

FCC PART 90
TEST AND MEASUREMENT REPORT



For

Getron System Co., Inc.

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Sungnam-Si, Kyunggi-Do, Korea

FCC ID: W8PGT-150HPN

Report Type: Original Report	Product Type: Private Communication Transmitter
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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "*" Rev. 2.0

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R0903163-90	Original	2009-04-14

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

This Bay Area Compliance Laboratories Corp. test report has been prepared on behalf of Getron System Co., Inc. and their product, model: *GT-150HPN*, FCC ID: *W8PGT-150PN* or the EUT (Equipment under Test) as referred to in the rest of this report. The EUT is a private communication transmitter. As a transmitting device for wireless call, GT-150HPN uses 150MHz channel of the frequency permitted as a private communication network and generates 5 Watt power. Designed as a simplex, light-weight communication device for a private communication network, GT-150HPN adopts a way of X-TAL which is highly-reliable and it is designed to be used in buildings, hospitals, hotels, department stores, and factories efficiently.

General Specification:

Frequency Range: 150.7125 MHz
Type of Emission: F2D
Power Supply: DC 12.5V
Dimensions: 295 (W) X 265 (H) X 285 (D) mm

** The test data gathered are from typical production sample, model: GT-150HPN serial number: B2133 assigned by BACL.*

EUT Photo



Additional photos in Exhibit C

Objective

This type approval report is prepared on behalf of *Getron System Co., Inc.* in accordance with Part 2, Subpart J and Part 90 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for RF output power, modulation characteristic, occupied bandwidth, spurious emission at antenna terminal, field strength of spurious radiation, frequency stability, and conducted and radiated margin.

This report is provided on behalf of *Getron System Co., Inc.* for confirmation of regulatory compliance. The manufacturer declares that the model: GT-150HPN serial number: B2133 provided for testing is identical in construction and electrical operation with the post production product. Retesting is recommended for any changes to the model that might affect compliance including those with respect to software, circuitries, PCB layout, RF module, features and functionality.

Related Submittal(s)/Grant(s)

No Related Submittals

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 90 – Private land mobile radio services

Applicable Standards: TIA-603-C, ANSI C63.4-2003.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in 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 range from ± 2.0 for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

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

Test Facility

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

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

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2463 and R-2698. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL 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/Standards/scopes/2001670.htm>

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to TIA-603-C.

The final qualification test was performed with test software provided by the manufacturer.

Block Diagram

Please refer to Exhibit D.

Equipment Modifications

No modifications were made to the EUT.

Local Support Equipment/device List and Details

Manufacturers	Descriptions	Models	Serial Number
Narda	Attenuator 10dB	766-10	/
Narda	Attenuator 30dB	766-30	/
Getron	RS422 POCAG Signal Generator	-	/

Interface Ports and Cabling

Cable Description	Length (m)	From	To
RF Cable	0.5	EUT	Spectrum Analyzer

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§2.1046, §90.205(d)	RF Output Power	Compliant
§2.1047	Modulation Characteristics	NA
§2.1049, §90.209, §90.210	Occupied Bandwidth, Emission Mask	Compliant
§2.1051, §90.210, §90.669	Spurious Emission at Antenna Terminals	Compliant
§2.1053, §90.210 (b) (d)	Field Strength of Spurious Emission	Compliant
§2.1055, §90.213	Frequency Stability	Compliant
§2.1091	RF Exposure	Compliant

§2.1046 & §90.205 (d) – RF OUTPUT POWER

Applicable Standard

§2.1046 (b) and §90.205

Test Procedure

The Transmitter (EUT) was connected to a resistive load coaxial attenuator of normal load impedance and modulated output power was measured by means of on Spectrum Analyzer.

