	849192/0085

2.5 Test Setup Block Diagram

5 meter semi-anechoic chamber



3 Summary of Test Results

Standard	Description	Result
FCC § 15.107	Conducted Emission	Compliant
FCC § 15.109	Radiated Emission	Compliant
FCC § 15.121	Scanning Receivers Cellular Image Rejection	Compliant

4 FCC §15.107 - CONDUCTED EMISSIONS

4.1 Applicable Standard

As per FCC §15.107: Conducted Limits

(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	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.*

4.2 EUT Setup

The conducted emissions tests were performed in the 10-meter test chamber, using the setup in accordance with ANSI C63.4-2003 measurement procedures. The specifications used were in accordance with FCC Part 15 Standard, Class B limits.

The spacing between the peripherals was 10 cm.

The external I/O cables were draped along the test table and bundled as required.

The EUT was connected to an AC/DC adapter which was connected to LISN-1 providing power.

4.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
R&S	EMI Test Receiver	ESCI1166.5950	100337	2008-03-26
FCC	LISN	FCC-LISN-50-50-2-M-H	6013	2007-08-14

****Statement of Traceability*:** BACL Corp. attests that all calibrations have been performed according to NVLAP requirements, traceable to the NIST.

4.4 Test Procedure

During the conducted emissions test, the power cord of the host system was connected to the main outlet of the LISN-1.

Maximizing procedure was performed on the six (6) highest emission readings from the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Average readings are labeled "AV," and Quasi-peak readings are labeled "QP," in the test data hereinafter.

4.5 Environmental Conditions

Temperature:	20 º C
Relative Humidity:	45 %
ATM Pressure:	101.2 kPa

**Testing was performed by Test Stella Cao on 2008-04-09.*

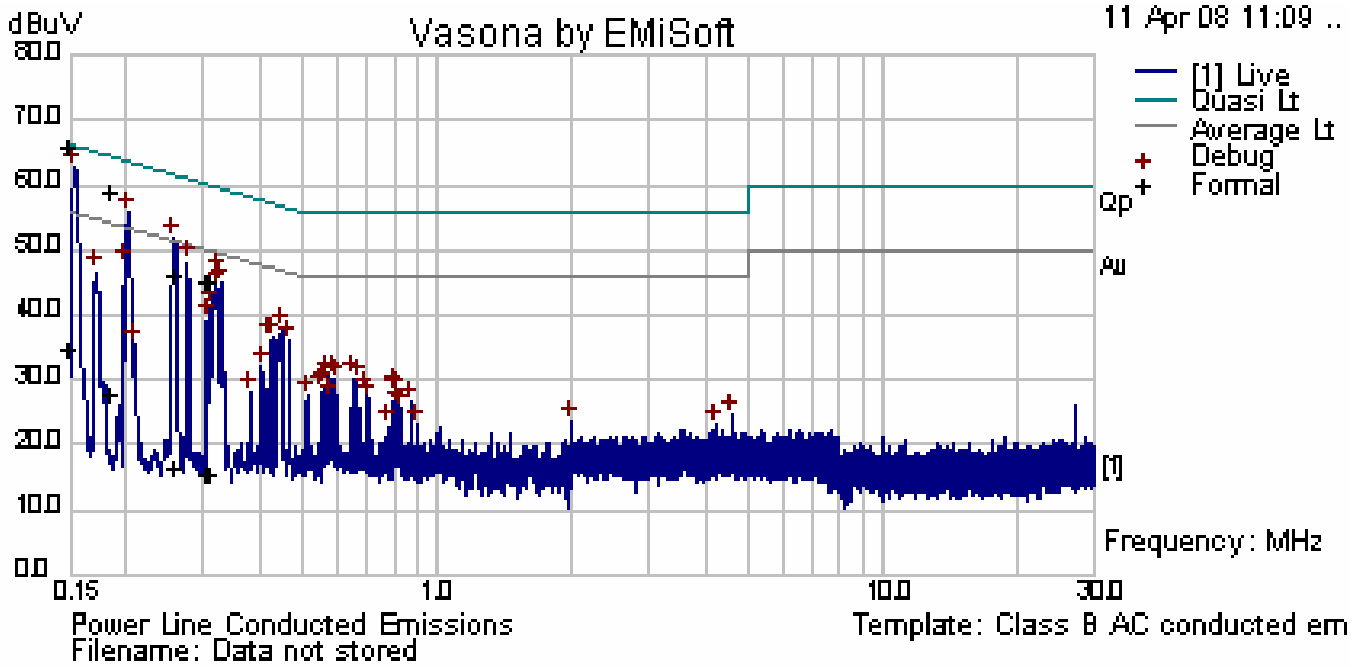
4.6 Summary of Test Results

According to the recorded data, the EUT complied with FCC §15.107 Standard, Class B limits, and had the worst margin reading of:

