

FCC PART 90
EMI MEASUREMENT AND TEST REPORT

For

**YULONG COMPUTER TELECOMMUNICATION
SCIENTIFIC (SHENZHEN) CO. LTD**

8/F, B TOWER, HIGH TECH. PLAZA, TIANAN CRYBERPARK,
SHENZHEN, CHINA

FCC ID: R38YLWM0404

| | |
|--|---|
| This Report Concerns: <input checked="" type="checkbox"/> Original Report | Equipment Type: Wireless Data Modem |
| Test Engineer: <u>Ming Jin</u> | |
| Report Number: <u>R0404063</u> | |
| Report Date: <u>2004-04-26</u> | |
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Note: This test report is specially limited to the above client company and product model. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *YULONG COMPUTER TELECOMMUNICATION SCIENTIFIC (SHENZHEN) CO. LTD*'s Model: *PIP-900* or the "EUT" as referred to in this report is a wireless data modem, transmitter part, which measures approximately 11.2cmL x 5.8cmW x 3.0cmH. The EUT operates at frequency 896 – 901MHz with maximum ERP of 1.36W, frequency tolerance 1.5ppm and emission designator F3D.

** The test data gathered are from production sample, serial number: PIP-900-001, provided by the manufacturer.*

Objective

This report is prepared on behalf of *YULONG COMPUTER TELECOMMUNICATION SCIENTIFIC (SHENZHEN) CO. LTD* in accordance with Part 90 Subpart A Subpart I and Subpart S of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for effective radiated power, modulation characteristics, occupied bandwidth, radiated spurious emissions, and frequency stability.

Related Grant/Submission

No Related Submittals.

Test Methodology

Measurements contained in this report were also conducted with TIA/EIA Standard 603, Telecommunications Industry Association Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

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

Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation 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 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 C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. 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, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, CISPR 22: 1997, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

SYSTEM TEST CONFIGURATION

Justification

The EUT was tested under typical operating modes to represent the worst-case results during the final qualification test.

Special Accessories

As shown in the test setup block diagram, interface cable used for compliance testing is shielded as normally supplied by customer and its respective support equipment manufacturers.

Schematics / Block Diagram

Please refer to Appendix D.

Equipment Modifications

No modification was made by BAACL Corp. to make sure the EUT to comply with the applicable limits.

Local Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number | FCC ID |
|--------------|-------------|--------|---------------|--------|
| Dell | Notebook PC | PS04RC | N/A | N/A |

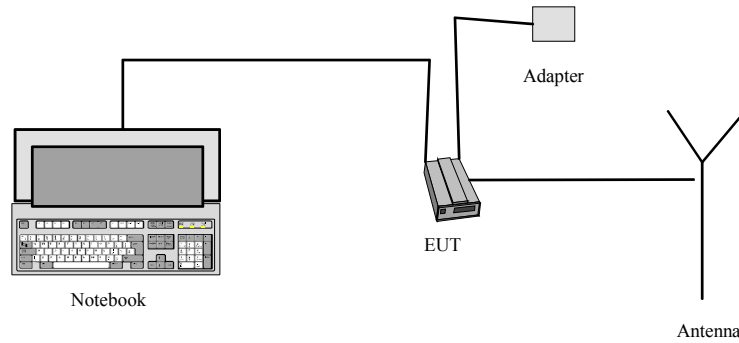
External I/O Cabling List and Details

| Cable Description | Length (M) | From | To |
|------------------------|------------|------------------------|---------------------------|
| RSS232 and Power Cable | 0.5 | RSS232 and Power Cable | Notebook PC / RSS232 Port |
| RSS232 and Power Cable | 0.5 | EUT / RSS232 Port | AC/DC Adapter |
| Antenna Cable | 1.0 | EUT / Antenna Port | Antenna |

