



**FCC PART 87
TEST AND MEASUREMENT REPORT**

For

Selex Sistemi Integrati Inc.

11300 West 89th Street, Overland Park, Kansas 66214, USA

FCC ID: JPAVOR2

| | |
|---|---|
| Report Type: Original Report | Product Type: VOR Transmitter |
| Test Engineer: Jack Liu  | |
| Report Number: R0902091 | |
| Report Date: 2009-04-14 | |
| Reviewed By: Sr. RF Engineer Boni Baniqued  | |
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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "*" 000-2

TABLE OF CONTENTS

| | | |
|----------|---|-----------|
| 1 | GENERAL INFORMATION | 5 |
| 1.1 | PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) | 5 |
| 1.2 | MECHANICAL DESCRIPTION OF EUT | 5 |
| 1.3 | EUT PHOTO | 5 |
| 1.4 | OBJECTIVE | 6 |
| 1.5 | RELATED SUBMITTAL(S)/GRANT(S) | 6 |
| 1.6 | TEST METHODOLOGY | 6 |
| 1.7 | MEASUREMENT UNCERTAINTY | 6 |
| 1.8 | TEST FACILITY | 7 |
| 2 | SYSTEM TEST CONFIGURATION | 8 |
| 2.1 | JUSTIFICATION | 8 |
| 2.2 | EQUIPMENT MODIFICATIONS | 8 |
| 2.3 | LOCAL SUPPORT EQUIPMENT LIST AND DETAILS | 8 |
| 2.4 | INTERFACE PORTS AND CABLING | 8 |
| 3 | SUMMARY OF TEST RESULTS | 9 |
| 4 | §2.1046, §87.131 & §87.137– OUTPUT POWER AND EMISSIONS | 10 |
| 4.1 | APPLICABLE STANDARD | 10 |
| 4.2 | TEST PROCEDURE | 10 |
| 4.3 | TEST SETUP BLOCK DIAGRAM | 10 |
| 4.4 | TEST EQUIPMENT LIST AND DETAILS | 10 |
| 4.5 | ENVIRONMENTAL CONDITIONS | 10 |
| 4.6 | TEST RESULTS | 11 |
| 5 | §2.1049, §87.135(A) & §87.137 – BANDWIDTH EMISSIONS | 12 |
| 5.1 | APPLICABLE STANDARDS | 12 |
| 5.2 | TEST PROCEDURE | 12 |
| 5.3 | TEST SETUP BLOCK DIAGRAM | 12 |
| 5.4 | TEST EQUIPMENT LIST AND DETAILS | 12 |
| 5.5 | ENVIRONMENTAL CONDITIONS | 12 |
| 5.6 | TEST RESULTS | 13 |
| 6 | §2.1051 & §87.139 – UNWANTED EMISSIONS & EMISSION MASK | 15 |
| 6.1 | APPLICABLE STANDARDS | 15 |
| 6.2 | TEST PROCEDURE | 15 |
| 6.3 | TEST SETUP BLOCK DIAGRAM | 15 |
| 6.4 | TEST EQUIPMENT LIST AND DETAILS | 15 |
| 6.5 | ENVIRONMENTAL CONDITIONS | 16 |
| 6.6 | TEST RESULTS | 16 |
| 7 | §2.1053 & §87.139 - FIELD STRENGTH OF SPURIOUS EMISSION, SUPPRESSION OF INTERFERENCE | 22 |
| 7.1 | APPLICABLE STANDARDS | 22 |
| 7.2 | TEST PROCEDURE | 22 |
| 7.3 | TEST EQUIPMENT LIST AND DETAILS | 22 |
| 7.4 | ENVIRONMENTAL CONDITIONS | 23 |
| 7.5 | TEST RESULTS | 23 |
| 8 | §2.1047 & §87.141 - MODULATION CHARACTERISTICS | 24 |
| 8.1 | APPLICABLE STANDARD | 24 |
| 8.2 | TEST PROCEDURE | 24 |
| 8.3 | TEST EQUIPMENT LIST AND DETAILS | 24 |

| | | |
|-------|--|-----------|
| 8.4 | ENVIRONMENTAL CONDITIONS | 24 |
| 8.5 | TEST RESULTS | 24 |
| 9 | §2.1055, §87.133 – FREQUENCY STABILITY..... | 26 |
| 9.1 | APPLICABLE STANDARD | 26 |
| 9.2 | TEST PROCEDURE | 26 |
| 9.3 | TEST EQUIPMENT LIST AND DETAILS..... | 26 |
| 9.4 | ENVIRONMENTAL CONDITIONS..... | 26 |
| 9.5 | TEST RESULTS | 27 |
| 10 | §87.149 – SPECIAL REQUIREMENTS FOR AUTOMATIC LINK ESTABLISHMENT (ALE) | 28 |
| 10.1 | APPLICABLE STANDARDS | 28 |
| 11 | §87.151 – SPECIAL REQUIREMENTS FOR DIFFERENTIAL GPS RECEIVERS | 29 |
| 11.1 | APPLICABLE STANDARDS | 29 |
| 12 | §2.1091 - RADIOFREQUENCY RADIATION EXPOSURE EVALUATION..... | 31 |
| 12.1 | APPLICABLE STANDARDS | 31 |
| 13 | EXHIBIT A - FCC ID LABELING AND WARNING STATEMENT..... | 33 |
| 13.1 | FCC ID LABEL REQUIREMENT | 33 |
| 13.2 | FCC ID LABEL..... | 33 |
| 13.3 | PROPOSED LABEL LOCATION ON EUT | 33 |
| 14 | EXHIBIT B - TEST SETUP PHOTOGRAPHS | 34 |
| 14.1 | RADIATED EMISSIONS BELOW 1 GHZ- FRONT VIEW | 34 |
| 14.2 | RADIATED EMISSIONS BELOW 1 GHZ – REAR VIEW | 34 |
| 14.3 | RADIATED EMISSIONS ABOVE 1 GHZ- FRONT VIEW | 35 |
| 14.4 | RADIATED EMISSIONS ABOVE 1 GHZ- REAR VIEW | 35 |
| 14.5 | CONDUCTED MEASUREMENT | 36 |
| 14.6 | FREQUENCY STABILITY MEASUREMENT..... | 36 |
| 15 | EXHIBIT C - EUT PHOTOGRAPHS..... | 37 |
| 15.1 | EUT – FRONT VIEW..... | 37 |
| 15.2 | EUT – REAR/PORT VIEW | 37 |
| 15.3 | EUT – AUDIO GEN REF DES 1A3A2 BOARD TOP VIEW | 38 |
| 15.4 | EUT – AUDIO GEN REF DES 1A3A2 BOARD BOTTOM VIEW..... | 38 |
| 15.5 | EUT – COMMUTATOR CONTROL REF DES 1A5A5 BOARD TOP VIEW | 39 |
| 15.6 | EUT – COMMUTATOR CONTROL REF DES 1A5A5 BOARD BOTTOM VIEW..... | 39 |
| 15.7 | EUT – LCU REF DES 1A1 BOARD TOP VIEW..... | 40 |
| 15.8 | EUT – LCU REF DES 1A1 BOARD BOTTOM VIEW | 40 |
| 15.9 | EUT – MONITOR REF DES 1A3A3 BOARD TOP VIEW | 41 |
| 15.10 | EUT – MONITOR REF DES 1A3A3 BOARD BOTTOM VIEW | 41 |
| 15.11 | EUT – RF MONITOR REF DES 1A4A4 BOARD TOP VIEW | 42 |
| 15.12 | EUT – RF MONITOR REF DES 1A4A4 BOARD BOTTOM VIEW..... | 42 |
| 15.13 | EUT – SIDEBAND AMPLIFIER REF DES 1A4A1, A2, A6, A7 BOARD (FRONT)..... | 43 |
| 15.14 | EUT – SIDEBAND AMPLIFIER REF DES 1A4A1, A2, A6, A7 BOARD BOTTOM VIEW | 43 |
| 15.15 | EUT – TEST GENERATOR REF DES 1A3A5 BOARD TOP VIEW..... | 44 |
| 15.16 | EUT – TEST GENERATOR REF DES 1A3A5 BOARD BOTTOM VIEW | 44 |
| 15.17 | EUT – CARRIER AMPLIFIER REF DES 1A5A3 BOARD TOP VIEW | 45 |
| 15.18 | EUT – CARRIER AMPLIFIER REF DES 1A5A3 BOARD BOTTOM VIEW..... | 45 |
| 15.19 | EUT – FACILITIES REF DES 1A3A7 BOARD TOP VIEW | 46 |
| 15.20 | EUT – FACILITIES REF DES 1A3A7 BOARD BOTTOM VIEW..... | 46 |
| 15.21 | EUT – LOW VOLTAGE PS REF DES 1A3A4 BOARD TOP VIEW | 47 |
| 15.22 | EUT – LOW VOLTAGE PS REF DES 1A3A4 BOARD BOTTOM VIEW..... | 47 |
| 15.23 | EUT – POWER SUPPLY, BCPS REF DES 1A5A1 BOARD TOP VIEW | 48 |
| 15.24 | EUT – POWER SUPPLY, BCPS REF DES 1A5A1 BOARD BOTTOM VIEW..... | 48 |
| 15.25 | EUT – RMS PROCESSOR REF DES 1A3A6 BOARD TOP VIEW..... | 49 |
| 15.26 | EUT – RMS PROCESSOR REF DES 1A3A6 BOARD BOTTOM VIEW | 49 |
| 15.27 | EUT – SYNTHESIZER REF DES 1A3 BOARD TOP VIEW..... | 50 |
| 15.28 | EUT – SYNTHESIZER REF DES 1A3 BOARD BOTTOM VIEW | 50 |