-1.82 dB at **0.157 MHz** on the **Neutral** conductor, 150 kHz to 30 MHz.

4.7 Conducted Emissions Test Plots and Data

120 V, 60 Hz – Live Line



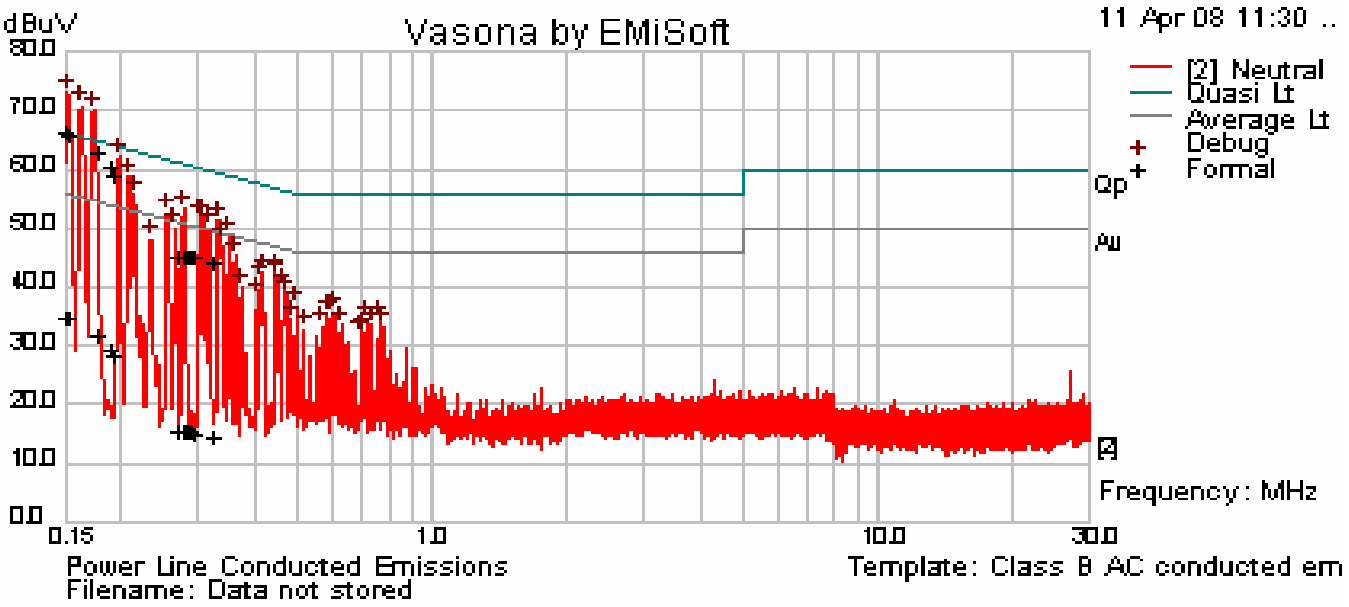
Quasi-Peak Measurements

Frequency (MHz)	Quasi-Peak (dBµV)	Conductor (L/N)	Limit (dBµV)	Margin (dB)
0.15	63.48	L	66	-2.52
0.185	56.57	L	64.25	-7.68
0.305	42.95	L	60.11	-17.16
0.313	42.72	L	59.9	-17.18
0.261	43.93	L	61.4	-17.47
0.258	43.92	L	61.48	-17.56

Average Measurements

Frequency (MHz)	Average (dBµV)	Conductor (L/N)	Limit (dBµV)	Margin (dB)
0.15	32.31	L	56	-23.69
0.185	25.6	L	54.25	-28.65
0.305	13.35	L	50.11	-36.76
0.313	12.96	L	49.9	-36.94
0.258	14.25	L	51.48	-37.23
0.261	14.1	L	51.4	-37.3