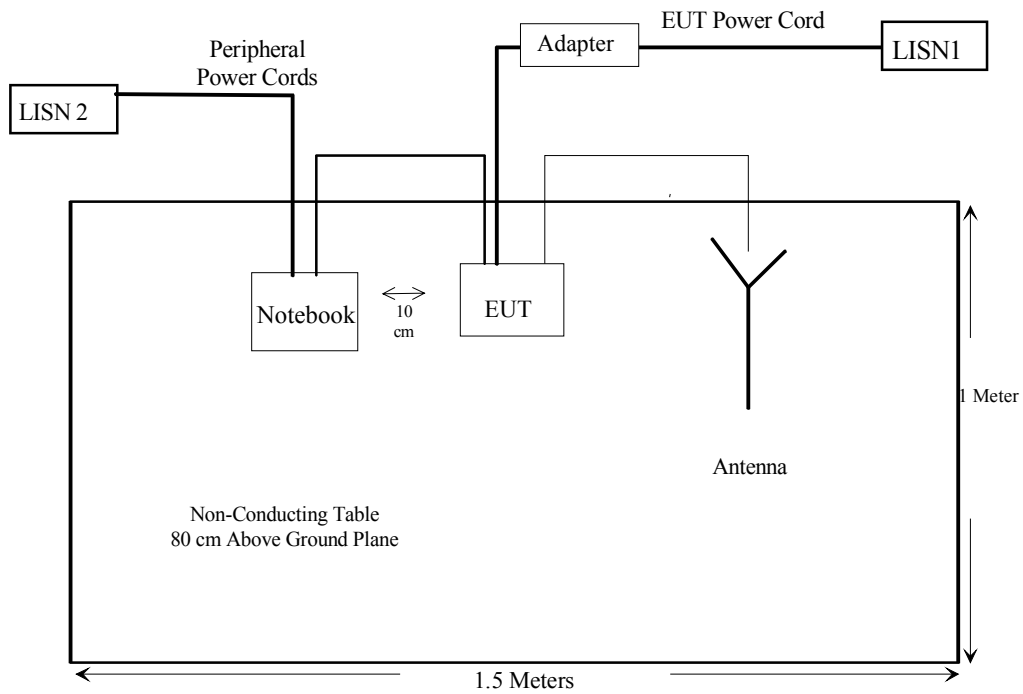
Power Supply and Line Filters

| Manufacturer | Description | Model | Serial Number | FCC ID |
|--------------|-----------------|------------|---------------|--------|
| Yulong | AC Power supply | PRS-Z30US7 | N/A | N/A |

Configuration of Test System



Test Setup Block Diagram



REQUIREMENTS OF PROVISIONS

Requirements and Test Summary

| FCC Rules | Rules Description | Result |
|----------------------|---|----------|
| 2.1046 90.205 (j) | RF Output Power | Complied |
| 2.1049 90.210 (j) | Occupied Bandwidth | Complied |
| 2.1053 90.210 | Radiated Spurious Emission | Complied |
| 2.1051 90.210 | Spurious Emission at Antenna Port | Complied |
| 2.1055 90.213 | Frequency Stability Vs. Temperature Vs. Voltage | Complied |

Labeling Requirement

Each equipment for which a type acceptance applications is filed on or after May 1, 1981, shall bear an identification plate or label pursuant to §2.295 (Identification of Equipment) and §2.926 (FCC identifier)

In August 1996 the Federal Communications Commissions (FCC) adopted RF exposure guidelines with safety levels for hand-held wireless devices.

Generally users manual contains a RF exposure statement to indicate compliance with FCC requirements.

§2.1046 and §90.205(j) - CONDUCTED OUTPUT POWER

Provision Applicable

Per FCC §2.1046 and §90.205(j): the output power shall not exceed 100W.

Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuator.