DOCUMENT REVISION HISTORY

| Revision Number | Report Number | Description of Revision | Date of Revision |
|-----------------|---------------|-------------------------|------------------|
| 0 | R0902091 | Original Report | 2009-04-14 |

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

This Bay Area Compliance Laboratories Corp. test report has been prepared on behalf of *Selex Sistemi Integrati Inc* and their product, model: *1150A VOR*, FCC ID: *JPAVOR2* or the EUT (Equipment Under Test) as referred to in the rest of this report. The EUT is a Single or Dual Doppler VHF Omni-range (DVOR) Station.

1.2 Mechanical Description of EUT

| | |
|-------------------|--|
| Frequency Range: | TX: 108 to 118 MHz |
| Type of Emission: | 21K0A9W |
| Power Supply: | 85 to 264 VAC, 47 to 63 Hz, single phase |
| Dimensions: | 183 (H) X 61 (W) X 61 (D) cm |
| Weight: | 205 Kg |

** The test data gathered are from typical production sample, model: 1150A VOR. Sample ID: 72271 serial number: B2103 assigned by the BACL.*

1.3 EUT Photo



Additional photos in Exhibit C

1.4 Objective

This type approval report is prepared on behalf of *Selex Sistemi Integrati Inc.* in accordance with Part 2, Subpart J and Part 87 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 *Selex Sistemi Integrati Inc.* for confirmation of regulatory compliance. The manufacturer declares that the *model: 1150A VOR Sample ID: 72271, serial number: B2103* 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.

1.5 Related Submittal(s)/Grant(s)

No Related Submittals

1.6 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 87 – Aviation 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.

1.7 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.

1.8 Test Facility

The test site used by Bay Area Compliance Laboratories Corp. to collect radiated and conducted emission measurement data is located at their facility in Sunnyvale, California 94089, USA.

The test site at Bay Area Compliance Laboratories 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 and Article 8 of the VCCI regulations. The facility also complies with the test methods and procedures set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference have the reports on file and are listed under FCC file 31040/SIT 1300F2, IC registration number: 3062A, and VCCI Registration No.: C-1298 and R-1234. 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/ts/htdocs/210/214/scopes/2001670.htm>

2 SYSTEM TEST CONFIGURATION

2.1 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.

2.2 Equipment Modifications

No modifications were made to the EUT.

2.3 Local Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|----------------|---------------------|------------|---------------|
| Red Bank, N.J. | Hi Power Attenuator | Ax-2000-30 | 375311 |

2.4 Interface Ports and Cabling

| Cable Description | Length (m) | From | To |
|-------------------|------------|---------------------------|-----|
| BNC Cable | 1.84 | RF Communication Test Set | EUT |

3 SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|------------------------------|--|-----------|
| §2.1046, §87.131, §87.137 | Output Power and Emission | Compliant |
| §2.1049, §87.135(a), §87.137 | Bandwidth of Emissions 99%Occupied Bandwidth, | Compliant |
| §2.1051; §87.139 | Emission Limitation Spurious Emission at Antenna & Emission Mask | Compliant |
| §2.1053, §87.139 | Field Strength of Spurious Emission | Compliant |
| §2.1047, §87.141 | Modulation Characteristics | Compliant |
| §2.1055, §87.133 | Frequency Stability | Compliant |
| §1.1310, §2.1091 | RF Exposure | Compliant |
| §87.151 | Special Requirements for Automatic Link Establishment (ALE) | N/A |
| §87.151 | Special Requirements for differential GPS Receiver | N/A |

4 §2.1046, §87.131 & §87.137– OUTPUT POWER AND EMISSIONS

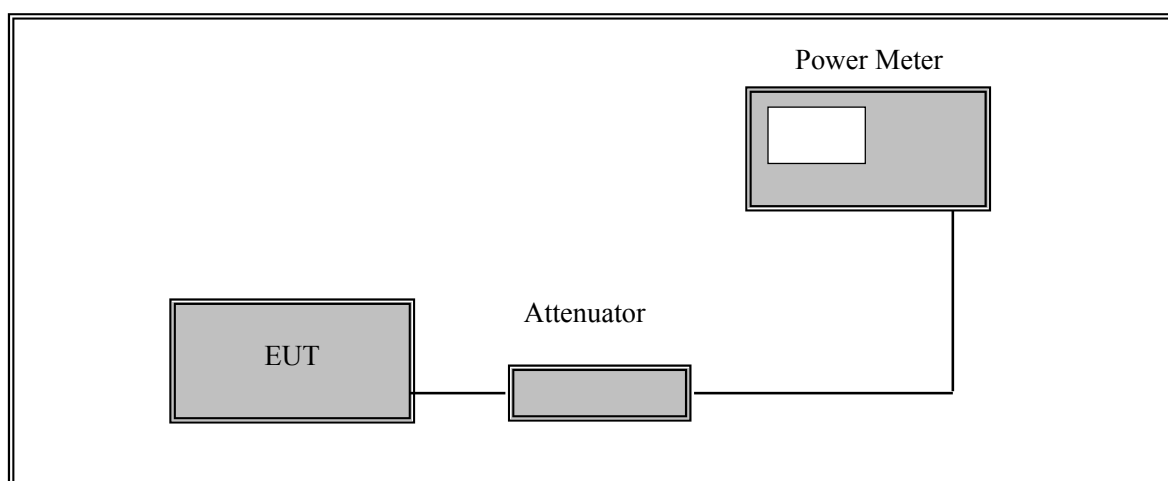
4.1 Applicable Standard

§2.1046 and §87.131, §87.137

4.2 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.