120 V, 60 Hz – Neutral



Quasi-Peak Measurements

Frequency (MHz)	Quasi-Peak (dBµV)	Conductor (L/N)	Limit (dBµV)	Margin (dB)
0.157	63.82	N	65.64	-1.82
0.153	63.98	N	65.85	-1.87
0.152	63.89	N	65.87	-1.97
0.181	60.52	N	64.44	-3.92
0.191	58.27	N	63.98	-5.71
0.197	56.91	N	63.74	-6.83

Average Measurements

Frequency (MHz)	Average (dBµV)	Conductor (L/N)	Limit (dBµV)	Margin (dB)
0.157	32.34	N	55.64	-23.30
0.152	32.53	N	55.87	-23.34
0.153	32.46	N	55.85	-23.39
0.181	29.28	N	54.44	-25.17
0.191	27.1	N	53.98	-26.88
0.197	25.94	N	53.74	-27.80

5 FCC §15.109 – Radiated Emissions

5.1 Applicable Standard

As per FCC §15.109: Radiated Emission Limits

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (μV/m)
30-88	100
88-216	150
216-960	200
Above 960	500

(g) As an alternative to the radiated emission limits shown in paragraphs (a) and (b) of this section, digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, "Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement"

Note: The CISPR 22 §6 Standard, Class B limits are applied to the test data hereinafter.

5.2 Test Setup

The radiated emissions tests were performed in the 5-meter test chamber, using the setup in accordance with ANSI C63.4-2003 measurement procedures. The specifications used were in accordance with CISPR 22 Standard, Class B limits for frequencies between 30 MHz and 1 GHz, and FCC Part 15 Standard, Class B limits for frequencies above 1 GHz.

5.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Document Technology	Pre-Amplifier	ALN-09173030	S/N 2944A07030	2007-11-12
HP	Pre-Amplifier	8447D	2944A06639	2007-12-19
A.R.A	Horn Antenna	DRG118/A	1132	2007-06-07
Sunol Science	Antenna	JB1	A020106-1	2007-05-21
R & S	EMI Test Receiver	ESCI1166.5950	100337	2008-03-26

***Statement of Traceability:* BACL Corp.** attests that all calibrations have been performed according to NVLAP requirements, traceable to the NIST.

5.4 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions readings to ensure the EUT is compliant with all installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings were performed only when an emission was found to be marginal (within -4 dB of specification limits).

5.5 Environmental Conditions

Temperature:	20 º C
Relative Humidity:	45 %
ATM Pressure:	101.2 kPa

**Testing was performed by Stella Cao on 2008-04-08.*

5.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor, and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Class B Limit

5.7 Summary of Test Results – 30 MHz to 1 GHz

According to the recorded data, the EUT complied with FCC §15.109 Standard, Class B limits, and had the worst margin readings of:

-7.32 dB at **710.195 MHz** in the **Horizontal** polarization

5.8 Summary of Test Results – Above 1 GHz

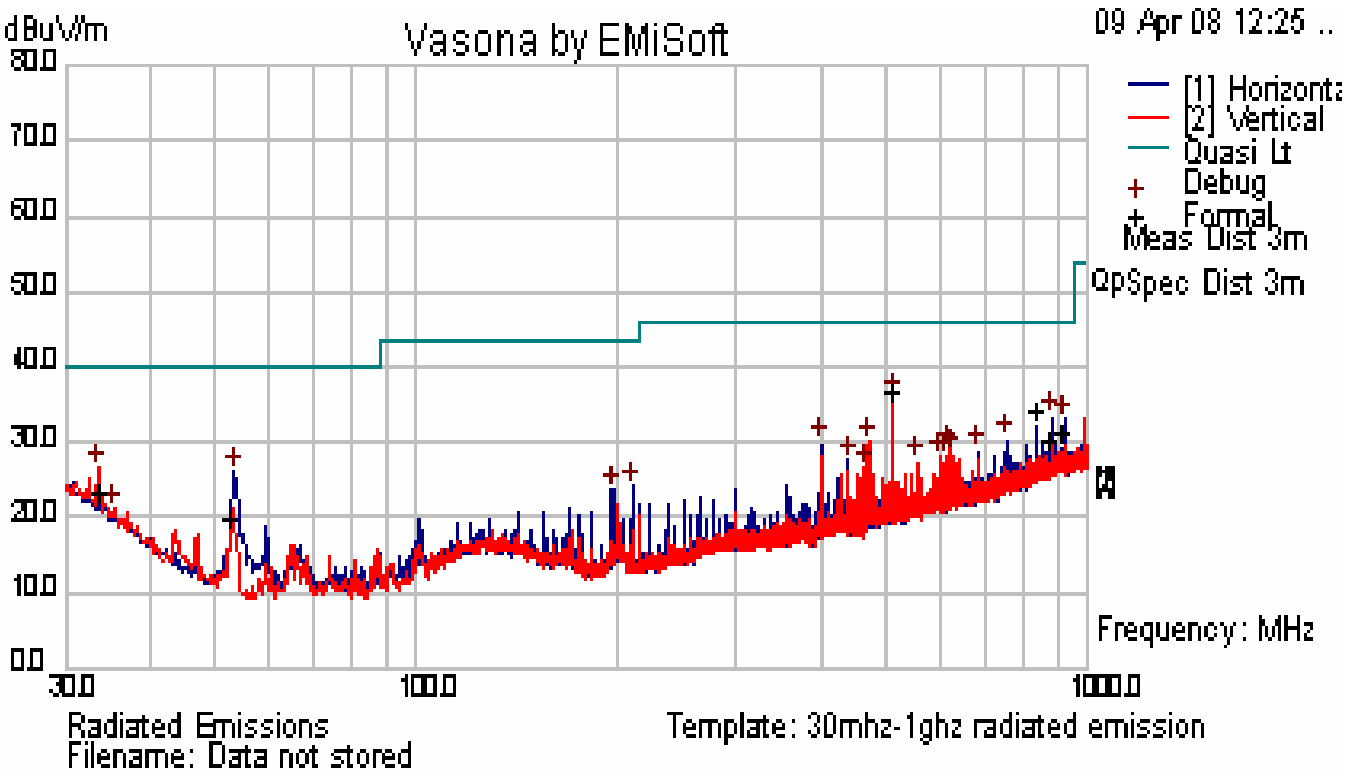
According to the recorded data, the EUT complied with FCC §15.109 Standard, Class B limits, and had the worst margin readings of:

-13.81 dB at **5000.014 MHz** in the **Vertical** polarization

5.9 Radiated Emissions Test Plots and Data

Mode 1: Scanning mode.

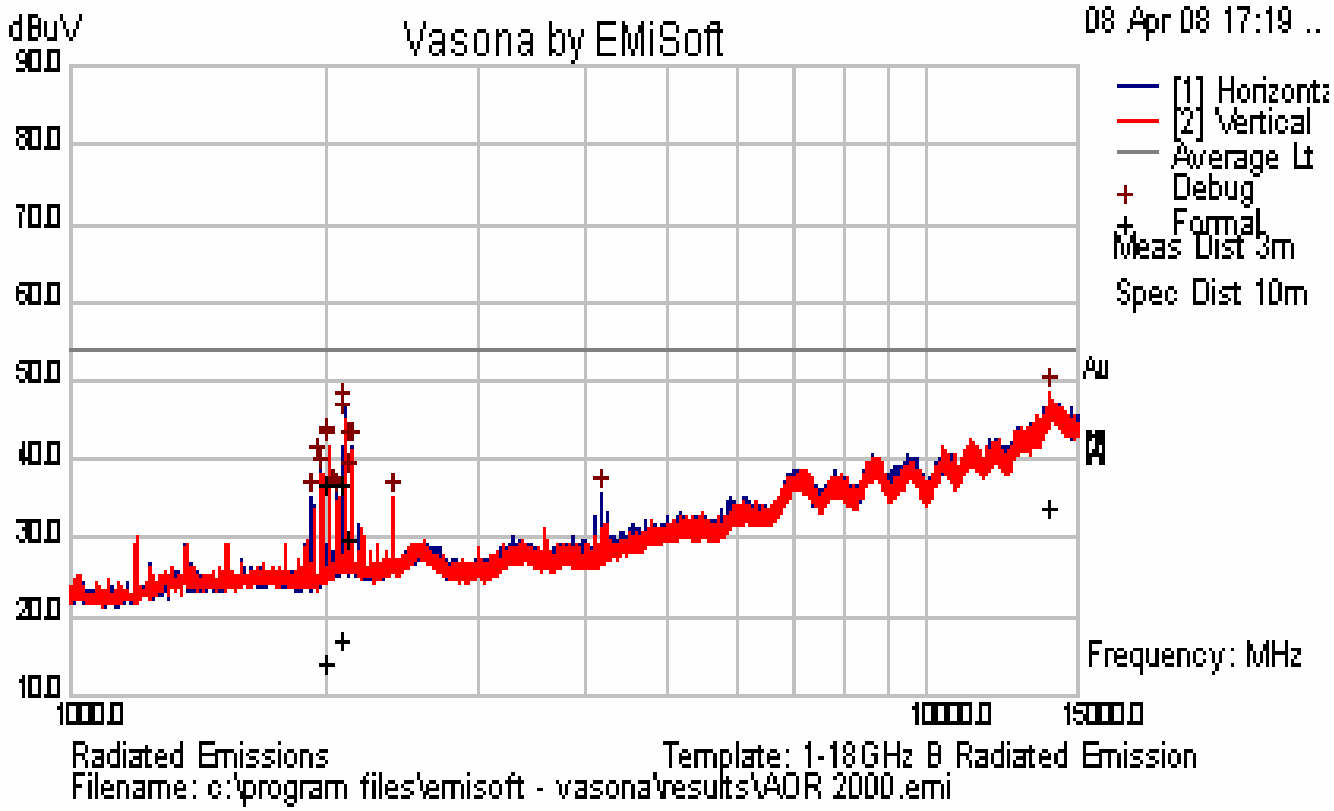
30-1000 MHz:



Quasi-Peak Measurements

Frequency (MHz)	Quasi-Peak (dBµV/m)	Antenna Height (cm)	Polarity (H/V)	Turntable Position (degrees)	Limit (dBµV/m)	Margin (dB)
513.62	34.2	102	V	358	46	-11.8
53.457	17.38	110	H	294	40	-22.62
33.767	21.3	139	V	276	40	-18.7
840.837	31.86	98	H	260	46	-14.14
880.855	28.19	105	H	103	46	-17.81
920.944	29.06	103	H	100	46	-16.94

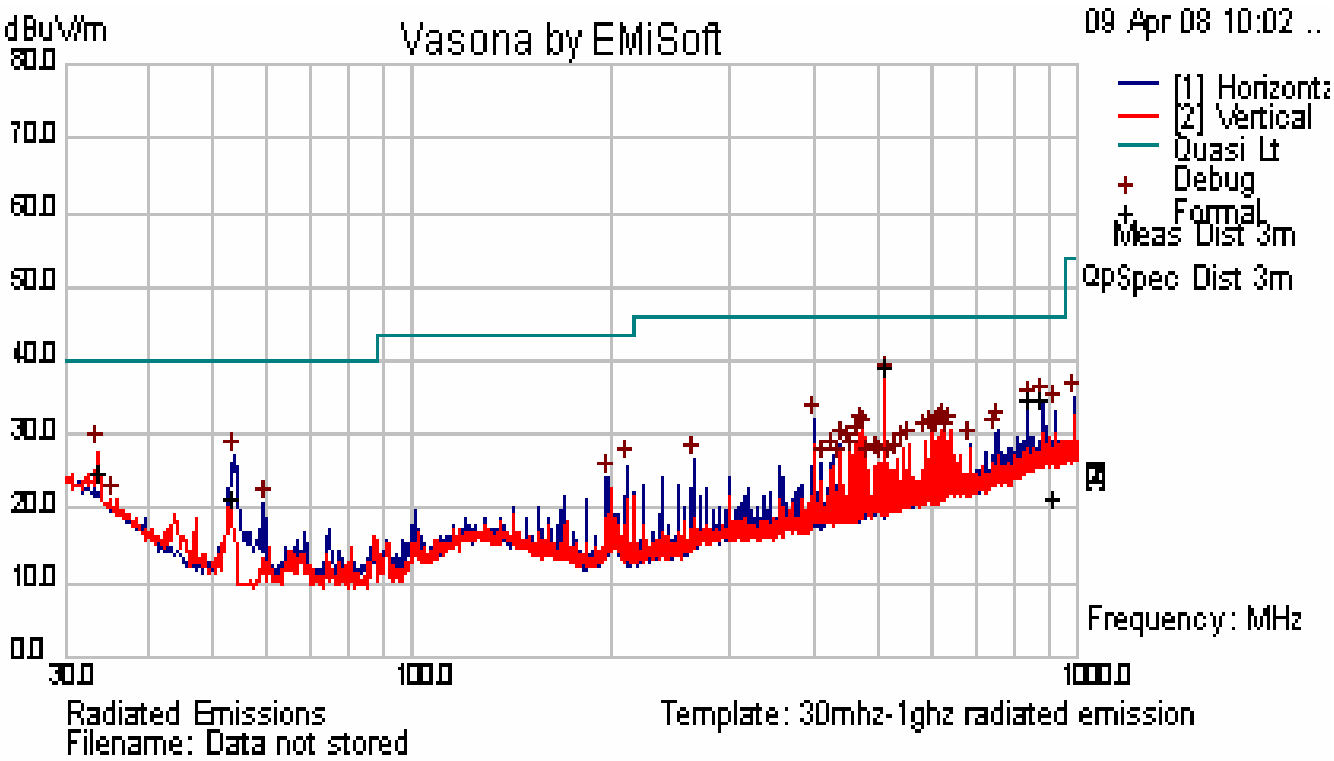
Above 1 GHz:



Average Measurements

Frequency (MHz)	Average (dBµV/m)	Antenna Height (cm)	Polarity (H/V)	Turntable Position (degrees)	Limit (dBµV/m)	Margin (dB)
2003.931	34.61	117	H	289	54	-19.39
2090.122	34.6	229	H	400	54	-19.40
13917.41	31.6	185	V	378	54	-22.40
2132.306	27.38	229	H	365	54	-26.62
2097.381	14.95	98	V	380	54	-39.05
2011.385	11.87	213	V	188	54	-42.13

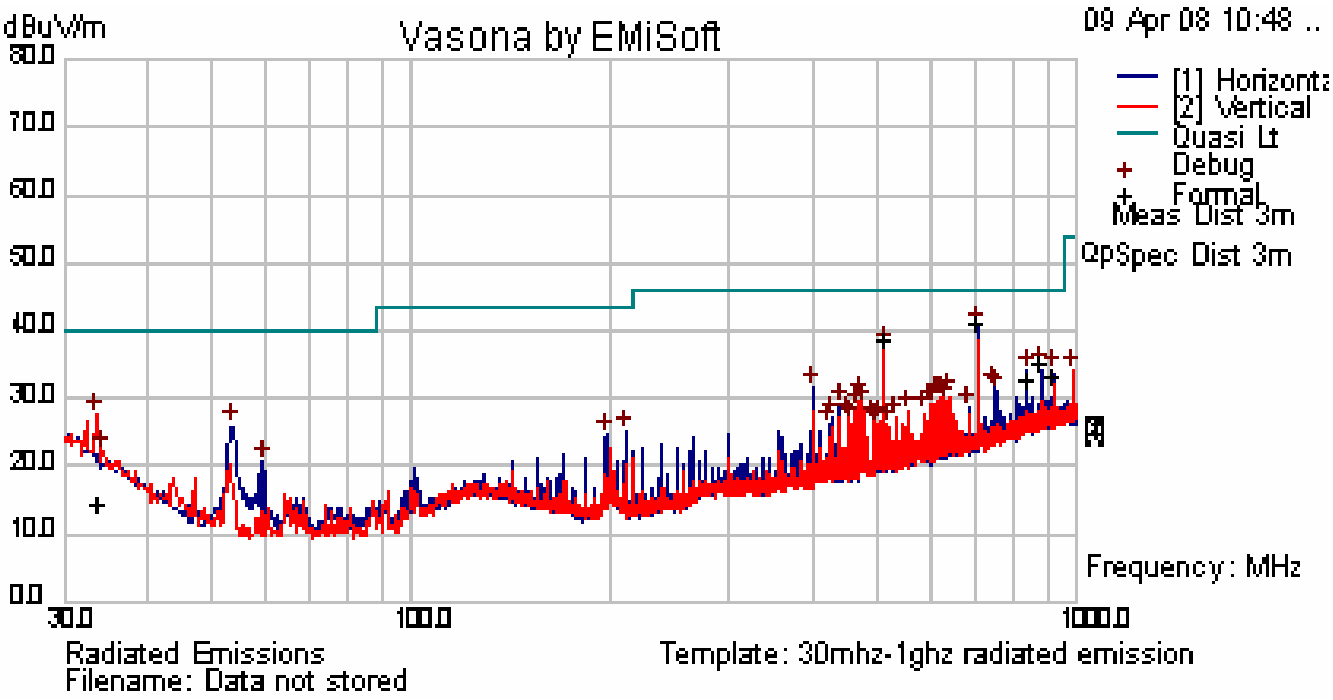
Mode 2: in receiving mode and set to low frequency.