Test Equipment

| Manufacturer | Description | Model | Serial Number | Cal. Due Date |
|---------------------|--------------------|--------------|----------------------|----------------------|
| Hewlett Packard | Spectrum Analyzer | HP8565C | 06042 | 2004-05-03 |
| Hewlett Packard | Plotter | HP7470A | N/A | N/A |

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

Test Results

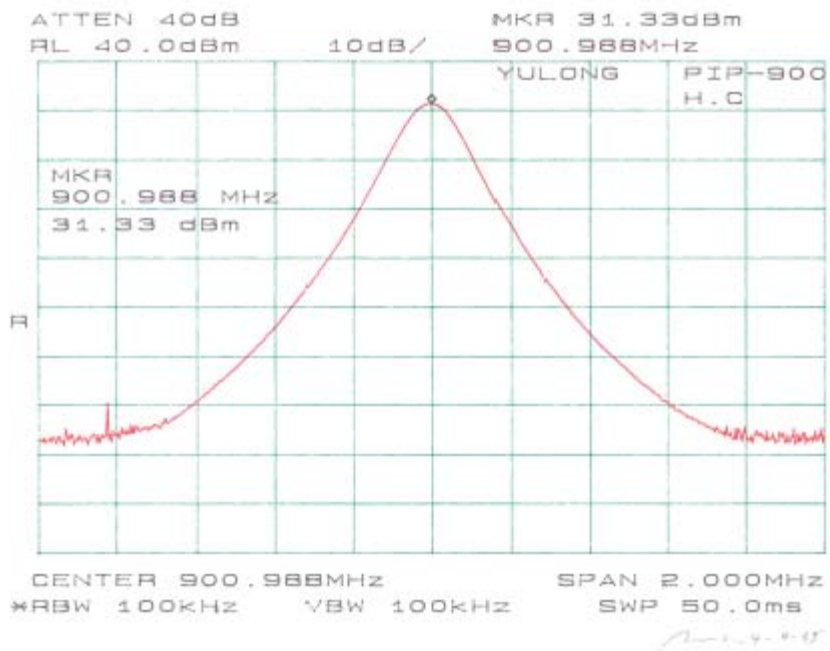
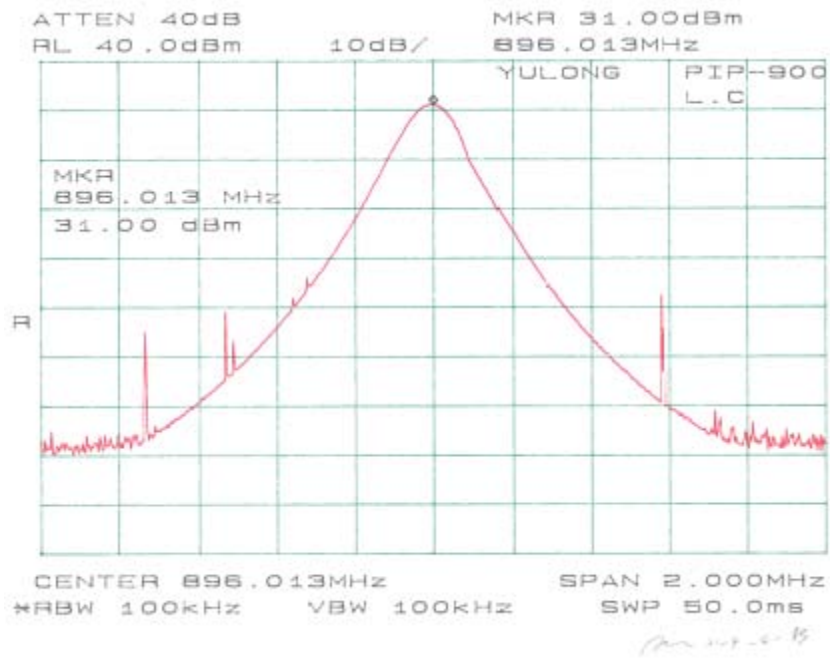
Environmental Conditions

| | |
|--------------------|----------|
| Temperature: | 25° C |
| Relative Humidity: | 38 % |
| ATM Pressure: | 1032mbar |

The testing was performed by Ming Jing on 2004-04-25.

| Frequency | Output Power in dBm | Output Power in W |
|-----------|---------------------|-------------------|
| 896.013 | 31.00 | 1.259 |
| 900.988 | 31.33 | 1.358 |

Please refer to the following plots.



§2.1049, and §90.209 - OCCUPIED BANDWIDTH OF EMISSION

Provision Applicable

Per FCC §2.1049, and §90.209, the emission bandwidth shall not exceed 12.5KHz.