4.3 Test Setup Block Diagram



4.4 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Due Date |
|--------------|-------------|--------|---------------|----------------------|
| Agilent | Power Meter | E4419B | MY41291511 | 2009-10-09 |

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

4.5 Environmental Conditions

| | |
|--------------------|----------|
| Temperature: | 16 °C |
| Relative Humidity: | 45 % |
| ATM Pressure: | 101.5kPa |

** Testing performed by Jack Liu on 2009-02-18 in the RF test site.*

4.6 Test Results

| Frequency (MHz) | Rated Power Level (Watt) | Final Voltage (Vdc) | Final Current (A) | Measured TX Output Power | |
|--------------------|--------------------------------|---------------------------|-------------------------|--------------------------|---------|
| | | | | (dBm) | (Watts) |
| 108.00 | 100 | 51.7 | 4.7 | 49.89 | 97.50 |
| 113.00 | 100 | 51.9 | 4.1 | 49.76 | 94.62 |
| 117.95 | 100 | 52.2 | 6.0 | 49.09 | 81.10 |

5 §2.1049, §87.135(a) & §87.137 – BANDWIDTH EMISSIONS

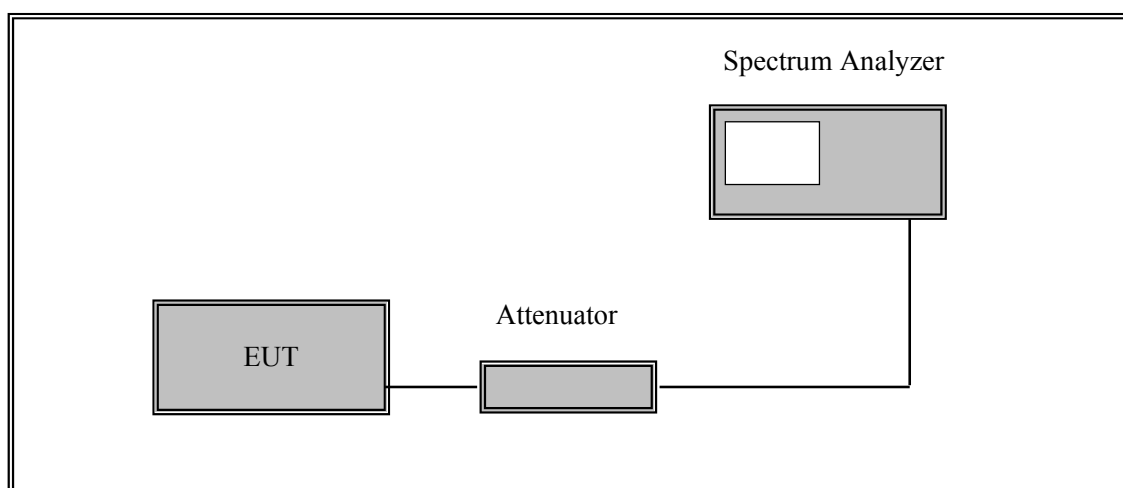
5.1 Applicable Standards

§ 2.1049, §87.135(a) and §87.137.

5.2 Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation. The EUT is modulated in J3E mode with 400Hz and 1800 Hz tones with a level 10dB greater than that of necessary to produce rated peak envelope power.

5.3 Test Setup Block Diagram



5.4 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Due Date |
|--------------|-------------------|--------|---------------|----------------------|
| Agilent | Spectrum Analyzer | E4440A | US45303156 | 2009-05-31 |

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

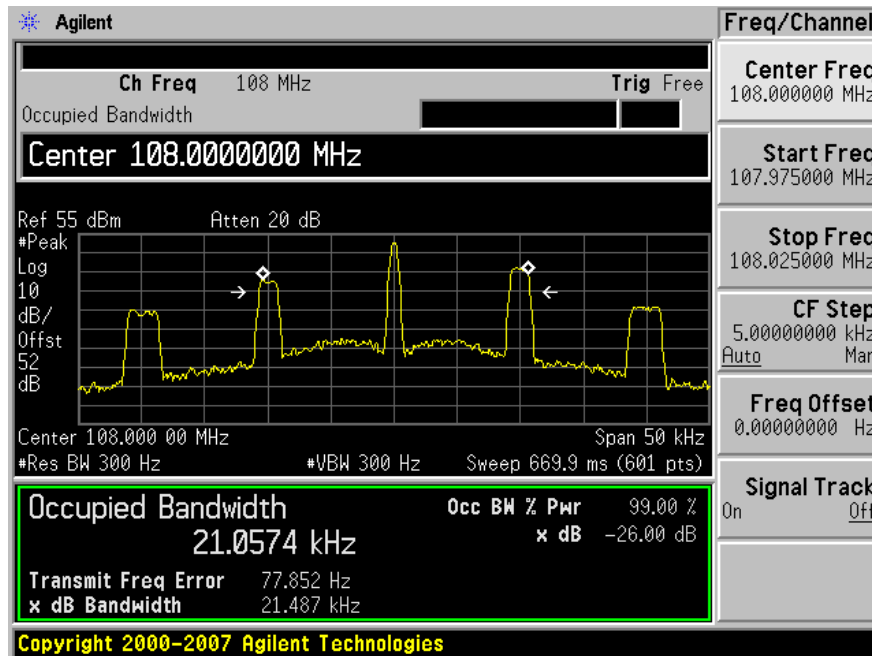
5.5 Environmental Conditions

| | |
|--------------------|----------|
| Temperature: | 16 °C |
| Relative Humidity: | 45 % |
| ATM Pressure: | 101.5kPa |

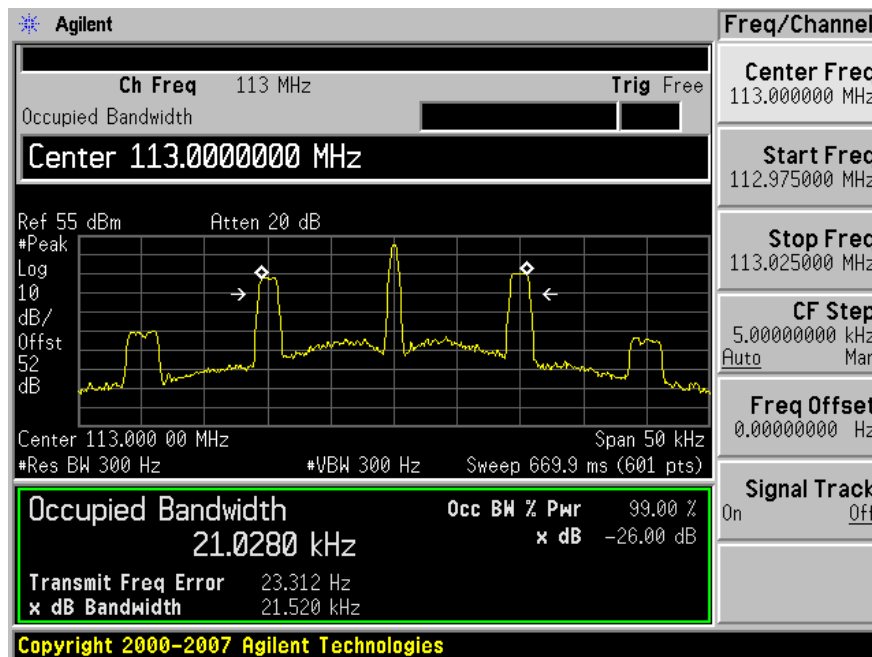
* Testing performed by Jack Liu on 2009-02-18 in RF test site.