Quasi-peak Measurements

Frequency (MHz)	Quasi-Peak (dBµV/m)	Antenna Height (cm)	Polarity (H/V)	Turntable Position (degrees)	Limit (dBµV/m)	Margin (dB)
513.621	36.71	98	V	316	46	-9.29
880.881	32.54	98	H	252	46	-13.46
840.854	32.28	103	H	260	46	-13.72
33.758	22.39	105	V	99	40	-17.61
53.982	19.22	98	H	45	40	-20.78
921.023	19.04	148	H	203	46	-26.96

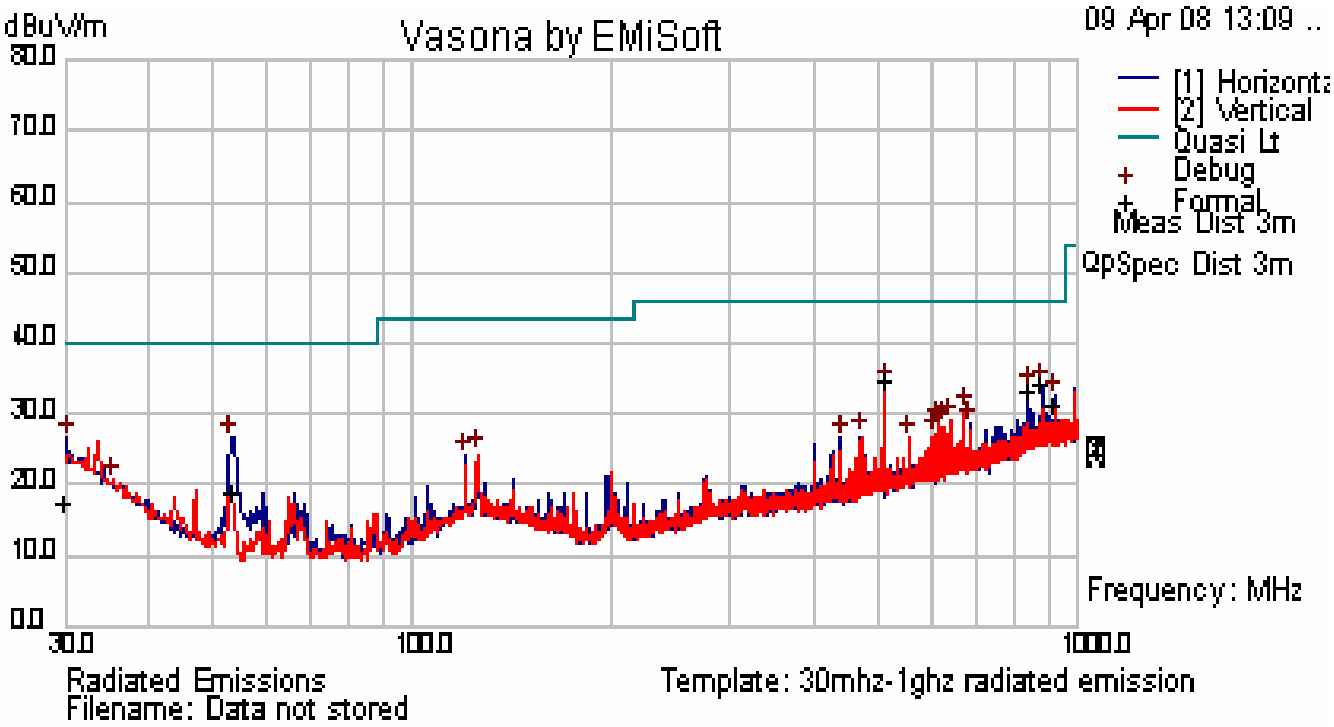
Mode 3: in receiving mode and set to middle frequency.