For any frequency removed from the center of the assigned channel by more than 50 percent up to and including 100 percent of the authorized bandwidth, at least 25 dB.

On any frequency removed from the center of the assigned channel by more than 100 percent up to and including 250 percent, at least 35 dB.

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

$50 + 10 \log(P)$ dBm

Test Procedure

The transmitter was connected to a spectrum analyzer via a low lose cable. The resolution bandwidth of the spectrum analyzer was set up to 1KHz and the spectrum of the transmitting signal was recorded. This spectrum was compared to the required emission mask.

Test Equipment

| Manufacturer | Description | Model No. | Serial No. | Calibration Date |
|-----------------|-----------------------|-----------|------------|------------------|
| Agilent | DRG Spectrum Analyzer | 8565EC | 3946A00131 | 2003-06-30 |
| Hewlett Packard | Plotter | HP7470A | N/A | N/A |
| NAAYAN | Audio Generator | NY2201 | 00042 | N/A |

2003.□. **Statement of Traceability: BACL Corp.**
certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

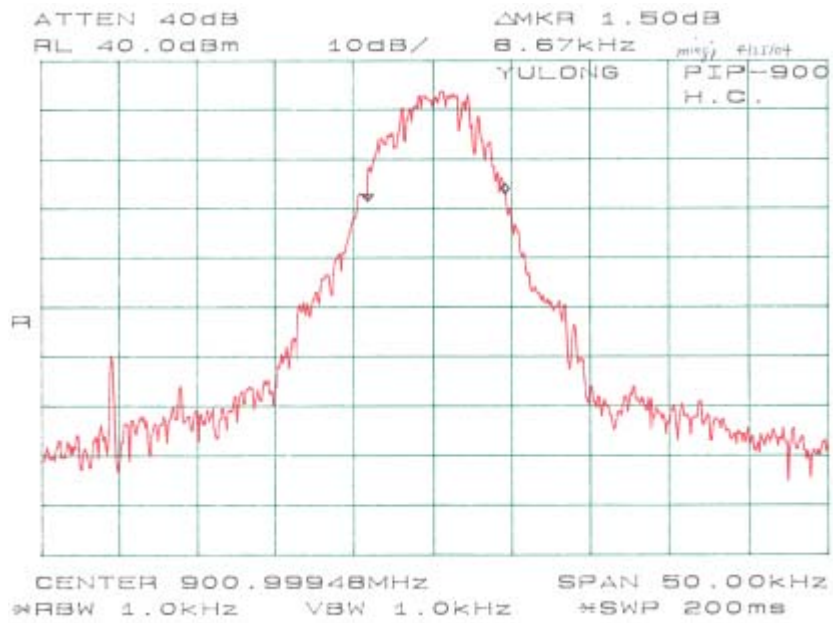
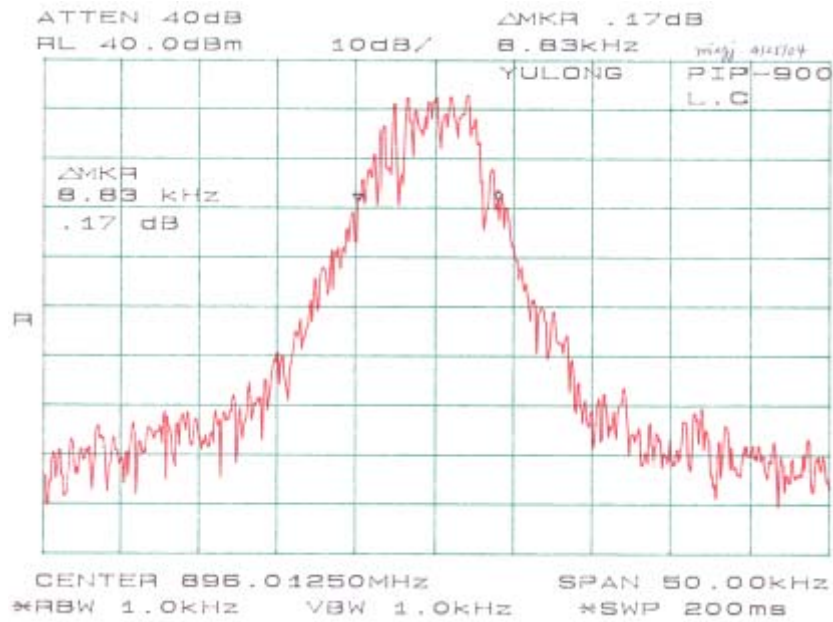
Test Results