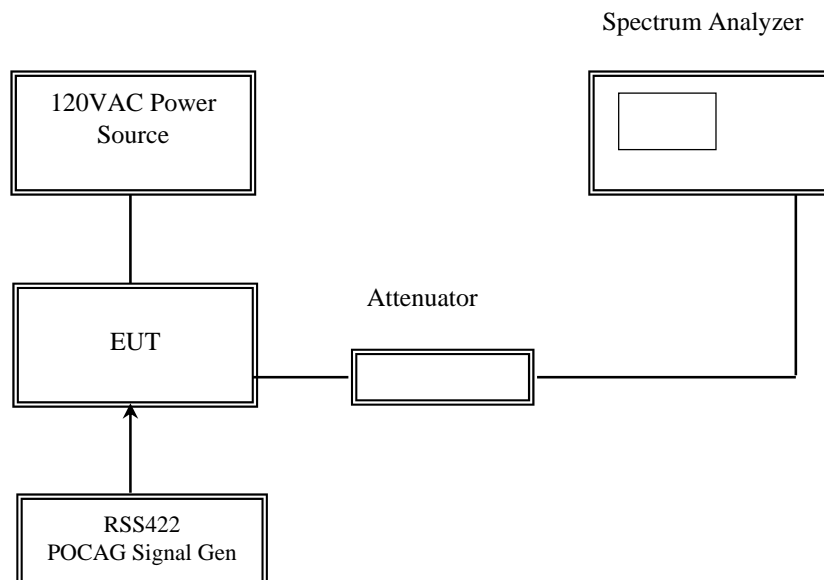
TIA-603-C § 2.2.1

Test Equipment List and Details

Manufacturer	Equipment Description	Model Number	Serial Numbers	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28

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

Test Setup Block Diagram



Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	47.2 %
ATM Pressure:	101.4 kPa

** The testing was performed by Victor Zhang on 2009-04-13 in RF Site.*

Test Results

Frequency (MHz)	Final Voltage (Vdc)	Final Current (A)	Transmit Output Power	
			(dBm)	(Watts)
150.7125	12.11	3.37	36.85	4.841

§2.1049 & §90.210 - OCCUPIED BANDWIDTH, EMISSION MASK

Applicable Standards

§2.1049 (c) (4) and §90.210

Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

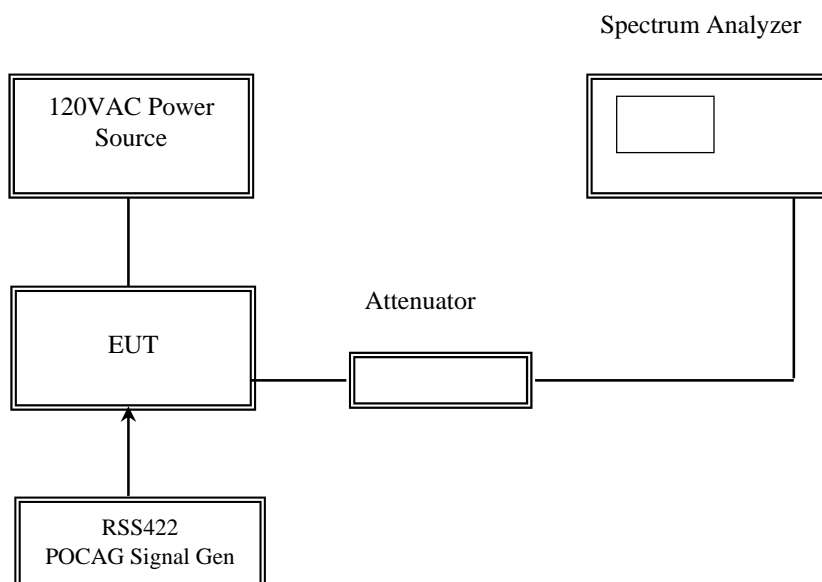
The EUT modulating signal is provided by RS422 POCAG signal generator.

Test Equipment List and Details

Manufacturer	Equipment Description	Model Number	Serial Numbers	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28

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

Test Setup Block Diagram



Test Environmental Conditions

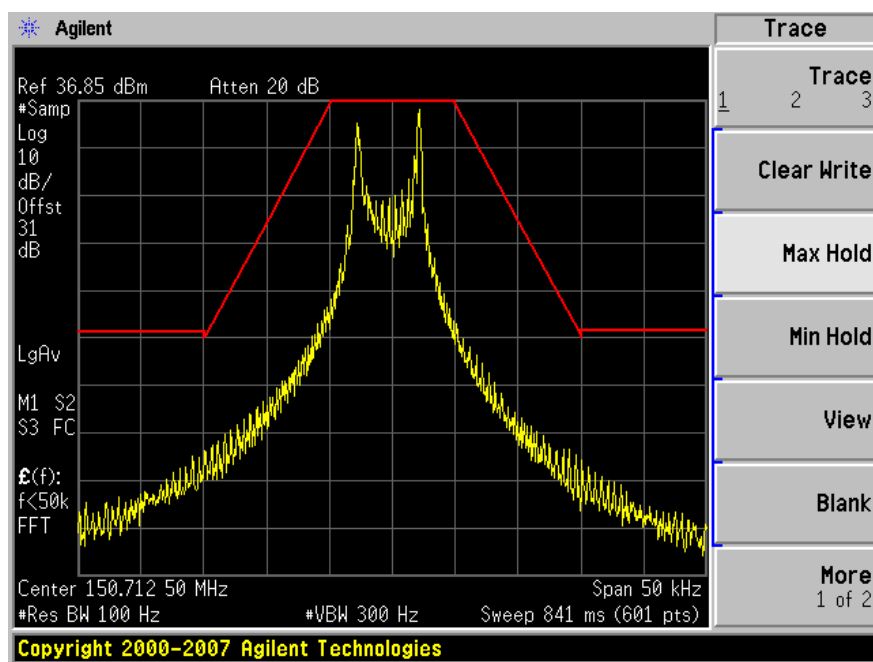
Temperature:	23 °C
Relative Humidity:	47.2 %
ATM Pressure:	101.4 kPa