Quasi-Peak Measurements

Frequency (MHz)	Quasi-Peak (dBµV/m)	Antenna Height (cm)	Polarity (H/V)	Turntable Position (degrees)	Limit (dBµV/m)	Margin (dB)
710.195	38.68	114	H	154	46	-7.32
513.611	36.34	98	V	321	46	-9.66
880.897	32.76	97	H	258	46	-13.24
920.909	31.03	97	H	104	46	-14.97
840.807	30.55	97	H	266	46	-15.45
33.807	12.2	169	V	157	40	-27.8

Mode 4: in receiving mode and set to high frequency



Quasi-Peak Measurements

Frequency (MHz)	Quasi-peak (dBμV/m)	Antenna Height (cm)	Polarity (H/V)	Turntable Position (degrees)	Limit (dBμV/m)	Margin (dB)
513.602	32.59	105	V	312	46	-13.41
880.898	31.95	102	H	262	46	-14.05
840.827	31.09	100	H	258	46	-14.91
920.883	29	98	H	111	46	-17.00
53.497	16.4	107	H	235	40	-23.60
30.004	15.33	369	H	169	40	-24.67

6 FCC §15.121 – Scanning Receiver Cellular Band Rejection

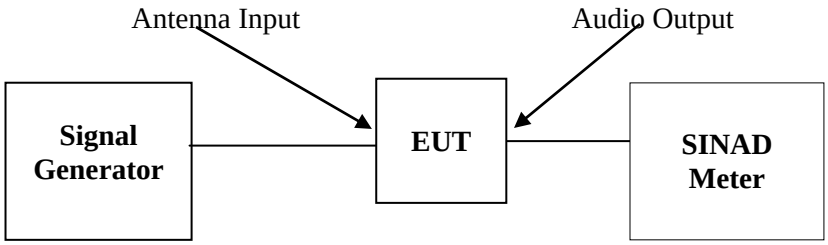
6.1 Applicable Standard

As per FCC §15.121: Scanning receivers and frequency converters used with scanning receivers
(b) Except as provided in paragraph (c) of this section, scanning receivers shall reject any signals from the Cellular Radiotelephone Service frequency bands that are 38 dB or lower based upon a 12 dB SINAD measurement, which is considered the threshold where a signal can be clearly discerned from any interference that may be present.

6.2 Test Setup

The EUT is placed in scan mode. Each of the cellular frequencies listed in the table below is injected into the antenna input of the EUT one by one. At each frequency input signal tested, the frequencies at which the EUT stops at are recorded in the data table.

Once this is completed, we measure the scanner's sensitivity to image and spurious responses to cellular band signals.



6.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Helper Instrument	SINAD Meter	SL-105	56800	2007-11-21
R & S	Signal Generator	SMIQ 03	849192/0085	2007-12-03

***Statement of Traceability:* BACL Corp.** attests that all calibrations have been performed according to NVLAP requirements, traceable to the NIST.

6.4 Test Procedure

Connect the Signal Generator to the EUT antenna input port, and SINAD Meter to the EUT Audio output port. The EUT is placed in scan mode. Each of the cellular frequencies listed in the table below is injected into the antenna input of the EUT one by one. At each frequency input signal tested, the frequencies at which the EUT stops at are recorded in the data table.

Once this is completed, we measure the scanner's sensitivity to image and spurious responses to cellular band signals.

In order to comply with 15.121 (b), when the scanner is tuned to any of the 'received' frequencies tested, its 12 dB SINAD sensitivity to any image and spurious signals in the cellular bands must be at least 38 dB poorer than its primary sensitivity as measured.

6.5 Environmental Conditions

Temperature:	20 º C
Relative Humidity:	45 %
ATM Pressure:	101.2 kPa

**Testing was performed by Stella Cao on 2008-04-08.*

6.6 Summary of Test Result: Compliant

Cellular Frequency (MHz)	Received Freq. (Image)	Image Rejection Ratio (dB)
824.5	332.20	45
	585.70	51
836.5	432.00	61
848.5	376.50	56
869.5	583.60	56
	763.20	49
	821.20	42
881.5	766.40	62
893.5	775.30	63

** Image Rejection Ratio = Scanner's sensitivity to image signal – Scanner's primary sensitivity measured*