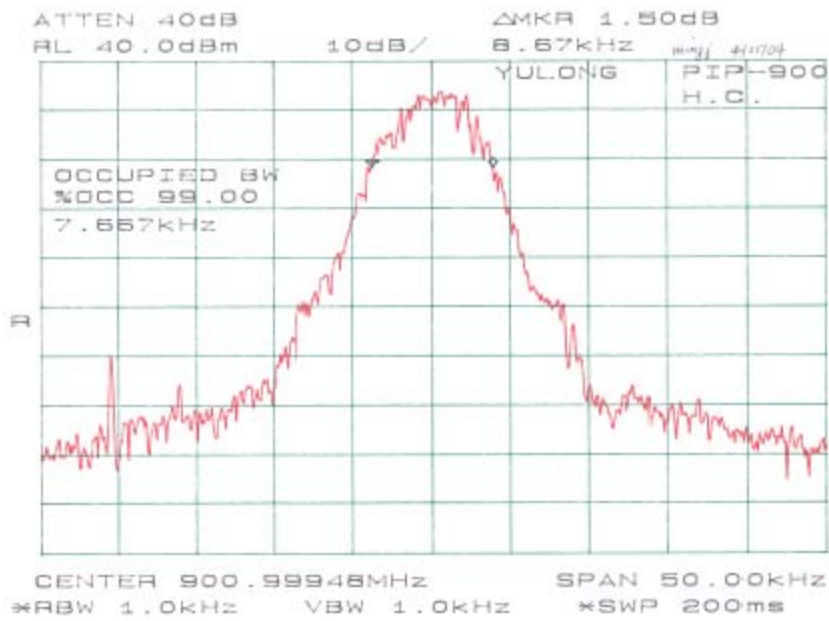
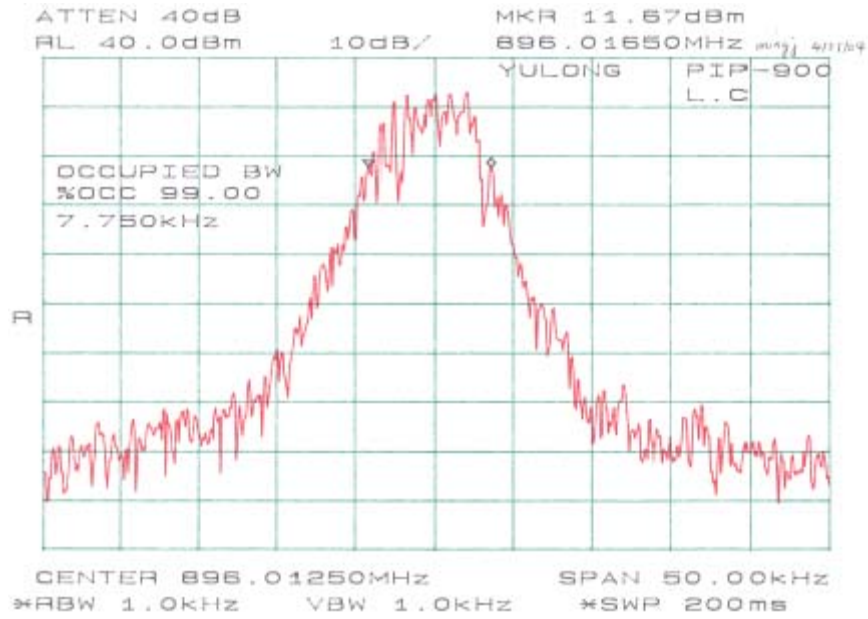
Environmental Conditions

| | |
|--------------------|----------|
| Temperature: | 25° C |
| Relative Humidity: | 38 % |
| ATM Pressure: | 1032mbar |

The testing was performed by Ming Jing on 2004-04-25.