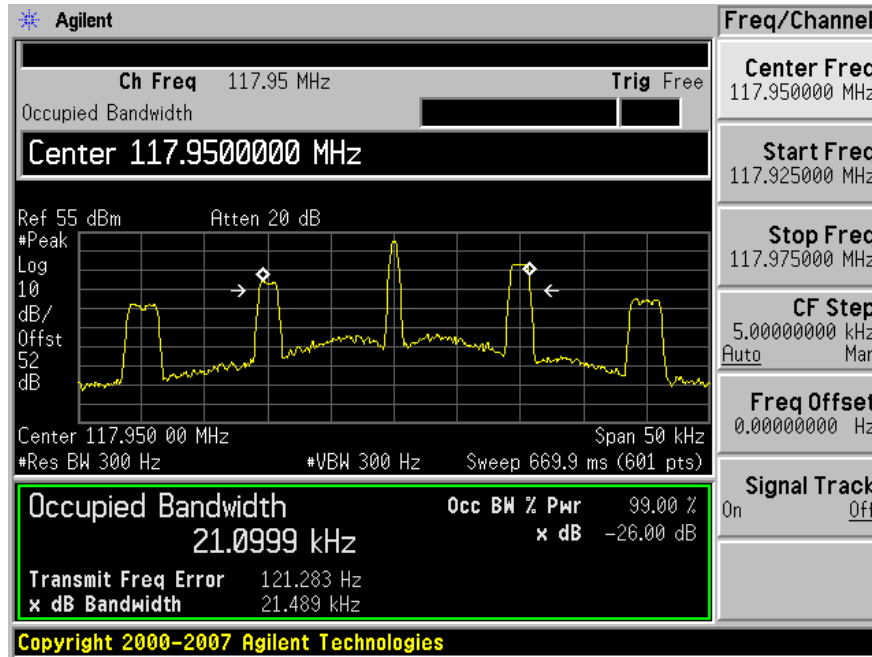
5.6 Test Results

Plot 1: Low Channel @ 108 MHz (9960Hz Modulation)



Plot 2: Middle Channel @ 113 MHz (9960Hz Modulation)



Plot 3: High Channel @ 117.95 MHz (9960Hz Modulation)

6 §2.1051 & §87.139 – UNWANTED EMISSIONS & EMISSION MASK

6.1 Applicable Standards

§ 2.1051 and §87.139

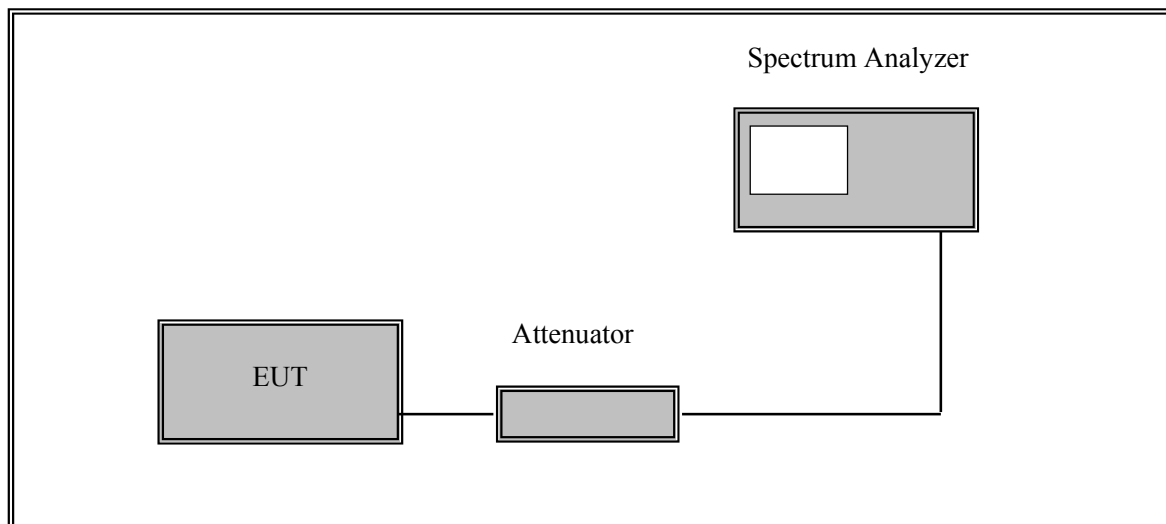
6.2 Test Procedure

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.

6.3 Test Setup Block Diagram



6.4 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Due Date |
|--------------|---------------------------|--------|---------------|----------------------|
| HP | RF Communication Test Set | 8920A | 3438A05338 | 2010-03-20 |
| Agilent | Spectrum Analyzer | E4440A | US45303156 | 2009-05-31 |

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

6.5 Environmental Conditions

| | |
|---------------------------|----------|
| Temperature: | 16 °C |
| Relative Humidity: | 45 % |
| ATM Pressure: | 101.5kPa |

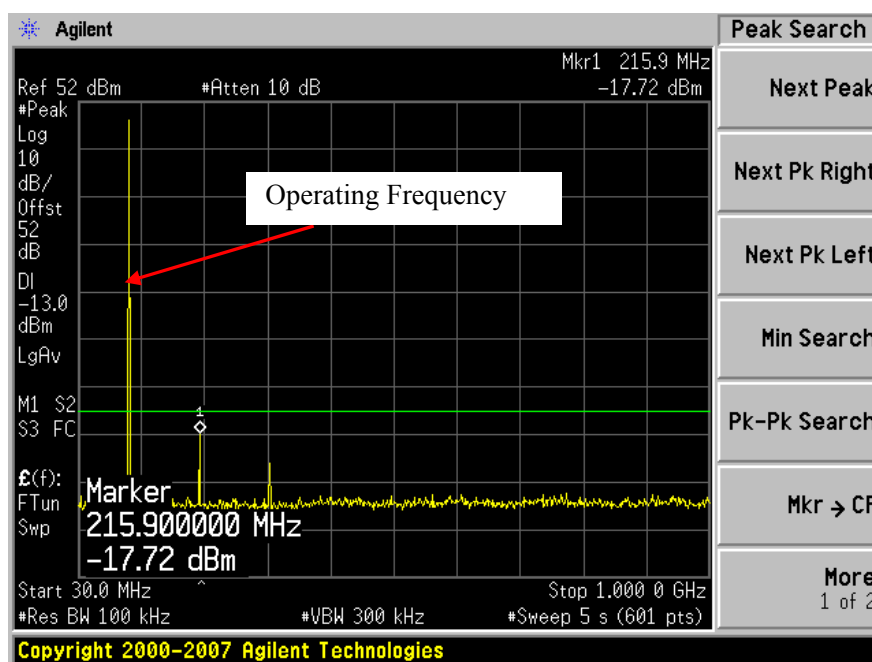
* Testing performed by Jack Liu on 2009-02-18 in RF test site.

6.6 Test Results

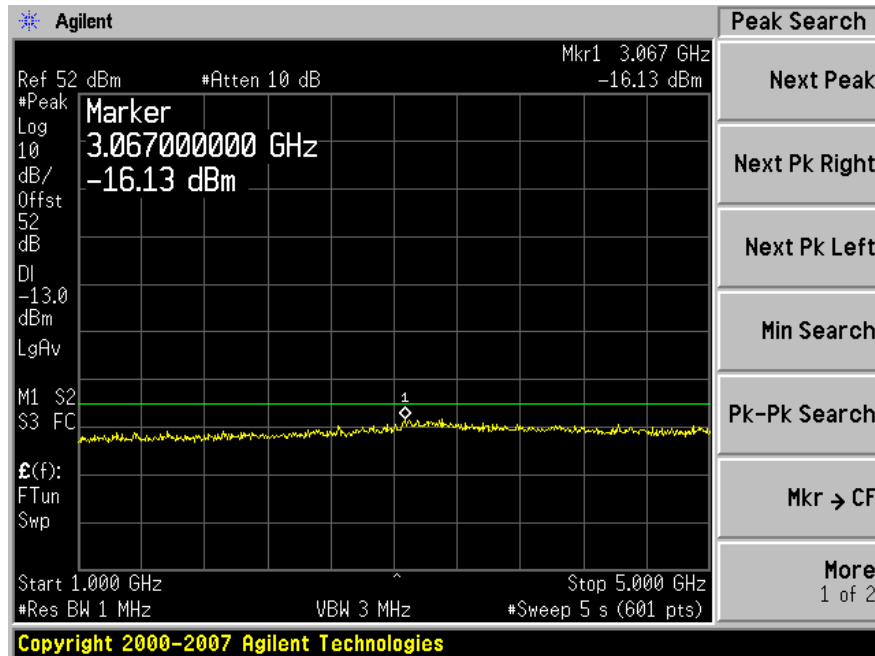
Please refer to the following plots.