* The testing was performed by Victor Zhang on 2009-04-13 in RF Site.

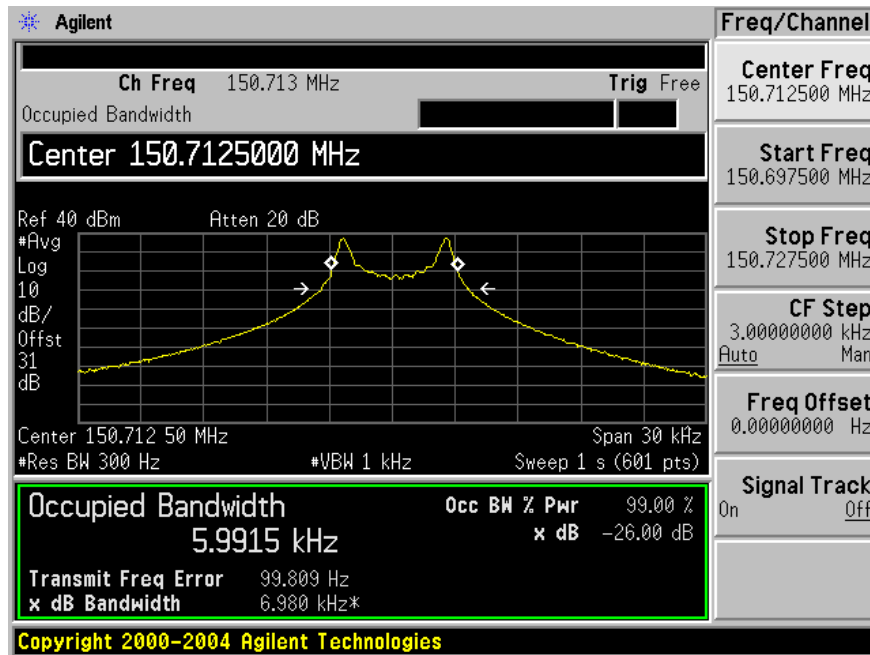
Test Results

Please refer to the following plots.

Fc = 150.7125 MHz



Emission Mask



Occupied Bandwidth

§2.1051, §90.210 & 90.669 – SPURIOUS EMISSION AT ANTENNA TERMINALS, SUPPRESSION OF INTERFERENCE

Applicable Standards

§ 2.1051, §90.210 and §90.669

Test Procedure

Conducted:

TIA 603-C Clause 2.2.13

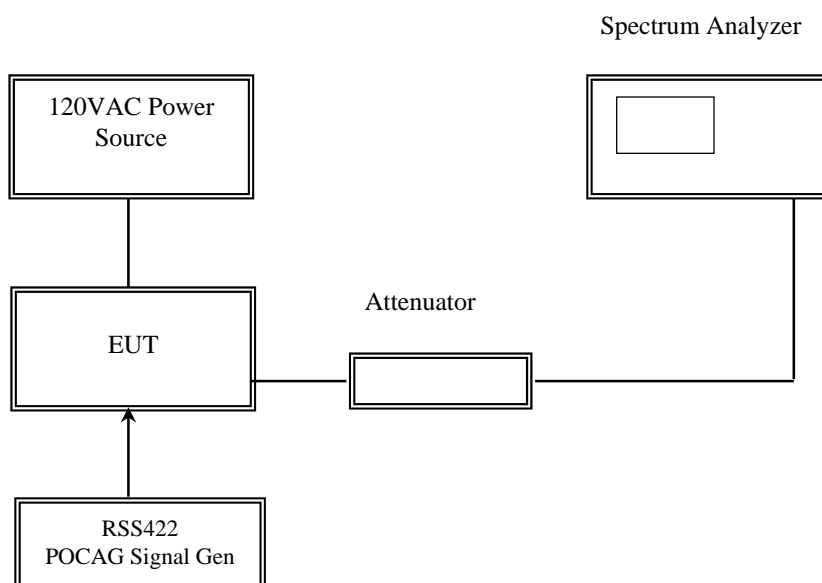
The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation.