Test Result: Pass
Please refer the following curve and plots.





§2.1053 and §90.210 (j) – RADIATED SPURIOUS EMISSION

Provision Applicable

Per FCC §2.1053 and FCC §90.210 (j)

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

$$50 + 10 \log(P) \text{ dBm}$$

Test Procedure

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 test was performed by placing the EUT on 3-orthogonal axis.

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

Remove the EUT and replace it with 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 = $10 \lg(\text{TXpwr in Watts}/0.001)$ – the absolute level

Spurious attenuation limit in dBm = $50 + 10 \log(P)$

Test Equipment

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---------------------|-----------------------|--------------|----------------------|------------------|
| EMCO | Biconical Antennas | 3110B | 9603-2315 | 2003-10-11 |
| EMCO | Log-Periodic Antenna | 3148 | 0004-1155 | 2003-10-11 |
| A.H. System | Horn Antenna | SAS-200/571 | 2455-261 | 2003-08-02 |
| Agilent | DRG Spectrum Analyzer | 8565EC | 3946A00131 | 2003-06-30 |
| Rohde & Schwarz | Signal Generator | SMIQ03 | DE237467 | 2003-07-03 |
| Mini-Circuits | High Pass Filter | NHP-1200 | 10312 | N/R |

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

Test Result**Environmental Conditions**

| | |
|--------------------|----------|
| Temperature: | 25° C |
| Relative Humidity: | 38 % |
| ATM Pressure: | 1032mbar |

The testing was performed by Ming Jing on 2004-04-25.

Low Frequency: -1.1 dB at 2688.0375 MHz

High Frequency: -1.1 dB at 2702.9625 MHz

Primary scan at Low Frequency 896.0125MHz

| EUT | | | | | Generator | | | | | | Standard | |
|------------------|-----------------|-----------------|-----------------|--------------|------------------|--------------|--------------|-------------------|------------|--------------|--------------|--------------|
| Indicated | | Table | Test Antenna | | Substitution | | | Antenna | Cable | Absolute | FCC | FCC |
| Frequency MHz | Ampl. dBuV/m | Angle Degree | Height Meter | Polar H/V | Frequency MHz | Level dBm | Polar H/V | Gain Corrected | Loss DB | Level dBm | Limit dBm | Margin DB |
| 896.0125 | 104.2 | 30 | 1.2 | v | 896.0125 | 26.53 | v | 6.5 | 0.2 | 32.83 | | |
| 896.0125 | 99.6 | 130 | 1.8 | h | 896.0125 | 21.92 | h | 6.5 | 0.2 | 28.22 | | |
| 2688.0375 | 43.2 | 195 | 1.3 | h | 2688.0375 | -29.1 | h | 8.7 | 0.7 | -21.1 | -20 | -1.1 |
| 2688.0375 | 42.6 | 172 | 1.4 | v | 2688.0375 | -29.3 | v | 8.7 | 0.7 | -21.3 | -20 | -1.3 |
| 1792.025 | 45.2 | 160 | 1.2 | h | 1792.025 | -27.7 | h | 6.8 | 0.5 | -21.4 | -20 | -1.4 |
| 1792.025 | 44.9 | 270 | 1.4 | v | 1792.025 | -28.1 | v | 6.8 | 0.5 | -21.8 | -20 | -1.8 |
| 3584.05 | 33.2 | 172 | 1.4 | v | 3584.05 | -34.8 | v | 10.8 | 0.9 | -24.9 | -20 | -4.9 |
| 3584.05 | 30.1 | 195 | 1.3 | h | 3584.05 | -37.1 | h | 10.8 | 0.9 | -27.2 | -20 | -7.2 |