Note: Attenuation Limit = 65 dB (-13 dBm)

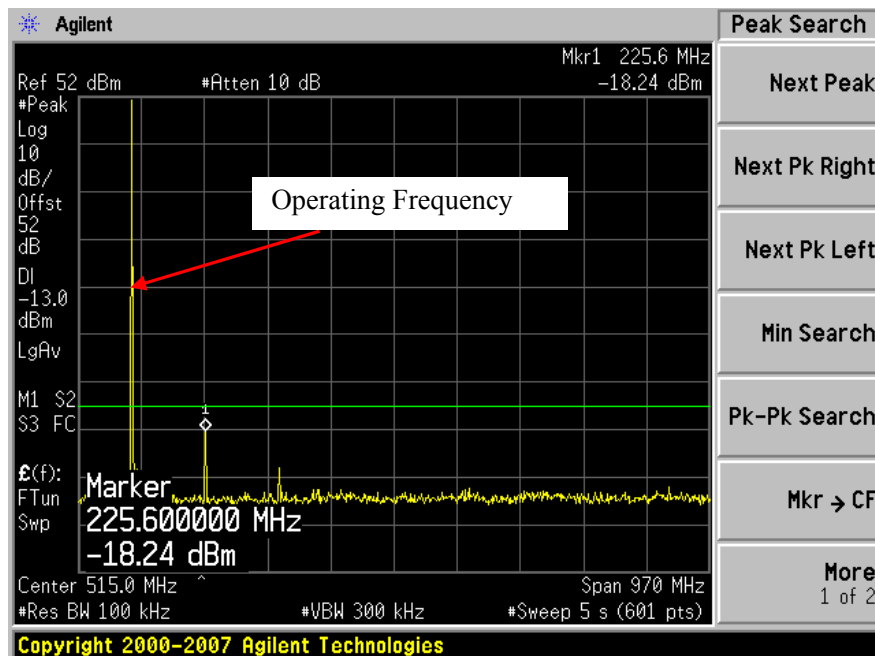
Plot 1: Low Channel 30MHz to 1GHz



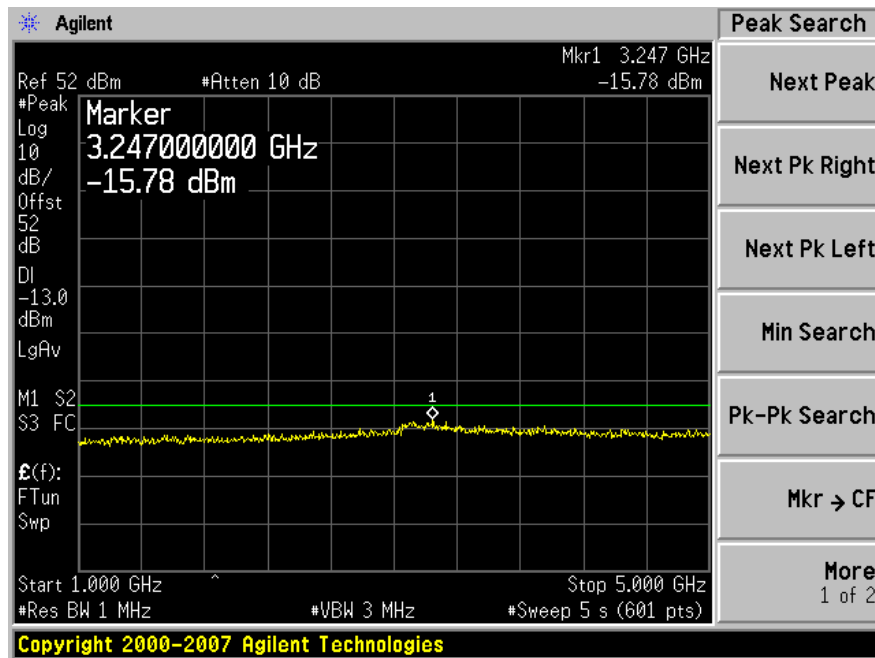
Plot 2: Low Channel 1GHz to 5GHz



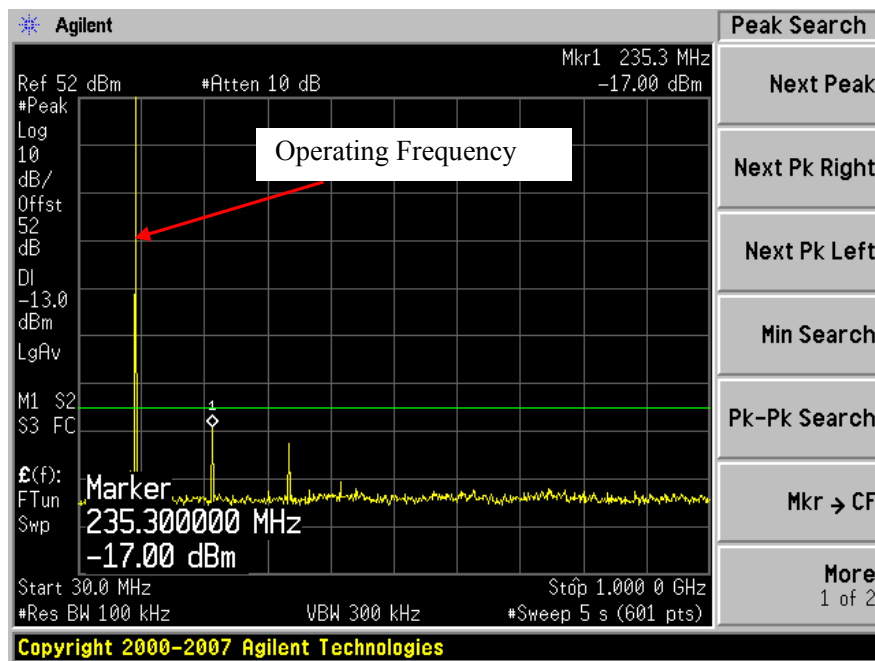
Plot 3: Middle CH 30MHz to 1GHz

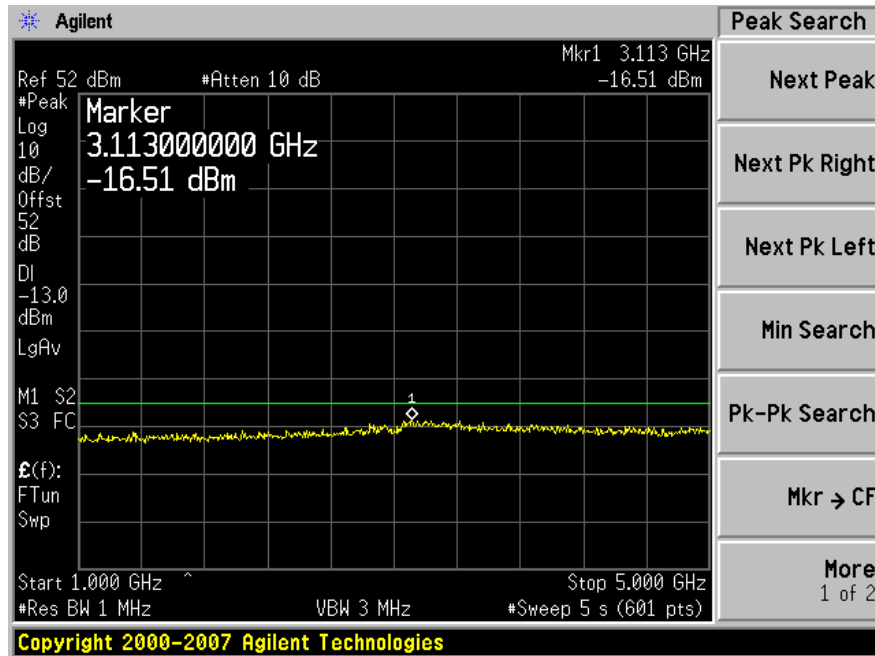


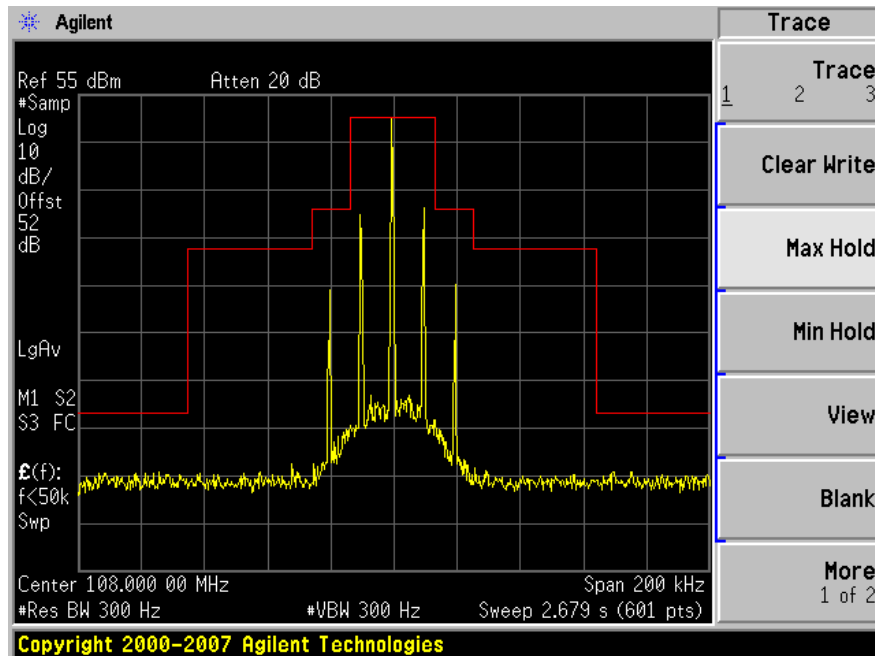
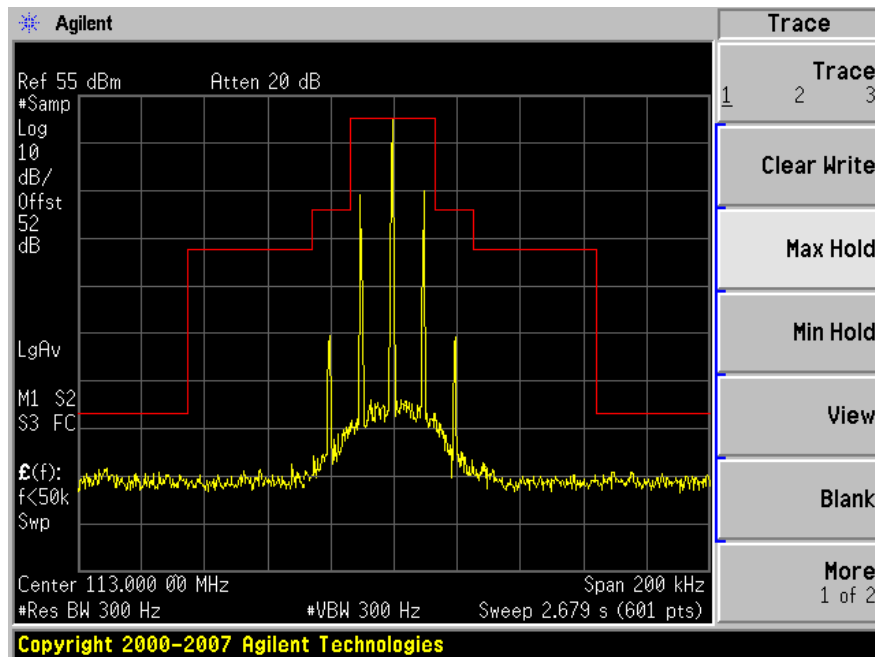
Plot 4: Middle CH 1GHz to 5GHz

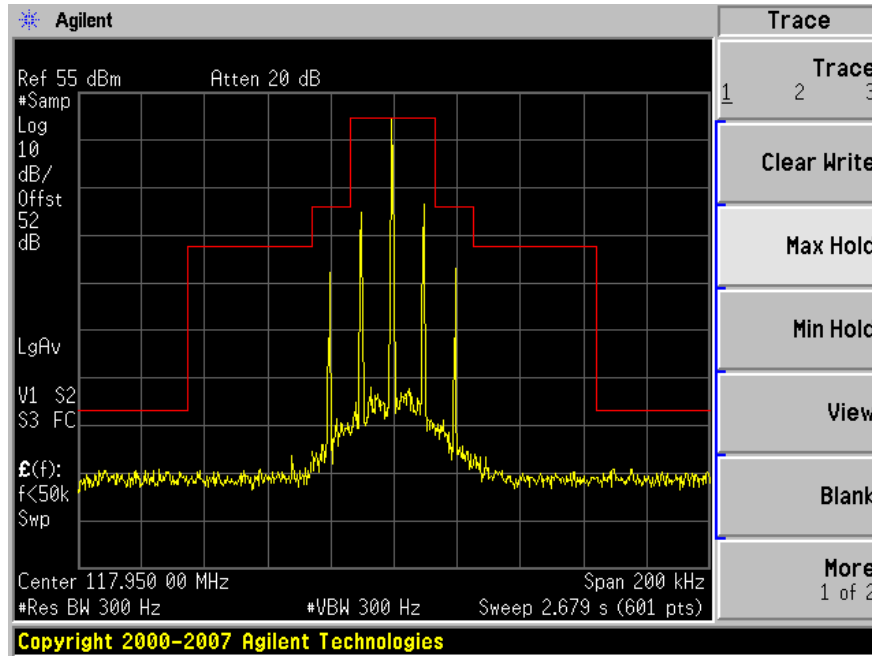


Plot 5: High Channel 30MHz to 1GHz



Plot 6: High Channel 1GHz to 5GHz

Emission Mask**Low Channel @ 108 MHz (9960Hz Modulation)****Middle Channel @ 113 MHz (9960Hz Modulation)**

High Channel @ 117.95 MHz (9960Hz Modulation)

7 §2.1053 & §87.139 - FIELD STRENGTH OF SPURIOUS EMISSION, SUPPRESSION OF INTERFERENCE

7.1 Applicable Standards

§2.1053 and §87.139

7.2 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.

Spurious emissions in dB = $10 \log (\text{TX Power in Watts}/0.001)$ – the absolute level

Spurious attenuation limit in dB = $43 + 10 \log_{10} (\text{Power out in Watts})$
 $= 43 + 10 \log_{10} (150) = 65 \text{ dB}$

7.3 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Due Date |
|----------------|--------------------------|-------------|---------------|----------------------|
| Agilent | Spectrum Analyzer | E4440A | US45303156 | 2009-05-31 |
| Agilent | Analyzer, Communications | E5155C | GB44051221 | 2009-08-08 |
| Sunol Sciences | Antenna | JB1 | A103105-3 | 2009-03-25 |
| A.R.A | Horn Antenna | DRG-118/A | 1132 | 2009-07-28 |
| A. H. Systems | Antenna, Horn, DRG | SAS-200/571 | 261 | 2009-07-01 |
| HP | Pre-Amplifier | 8449B | 3008A01978 | 2009-10-21 |
| HP | Pre-Amplifier | 8447D | 2944A06639 | 2009-12-19 |

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

7.4 Environmental Conditions

| | |
|---------------------------|----------|
| Temperature: | 14 °C |
| Relative Humidity: | 52 % |
| ATM Pressure: | 101.2kPa |

* Testing performed by Jack Liu on 2009-02-17 in 5m chamber 3.