Test Equipment List and Details

Manufacturer	Equipment Description	Model Number	Serial Numbers	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28

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

Test Setup Block Diagram



Test Environmental Conditions

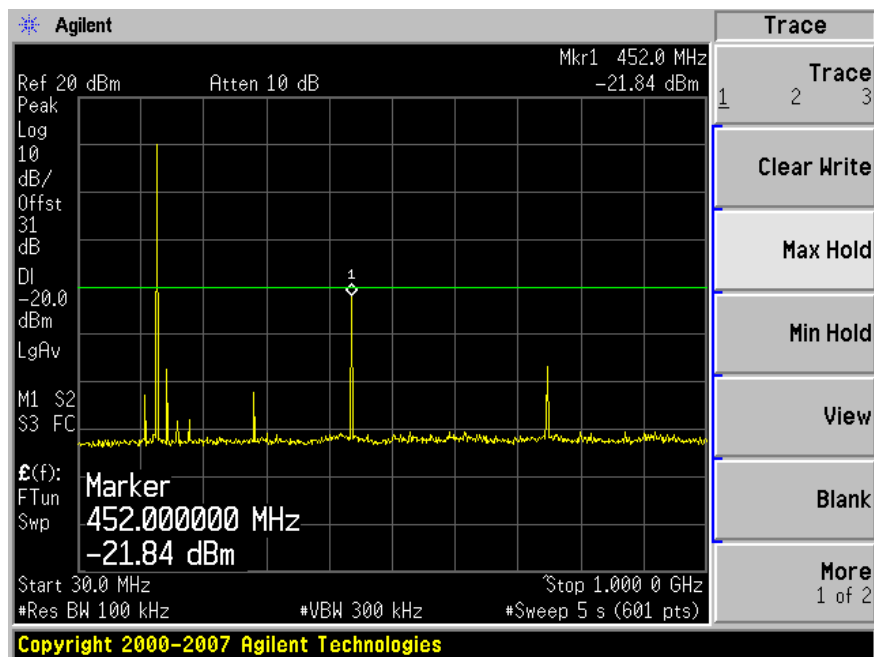
Temperature:	23 °C
Relative Humidity:	47.2 %
ATM Pressure:	101.4 kPa

* The testing was performed by Victor Zhang on 2009-04-13 in RF Site.

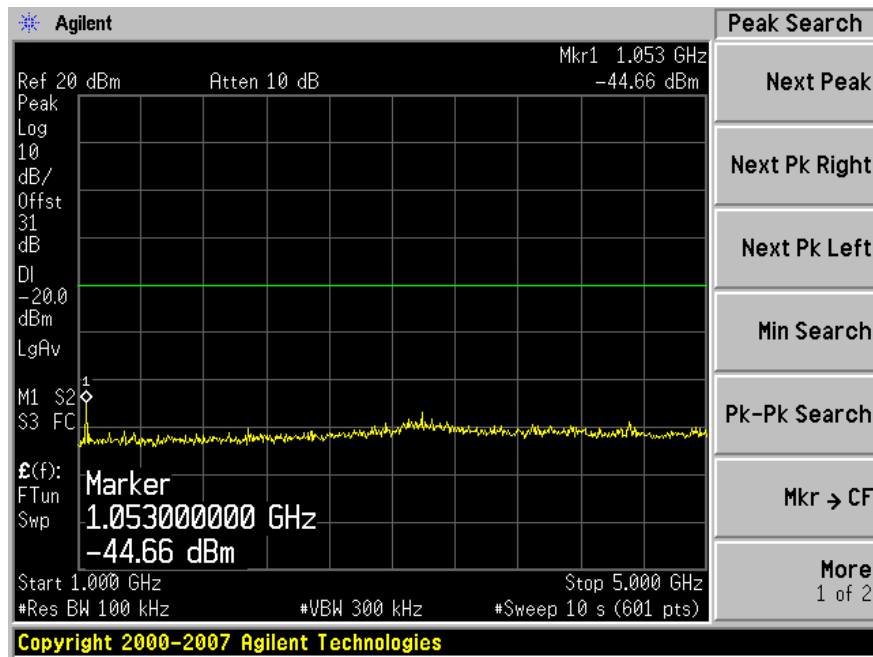
Test Results

Please refer to the following plots.

