



NVLAP LAB CODE 200707-0



## FCC PART 95

# EMI MEASUREMENT AND TEST REPORT

For

## China and Hong Kong Telecom Engineering Co Ltd

Unit 608, 6/F, New Tech Plaza, 34 Tai Yau Street, San Po Kong, Kowloon, Hong Kong.

**FCC ID: QTWG066**

|   |  |                                    |  |
|---|--|------------------------------------|--|
| <b>This Report Concerns:</b><br><input checked="" type="checkbox"/> Original Report |  | <b>Equipment Type:</b><br>FRS/GMRS |  |
| <b>Test Engineer:</b>   | William Chan <i>William Chan</i>   |                                    |  |
| <b>Report No.:</b>  | RSZ07030101  |                                    |  |
| <b>Test Date:</b>   | 2007-03-09 to 2007-03-14   |                                    |  |
| <b>Report Date:</b>   | 2007-03-16   |                                    |  |
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**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 Laboratory Corp. (Shenzhen). 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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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The *China and Hong Kong Telecom Engineering Co Ltd*'s product, model number: G-066 or the "EUT" as referred to in this report is a FRS/GMRS. The EUT is measured approximately 22.5 cm L x 4.5 cmW x 2.5 cmH rated input voltage: DC 3.7 V Battery, with permanent Antenna.

*\* The test data gathered are from production sample, serial number: 0702022 provided by the manufacturer, we received the EUT on 2007-03-01.*

### Objective

This Type approval report is prepared on behalf of *China and Hong Kong Telecom Engineering Co Ltd* in accordance with Part 2, Subpart J, and Part 95 of the Federal Communication Commissions rules.

### Related Submittal(s)/Grant(s)

No related submittal(s).

### Test Methodology

All tests and measurements indicated in this document were performed in accordance with TIA/EIA 603-C and Part 95 Subpart B and Subpart E of the Federal Communication Commissions rules.

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

### Test Facility

The Test site used by Bay Area Compliance Laboratory Corp. (Shenzhen) to collect radiated and conducted emission measurement data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratory Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 04, 2004. 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 has the reports on file and is listed under FCC Registration No.: 382179 and Industrial Canada registration test site No.: 5500A. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corp. (Shenzhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0). The current scope of accreditations can be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2007070.htm>

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## **SYSTEM TEST CONFIGURATION**

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### **Description of Test Configuration**

The system was configured for testing in a typical fashion (as normally used by a typical user).

### **Equipment Modifications**

Bay Area Compliance Laboratory Corp. (Shenzhen) has not done any modification on the EUT.

## Configuration of Test Setup



Lying View



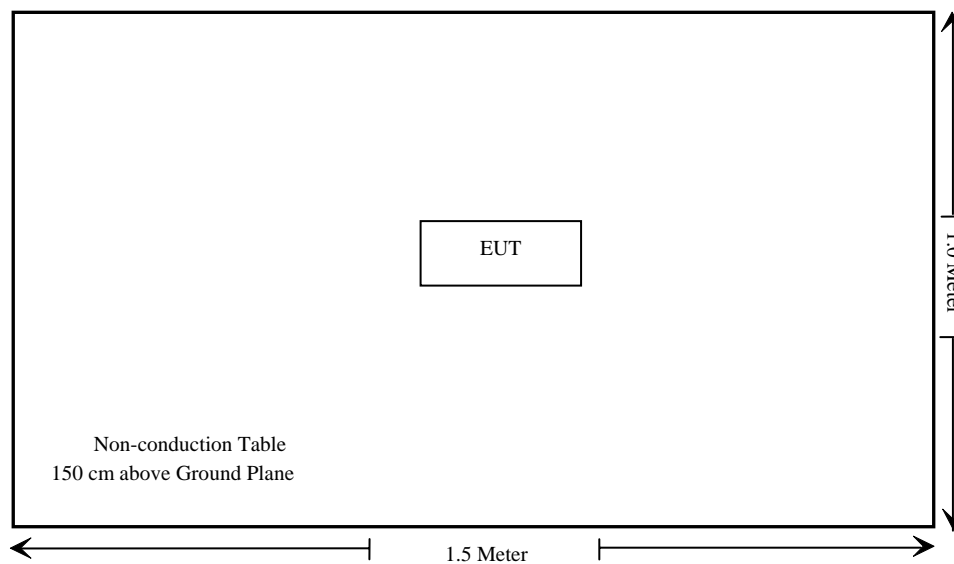
Side View



Standing View

Note: We tested Lying orientation, Side orientation and standing orientation, the Standing orientation is the worst mode, so we select the Standing orientation to test.

## Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

| <b>FCC Rules</b>                    | <b>Description Of Test</b>  | <b>Result</b> |
|-------------------------------------|-----------------------------|---------------|
| §1.1310, §2.1093                    | RF Radiation Exposure       | Compliant     |
| §2.1046, §95.135 and §95.639(d)     | RF Output Power             | Compliant     |
| §2.1047, and §95.637(a)             | Modulation Characteristic   | Compliant     |
| §2.1049, and §95.633(a)(c)          | Occupied Bandwidth          | Compliant     |
| §2.1053<br>§95.635(b) (7)           | Spurious Radiated Emissions | Compliant     |
| §2.1055 (d), §95.627(b) and §95.621 | Frequency stability         | Compliant     |

## §1.1310 and §2.1093 – RF EXPOSURE

### Standard Applicable

According to §1.1310, §2.1093, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to FCC Exclusion list, In the following table,  $f_{\text{GHz}}$  is mid-band frequency in GHz, and  $d$  is the distance to a person's body, excluding hands, wrists, feet, and ankles.

| Exposure category  | <u>low threshold</u>  | <u>high threshold</u>                                 |
|--------------------|---|---|
| general population | $(60/f_{\text{GHz}}) \text{ mW}, d < 2.5 \text{ cm}$<br>$(120/f_{\text{GHz}}) \text{ mW}, d \geq 2.5 \text{ cm}$  | $(900/f_{\text{GHz}}) \text{ mW}, d < 20 \text{ cm}$  |
| occupational       | $(375/f_{\text{GHz}}) \text{ mW}, d < 2.5 \text{ cm}$<br>$(900/f_{\text{GHz}}) \text{ mW}, d \geq 2.5 \text{ cm}$ | $(2250/f_{\text{GHz}}) \text{ mW}, d < 20 \text{ cm}$ |

Routine SAR evaluation refers to that specifically required by § 2.1093, using measurements or computer simulation. When routine SAR evaluation is not required, portable transmitters with output power greater than the applicable low threshold require SAR evaluation to qualify for TCB approval.

### Measurement Result:

This is a portable device and the Max peak output power is  $79 \text{ mW} < 128 \text{ mW} = (60/0.467\text{GHz}) \text{ mW}$ , SAR measurement is not required.

## **§2.1046, §95.135 and §95.639(d) - RF OUTPUT POWER**

### **Applicable Standard**

Per FCC §2.1046, and §95.639(d), No FRS Unit, under any condition of modulation, shall exceed a 0.500 w effective radiated power (ERP).

Per §95.135, A small base station must transmit with no more than 5 watts effective radiated power (ERP).

### **Test Equipment List and Details**

| <b>Manufacturer</b> | <b>Description</b> | <b>Model</b> | <b>Serial Number</b> | <b>Calibration Date</b> | <b>Calibration Due Date</b> |
|---------------------|--------------------|--------------|----------------------|-------------------------|-----------------------------|
| HP                  | Signal Generator   | HP8657A      | 2849U00982           | 2006-09-29              | 2007-09-29                  |
| Agilent             | Spectrum Analyzer  | 8564E        | 3943A01781           | 2006-11-22              | 2007-11-22                  |
| Sunol Sciences      | Broadband Antenna  | JB1          | A040904-1            | 2006-08-14              | 2007-08-14                  |
| COM POWER           | Dipole Antenna     | AD-100       | 041000               | 2006-09-25              | 2007-09-25                  |

\* **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### **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.

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 emissions were measured by the substitution.