7.5 Test Results

Transmitting at Middle Channel (113 MHz)

| Indicated | | Azimuth (degree) | Test Antenna | | Substituted | | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|--------------------|------------------------|---------------------|---------------|----------------|--------------------|------------------------|-----------------------------|-----------------------|----------------------------|----------------|----------------|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polar (H/V) | Frequency (MHz) | S.G. Level (dBm) | Ant. Gain Cord. (dBi) | Cable Loss (dB) | | | |
| 36.5 | 70.89 | 326 | 100 | V | 36.5 | -38 | 0 | 0.27 | -38.27 | -13 | -25.27 |
| 240.2 | 64.22 | 277 | 100 | H | 240.2 | -55 | 0 | 0.37 | -55.37 | -13 | -42.37 |

Note: All other emissions in the required measurement range were more than 20 dB below the required Limit.

8 §2.1047 & §87.141 - MODULATION CHARACTERISTICS

8.1 Applicable Standard

§ 2.1047 and §87.141

8.2 Test Procedure

Modulation Limiting:

TIA-603-C 2.2.3.2

Audio Frequency Response:

TIA-603-C 2.2.6.2.2

8.3 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Due Date |
|--------------|---------------------------|--------|---------------|----------------------|
| HP | RF Communication Test Set | 8920A | 3438A05338 | 2010-03-20 |
| Agilent | Spectrum Analyzer | E4440A | US45303156 | 2009-05-31 |

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

8.4 Environmental Conditions

| | |
|--------------------|----------|
| Temperature: | 16 °C |
| Relative Humidity: | 45 % |
| ATM Pressure: | 101.5kPa |

** Testing performed by Jack Liu on 2009-02-18 in RF test site.*

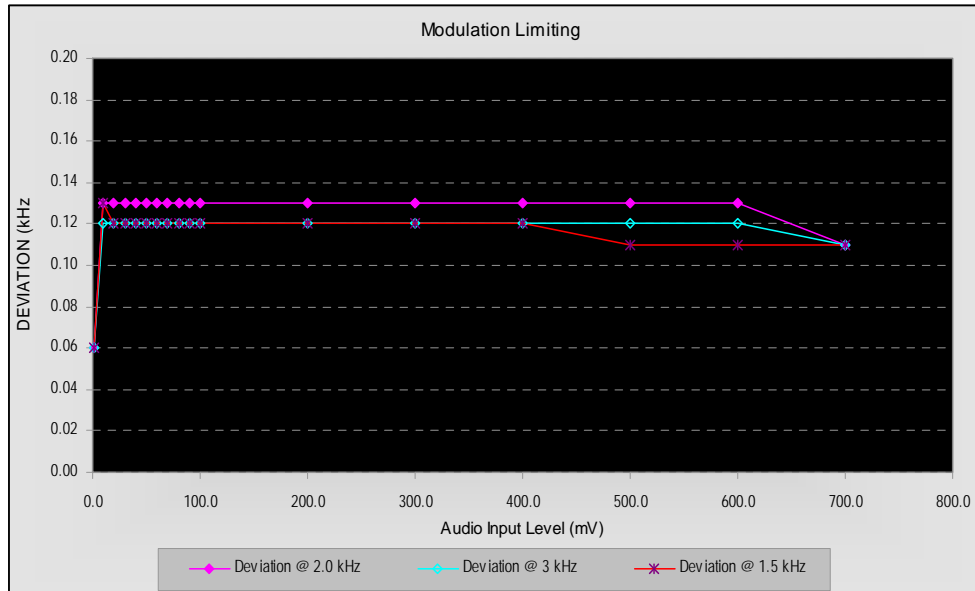
8.5 Test Results

Classes of Emission: A9W

Please refer to the following plots.

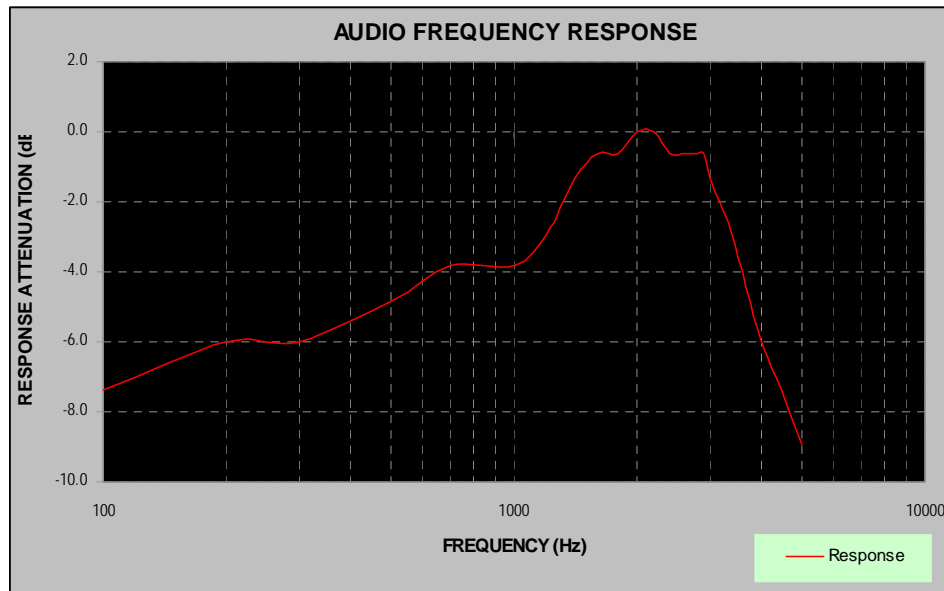
Modulation Limiting

Test Frequency: Middle Channel @ 113 MHz



Audio Frequency Response

Test Frequency: Middle Channel @ 113 MHz



9 §2.1055, §87.133 – FREQUENCY STABILITY

9.1 Applicable Standard

§2.1055 and §87.133

9.2 Test Procedure

Frequency Stability vs. Temperature:

The equipment under test was connected to an external DC power supply 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 supply 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.

9.3 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Due Date |
|--------------|-------------------|---------|---------------|----------------------|
| Espec | Chamber, Humidity | ESL-4CA | 18010 | 2009-12-10 |
| Agilent | Spectrum Analyzer | E4440A | US45303156 | 2009-05-31 |

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

9.4 Environmental Conditions

| | |
|--------------------|----------|
| Temperature: | 14 °C |
| Relative Humidity: | 45 % |
| ATM Pressure: | 101.2kPa |

** Testing performed by Jack Liu on 2009-02-18 in RF test site.*

9.5 Test Results

Frequency Stability with Temperature:

| Test Environment | | Channel Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (MHz) | Frequency Error (ppm) | Limit (ppm) |
|----------------------|------------------|-------------------------|--------------------------|-----------------------|-----------------------|-------------|
| Supply Voltage (Vac) | Temperature (°C) | | | | | |
| 120 | -30 | 113.000000 | 112.998300 | 0.001700 | 15.044248 | ± 50 |
| | -20 | 113.000000 | 112.998700 | 0.001300 | 11.504425 | ± 50 |
| | -10 | 113.000000 | 112.998450 | 0.001550 | 13.716814 | ± 50 |
| | 0 | 113.000000 | 112.999200 | 0.000800 | 7.079646 | ± 50 |
| | 10 | 113.000000 | 112.999920 | 0.000080 | 0.707965 | ± 50 |
| | 20 | 113.000000 | 112.998420 | 0.001580 | 13.982301 | ± 50 |
| | 30 | 113.000000 | 112.999300 | 0.000700 | 6.194690 | ± 50 |
| | 40 | 113.000000 | 112.999400 | 0.000600 | 5.309735 | ± 50 |
| | 50 | 113.000000 | 112.999300 | 0.000700 | 6.194690 | ± 50 |

Frequency Stability with Supply Voltage:

| Test Environment | | Channel Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (MHz) | Frequency Error (ppm) | Limit (ppm) |
|-----------------------|----------------------|-------------------------|--------------------------|-----------------------|-----------------------|-------------|
| Voltage Variation (%) | Supply Voltage (Vac) | | | | | |
| -15.0 | 102 | 113.000000 | 112.999400 | 0.000600 | 5.309735 | ± 50 |
| 0.0 | 120 | 113.000000 | 112.999350 | 0.000650 | 5.752212 | ± 50 |
| 15.0 | 138 | 113.000000 | 112.999750 | 0.000250 | 2.212389 | ± 50 |