Primary scan at High Frequency 900.987MHz

| EUT | | | | | Generator | | | | | | Standard | |
|------------------|-----------------|-----------------|-----------------|--------------|------------------|--------------|--------------|-------------------|------------|--------------|--------------|--------------|
| Indicated | | Table | Test Antenna | | Substitution | | | Antenna | Cable | Absolute | FCC | FCC |
| Frequency MHz | Ampl. dBuV/m | Angle Degree | Height Meter | Polar H/V | Frequency MHz | Level dBm | Polar H/V | Gain Corrected | Loss DB | Level dBm | Limit dBm | Margin DB |
| 900.9875 | 102.8 | 74 | 1.5 | v | 900.9875 | 25.27 | v | 6.5 | 0.2 | 31.57 | | |
| 900.9875 | 99.2 | 190 | 1.2 | h | 900.9875 | 21.85 | h | 6.5 | 0.2 | 28.15 | | |
| 2702.9625 | 42.7 | 64 | 1.3 | v | 2702.9625 | -29.1 | v | 8.7 | 0.7 | -21.1 | -20 | -1.1 |
| 1801.975 | 45.1 | 55 | 1.5 | v | 1801.975 | -27.5 | v | 6.8 | 0.5 | -21.2 | -20 | -1.2 |
| 2702.9625 | 41.8 | 90 | 1.3 | h | 2702.9625 | -30.2 | h | 8.7 | 0.7 | -22.2 | -20 | -2.2 |
| 1801.975 | 43.5 | 95 | 1.2 | h | 1801.975 | -29 | h | 6.8 | 0.5 | -22.7 | -20 | -2.7 |
| 3603.95 | 32.7 | 64 | 1.3 | v | 3603.95 | -35.4 | v | 10.8 | 0.9 | -25.5 | -20 | -5.5 |
| 3603.95 | 32.4 | 90 | 1.3 | h | 3603.95 | -35.8 | h | 10.8 | 0.9 | -25.9 | -20 | -5.9 |

Result: Pass

Test was performed in three orthogonal plane.

§2.1051 and §90.210 - SPURIOUS EMISSION AT ANTENNA TERMINAL

Standard Applicable

Per FCC §2.1051 and FCC §90.210

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

$50 + 10 \log(P)$ dBm

Measurement Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

Test Equipment

| Manufacturer | Description | Model No. | Serial No. | Calibration Date |
|--------------|-----------------------|-----------|------------|------------------|
| Agilent | DRG Spectrum Analyzer | 8565EC | 3946A00131 | 2003-06-30 |

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

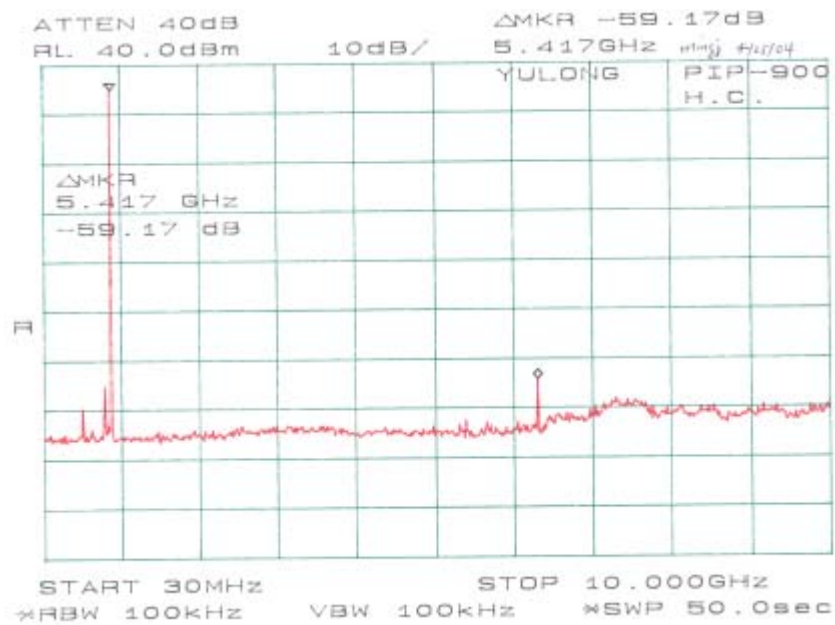
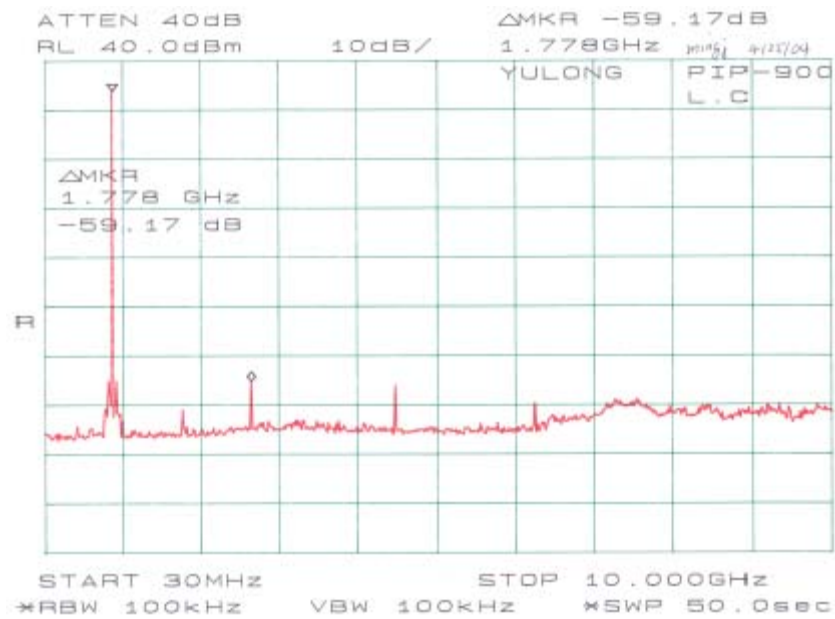
Test Result