**Test Data****Environmental Conditions**

|                    |          |
|--------------------|----------|
| Temperature:       | 25 ° C   |
| Relative Humidity: | 50%      |
| ATM Pressure:      | 1005mbar |

*The testing was performed by William Chan on 2007-03-09.*

*Test Mode: Transmitting*

| Indicated          |                   | Table           | Test Antenna  |              | Substituted        |                |              | Antenna<br>Gain<br>Correction | Cable<br>Loss<br>(dB) | FCC Part 95                |                            |                |                    |
|--------------------|-------------------|-----------------|---------------|--------------|--------------------|----------------|--------------|-------------------------------|-----------------------|----------------------------|----------------------------|----------------|--------------------|
| Frequency<br>(MHz) | Reading<br>(dBuV) | Angle<br>Degree | Height<br>(m) | Polar<br>H/V | Frequency<br>(MHz) | Level<br>(dBm) | Polar<br>H/V |                               |                       | Absolute<br>Level<br>(dBm) | Absolute<br>Level<br>( W ) | Limit<br>( W ) | Comments           |
| 462.6375           | 85.46             | 0               | 1.50          | V            | 462.6375           | 21.02          | V            | 0                             | 3.86                  | 17.16                      | 0.051                      | 0.5            | FRS<br>Channel 4   |
| 467.6375           | 87.01             | 0               | 1.50          | V            | 467.6375           | 22.85          | V            | 0                             | 3.87                  | 18.98                      | 0.079                      | 0.5            | FRS<br>Channel 11  |
| 462.6250           | 85.82             | 0               | 1.50          | V            | 462.6250           | 21.25          | V            | 0                             | 3.86                  | 17.39                      | 0.054                      | 5              | GMRS<br>Channel 18 |

**Test Result:** Pass

## §2.1047 and §95.637(a) - MODULATION CHARACTERISTIC

### Applicable Standard

§2.1047 & §95.637:

- (a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. for equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.
- (b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.
- (c) A FRS Unit that transmits emission type F3E must not exceed peak frequency deviation of plus or minus 2.5 kHz.
- (d) A GMRS transmitter that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 5 kHz.

### Test Equipment List and Details

| Manufacturer | Description         | Model  | Serial Number | Calibration Date | Calibration Due Date |
|--------------|---------------------|--------|---------------|------------------|----------------------|
| HP           | Modulation Analyzer | 8901B  | 3438A05208    | 2007-03-01       | 2008-03-01           |
| NANYAN       | Audio Generator     | NY2201 | 019829        | 2006-12-23       | 2007-12-23           |

\* **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### Test Procedure

Test Method: TIA/EIA-603-C

### Test Data

#### Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 25 ° C   |
| Relative Humidity: | 50%      |
| ATM Pressure:      | 1005mbar |