Fc: 150.7125 MHz

30 MHz to 1GHz

Above 1GHz



§2.1053, §90.210 (b), (d) - FIELD STRENGTH OF SPURIOUS EMISSION, SUPPRESSION OF INTERFERENCE**Applicable Standards**

§2.1053 and §90.210.

Test Procedure

TIA/EIA 603-C Clause 2.2.12

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

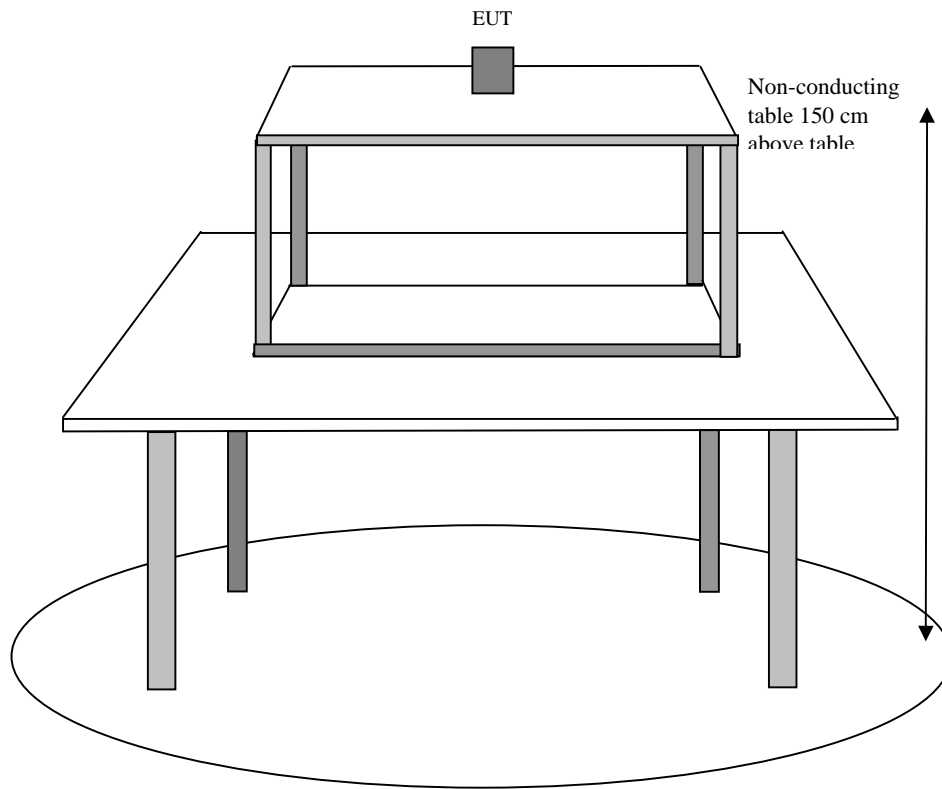
The frequency range up to tenth harmonic of the fundamental frequency was investigated.

The EUT Removed and replaced with a substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Test Equipment List and Details

Manufacturers	Equipment Descriptions	Models Number	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4446A	US44300386	2008-05-19
HP	Signal Generator	83650B	3614A00276	2008-05-28
Ducommun Technologies	Pre-Amplifier	1-18GHz	9909297-01R	2009-03-04
A. H. Systems	Horn Antenna	SAS-200/571	261	2008-07-01
A.R.A.	Horn Antenna	DRG-118/A	1132	2008-06-18
Agilent	ESG Vector Signal Generator	E44387C	MY45092922	2009-01-23

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

Test Setup Block Diagram**Test Environmental Conditions**

Temperature:	23 °C
Relative Humidity:	47.2 %
ATM Pressure:	101.4 kPa

* The testing was performed by Victor Zhang on 2009-04-13 in 5 Meter Chamber #3.