Environmental Conditions

| | |
|--------------------|----------|
| Temperature: | 25° C |
| Relative Humidity: | 38 % |
| ATM Pressure: | 1032mbar |

The testing was performed by Ming Jing on 2004-04-25.

Please refer to following plots.



§90.265(b)(3) - FREQUENCY STABILITY MEASUREMENT

Provision Applicable

According to §90.265(b)(3), the frequency stability of the wireless microphones shall limit the total emission to within ± 32.5 KHz of the assigned frequency.

Test Procedure

Frequency stability versus environmental temperature

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber.

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

Frequency Stability versus Input Voltage

At room temperature ($25 \pm 5^\circ\text{C}$), an external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage.

Test Equipment

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|--------------|--|--------|---------------|------------|
| Tenney | Temperature Chamber -50° to $+100^\circ\text{C}$ | Versa | 12.222-193 | 2003-04-23 |
| Agilent | DRG Spectrum Analyzer | 8565EC | 3946A00131 | 2003-06-30 |

* **Statement of Traceability: BA CL Corp.** certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Results

| Reference Frequency: 896.0125 MHz, Limit: 1.5 ppm | | | |
|---|-------------------------|-------------------------------------|-------------|
| Environment Temperature (°C) | Power Supplied (Vac) | Frequency Measure with Time Elapsed | |
| | | MCF (MHz) | Error (ppm) |
| 60 | 120 | 896.0117 | -0.9 |
| 50 | 120 | 896.0119 | -0.7 |
| 40 | 120 | 896.0119 | -0.7 |
| 30 | 120 | 896.0121 | -0.4 |
| 20 | 120 | 896.0121 | -0.4 |
| 10 | 120 | 896.0121 | -0.4 |
| 0 | 120 | 896.0124 | -0.1 |
| -10 | 120 | 896.0127 | 0.2 |
| -20 | 120 | 896.0129 | 0.4 |
| -30 | 120 | 896.0129 | 0.4 |

Frequency Stability Versus Input Voltage

| Reference Frequency: 896.1025 MHz, Limit: 1.5 ppm | | |
|---|-------------------------------------|-------------|
| Power Supplied (Vac) | Frequency Measure with Time Elapsed | |
| | Frequency (MHz) | Error (ppm) |
| 102 | 896.0119 | -0.7 |
| 120 | 896.0121 | -0.4 |
| 138 | 896.0127 | 0.2 |