10 §87.149 – SPECIAL REQUIREMENTS FOR AUTOMATIC LINK ESTABLISHMENT (ALE)

10.1 Applicable Standards

As per Part 87.149,

Brief signaling for the purposes of measuring the quality of a radio channel and thereafter establishing communication shall be permitted within the 2 MHz–30 MHz band. Public coast stations licensed under part 80 of this chapter providing high seas service are authorized by rule to use such signalling under the following conditions:

- (a) The transmitter power shall not exceed 100 W ERP;
- (b) Transmissions must sweep linearly in frequency at a rate of at least 60 kHz per second, occupying any 3 kHz bandwidth for less than 50 milliseconds;
- (c) The transmitter shall scan the band no more than four times per hour;
- (d) Transmissions within 6 kHz of the following protected frequencies and frequency bands must not exceed 10 μ W peak ERP:

(1) Protected frequencies (kHz)

| | | | | |
|--------|--------|---------|---------|---------|
| 2091.0 | 4188.0 | 6312.0 | 12290.0 | 16420.0 |
| 2174.5 | 4207.5 | 8257.0 | 12392.0 | 16522.0 |
| 2182.0 | 5000.0 | 8291.0 | 12520.0 | 16695.0 |
| 2187.5 | 5167.5 | 8357.5 | 12563.0 | 16750.0 |
| 2500.0 | 5680.0 | 8364.0 | 12577.0 | 16804.5 |
| 3023.0 | 6215.0 | 8375.0 | 15000.0 | 20000.0 |
| 4000.0 | 6268.0 | 8414.5 | 16000.0 | 25000.0 |
| 4177.5 | 6282.0 | 10000.0 | | |

(2) Protected bands (kHz)

4125.0–4128.0
 8376.25–8386.75
 13360.0–13410.0
 25500.0–25670.0

(e) The instantaneous signal, which refers to the peak power that would be measured with the frequency sweep stopped, along with spurious emissions generated from the sweeping signal, must be attenuated below the peak carrier power (in watts) as follows:

- (1) On any frequency more than 5 Hz from the instantaneous carrier frequency, at least 3 dB;
- (2) On any frequency more than 250 Hz from the instantaneous carrier frequency, at least 40 dB; and
- (3) On any frequency more than 7.5 kHz from the instantaneous carrier frequency, at least $43 + 10\log_{10}$ (peak power in watts) dB.

☐ Compliant

☒ N/A

11 §87.151 – SPECIAL REQUIREMENTS FOR DIFFERENTIAL GPS RECEIVERS

11.1 Applicable Standards

As per Part 87.151

- (a) The receiver shall achieve a message failure rate less than or equal to one failed message per 1000 full-length (222 bytes) application data messages, while operating over a range from –87 dBm to –1 dBm, provided that the variation in the average received signal power between successive bursts in a given time slot shall not exceed 40 dB. Failed messages include those lost by the VHF data receiver system or which do not pass the cyclic redundancy check (CRC) after application of the forward error correction (FEC).
- (b) The aircraft receiving antenna can be horizontally or vertically polarized. Due to the difference in the signal strength of horizontally and vertically polarized components of the broadcast signal, the total aircraft implementation loss is limited to 15 dB for horizontally polarized receiving antennas and 11 dB for vertically polarized receiving antennas.
- (c) Desensitization. The receiver shall meet the requirements specified in paragraph (a) of this section in the presence of VHF-FM broadcast signals in accord with following tables.

(1) Maximum levels of undesired signals.

| Frequency ¹ | Maximum level of undesired signal at the receiver input (dBm) |
|------------------------------|---|
| 50 kHz up to 88 MHz | –13 |
| 88 MHz–107.900 MHz | [see paragraph (c)(2)] |
| 108.000 MHz–117.975 MHz | excluded |
| 118MHz | –44 |
| 118.025 MHz | –41 |
| 118.050 MHz up to 1660.5 MHz | –13 |

¹The relationship is linear between single adjacent points designated by the above frequencies.

(2) Desensitization frequency and power requirements for the frequencies 108.025 MHz to 111.975 MHz.

| Frequency ¹ | Maximum level of undesired signal at the receiver input (dBm) |
|------------------------------|---|
| 88 MHz $\leq f \leq$ 102 MHz | 15 |
| 104 MHz | 10 |
| 106 MHz | 5 |
| 107.9 MHz | –10 |

¹The relationship is linear between single adjacent points designated by the above frequencies.

(3) Desensitization frequency and power requirements for the frequencies 112.00 MHz to 117.975 MHz.

| Frequency ¹ | Maximum level of undesired signal at the receiver input (dBm) |
|--|---|
| $88 \text{ MHz} \leq f \leq 102 \text{ MHz}$ | 15 |
| 104 MHz | 10 |
| 106 MHz | 5 |
| 107.9 MHz | -10 |

¹The relationship is linear between single adjacent points designated by the above frequencies.

(d) Intermodulation immunity. The receiver shall meet the requirements specified in paragraph (a) of this section in the presence of interference from two-signal, third order intermodulation products of two VHF-FM broadcast signals having levels in accordance with the following:

- (1) $2N_1 + N_2 + 72 \leq 0$ for VHF-FM sound broadcasting signals in the range 107.7–108 MHz; and
- (2) $2N_1 + N_2 + 3(24 - 20\log \Delta f / 0.4) \leq 0$ for VHF-FM sound broadcasting signals below 107.7 MHz, where the frequencies of the two VHF-FM sound broadcasting signals produce, within the receiver, a two signal, third-order intermodulation product on the desired VDB frequency.
- (3) In the formulas in paragraphs (d)(1) and (d)(2) of this section, N_1 and N_2 are the levels (dBm) of the two VHF FM sound broadcasting signals at the VHF data broadcast (VDB) receiver input. Neither level shall exceed the desensitization criteria set forth in paragraph (c) of this section. $\Delta f = 108.1 - f_1$, where f_1 is the frequency of N_1 , the VHF FM sound broadcasting signal closer to 108.1 MHz.

☐ Compliant

☒ N/A

12 §2.1091 - RADIOFREQUENCY RADIATION EXPOSURE EVALUATION

12.1 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 chapter, in particular §1.1307(b).

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

Limits for Exposure

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm ²) | Averaging Time (minutes) |
|--|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| (A) Limits for Occupational/Controlled Exposures | | | | |
| 0.3-3.0 | 614 | 1.63 | *(100) | 6 |
| 3.0-30 | 1842/f | 4.89/f | *(900/f ²) | 6 |
| 30-300 | 61.4 | 0.163 | 1.0 | 6 |
| 300-1500 | / | / | f/300 | 6 |
| 1500-100,00 | / | / | 1 | 6 |
| (B) 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/150 | 30 |
| 1500-100,000 | / | / | 1 | 30 |

f = frequency in MHz

* = Plane-wave equivalent power density

Note 1 to Table 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2 to Table 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

MPE Prediction

Predication of MPE limit at a given distance

Equation from page 18 of 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

| | |
|--|-----------------|
| Maximum peak output power at antenna input terminal (dBm): | <u>49.89</u> |
| Maximum peak output power at antenna input terminal (mW): | <u>97498.96</u> |
| Prediction distance (cm): | <u>1000</u> |
| Prediction frequency (MHz): | <u>108</u> |
| Maximum Antenna Gain, typical (dBi): | <u>3</u> |
| Maximum Antenna Gain (numeric): | <u>2</u> |
| Power density of prediction frequency at 1000 cm (mW/cm ²): | <u>0.016</u> |
| MPE limit for uncontrolled exposure at prediction frequency (mW/cm ²): | <u>0.36</u> |

Conclusion:

MPE will be addressed at the time of licensing.