Test Results

The worst case reading as follows:

Transmitting			
Margin (dB)	Frequency (MHz)	Antenna Polarization (Horizontal/Vertical)	Frequency Range
-22.68	301.42	Vertical	30 MHz to 5 GHz

Indicated		Table Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	S.G. Level (dBm)	Antenna Gain Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
301.42	59.95	250	104	V	301.42	-42.57	0	0.11	-42.68	-20	-22.68
301.42	57.8	203	114	H	301.42	-44.72	0	0.11	-44.83	-20	-24.83
452.141	53.97	306	100	H	452.141	-47.24	0	0.14	-47.38	-20	-27.38
452.141	53.79	153	133	V	452.141	-47.42	0	0.14	-47.56	-20	-27.56
602.84	55.15	7	102	V	602.84	-49.63	0	0.17	-49.8	-20	-29.8
1205.67	36.16	320	148	V	1205.67	-57.58	6.9	0.29	-50.97	-20	-30.97
1055	36.78	31	146	V	1055	-57.47	6.3	0.26	-51.43	-20	-31.43
1205.67	35.22	137	183	H	1205.67	-58.52	6.9	0.29	-51.91	-20	-31.91
1055	33.58	150	144	H	1055	-60.67	6.3	0.26	-54.63	-20	-34.63
870.775	44.09	181	187	V	870.775	-55.55	0	0.22	-55.77	-20	-35.77
602.84	46.35	4	100	H	602.84	-58.43	0	0.17	-58.6	-20	-38.6
753.6	41.49	68	206	V	753.6	-60.1	0	0.20	-60.3	-20	-40.3
870.775	38.91	119	121	H	870.775	-60.73	0	0.22	-60.95	-20	-40.95
753.6	40.76	308	141	H	753.6	-60.83	0	0.20	-61.03	-20	-41.03

§2.1055 & §90.213 – FREQUENCY STABILITY, TRANSMITTER FREQUENCY TOLERANCE

Applicable Standard

§2.1055 and §90.213.

Test Procedure

Frequency Stability vs. Temperature:

The equipment under test was connected to an external DC power source and the RF output was connected to a frequency counter via feed through attenuators. EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the frequency counter.

Frequency Stability vs. Voltage:

An external variable DC power source was connected to the EUT, The voltage was set to 115%, 100%, and 85% of the nominal operating input voltage, and the frequency output was recorded from the frequency counter.

Test Equipment List and Details

Manufacturers	Equipment Descriptions	Models Number	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28
Espec	Temp Chamber	ESL-4CA	18010	2008-12-10

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

Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	44 %
ATM Pressure:	101.7 kPa

* The testing was performed by Victor Zhang on 2009-04-09 in RF Site.

Test Results**Frequency Stability with Temperature**

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (ppm)	Limit (ppm)
Voltage (Vac)	Temperature (°C)				
110	50	150.7125	150.71246	-0.28531144	2.5
110	40	150.7125	150.71265	1.015177905	2.5
110	30	150.7125	150.7122	-1.97727461	2.5
110	20	150.7125	150.71241	-0.62370407	2.5
110	10	150.7125	150.71246	-0.25213569	2.5
110	0	150.7125	150.71261	0.716596168	2.5
110	-10	150.7125	150.71259	0.610433773	2.5
110	-20	150.7125	150.71263	0.849299162	2.5
110	-30	150.7125	150.7123	-1.34030024	2.5

Frequency Stability with Supply Voltage

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (ppm)	Limit (ppm)
Voltage (Vac)	Temperature (°C)				
93.5	20	150.7125	150.71242	-0.55735258	2.5
126.5	20	150.7125	150.71244	-0.38483868	2.5

§2.1091 – RF EXPOSURE

Applicable Standards

§ 2.1091

(a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of part 1 of this

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	842/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1	30

f = frequency in MHz

* = Plane-wave equivalent power density

MPE Prediction

Predication of MPE limit at a given distance

Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Conclusion

Maximum peak output power at antenna input terminal:	<u>36.85 (dBm)</u>
Maximum peak output power at antenna input terminal:	<u>4841.72 (mW)</u>
Prediction distance:	<u>50 (cm)</u>
Prediction frequency:	<u>150.7125 (MHz)</u>
Antenna Gain (typical):	<u>0 (dBi)</u>
antenna gain:	<u>1 (numeric)</u>
Power density at predication frequency at 50 cm:	<u>0.154 (mW/cm²)</u>

MPE limit for uncontrolled exposure at prediction frequency: 0.2 (mW/cm²)

The Power density at prediction distance of 50 cm does not exceed the limit 0.2 mW/cm² Therefore, the exposure condition is compliant with FCC Rules.