*The testing was performed by William Chan on 2007-03-09.*

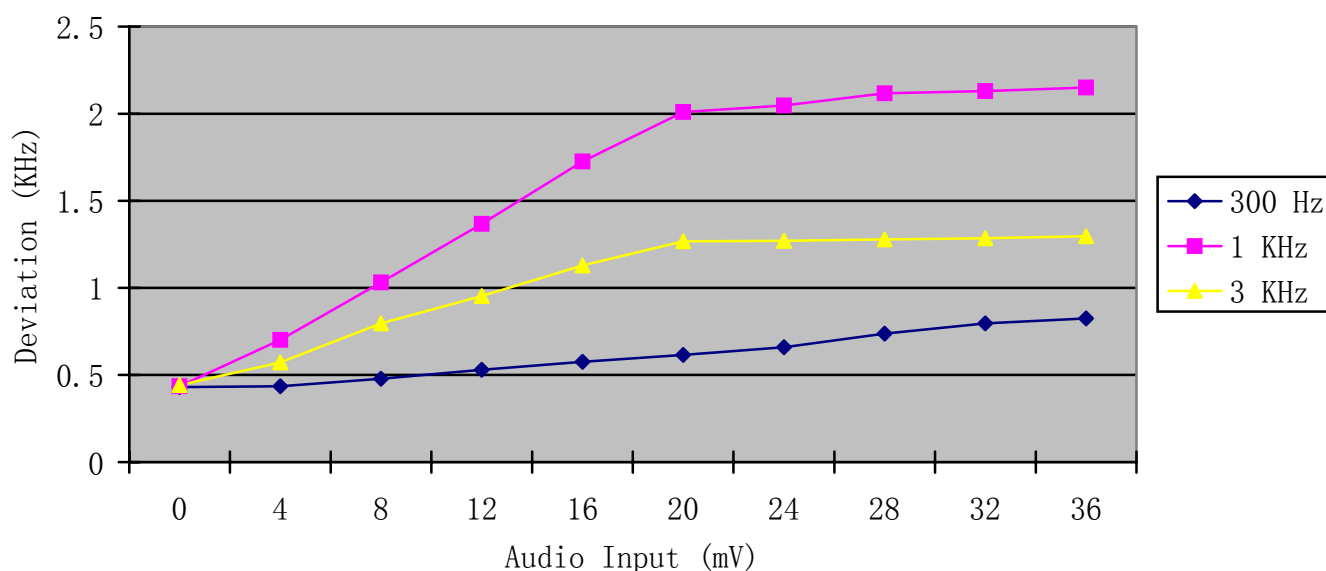
**Test Result:** Pass

*Test Mode: Transmitting*

For 12.5 kHz Channel Bandwidth (FRS –Channel 4) :

| Audio Input (mV) | 300 Hz Deviation (kHz) | 1kHz Deviation (kHz) | 3 kHz Deviation (kHz) |
|------------------|------------------------|----------------------|-----------------------|
| 0.0              | 0.431                  | 0.435                | 0.442                 |
| 4.0              | 0.435                  | 0.701                | 0.572                 |
| 8.0              | 0.478                  | 1.031                | 0.796                 |
| 12.0             | 0.530                  | 1.368                | 0.953                 |
| 16.0             | 0.576                  | 1.726                | 1.128                 |
| 20.0             | 0.615                  | 2.010                | 1.268                 |
| 24.0             | 0.659                  | 2.047                | 1.271                 |
| 28.0             | 0.737                  | 2.117                | 1.279                 |
| 32.0             | 0.796                  | 2.130                | 1.285                 |
| 36.0             | 0.824                  | 2.150                | 1.297                 |

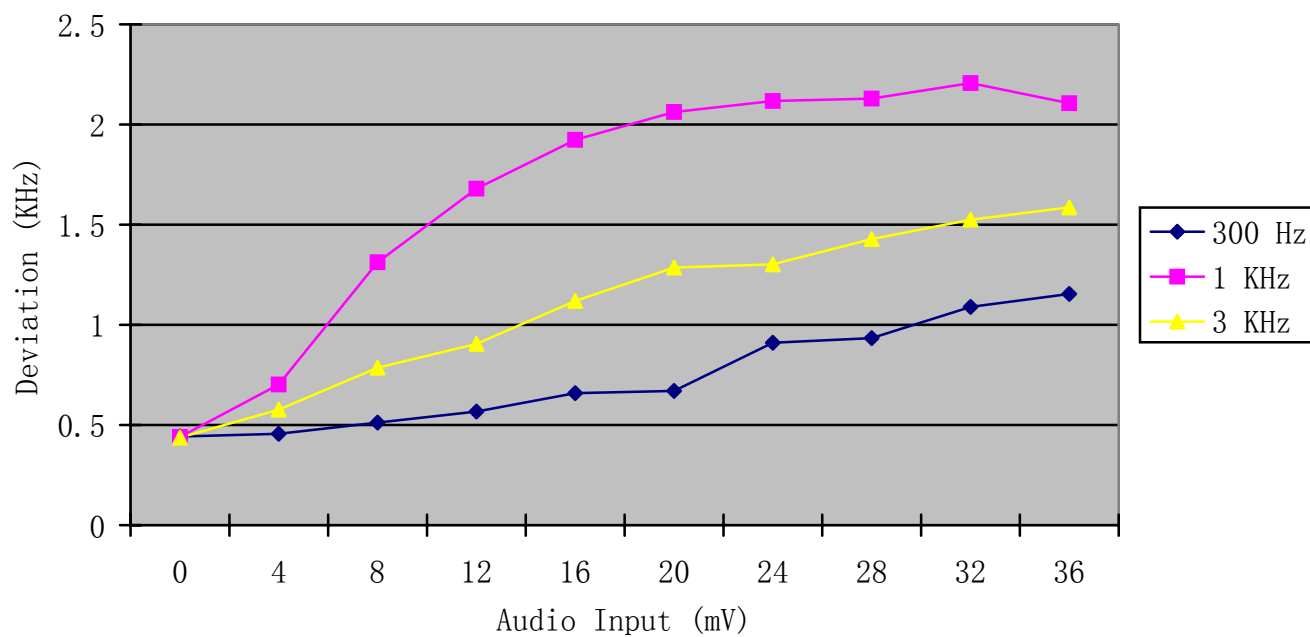
Modulation Limit



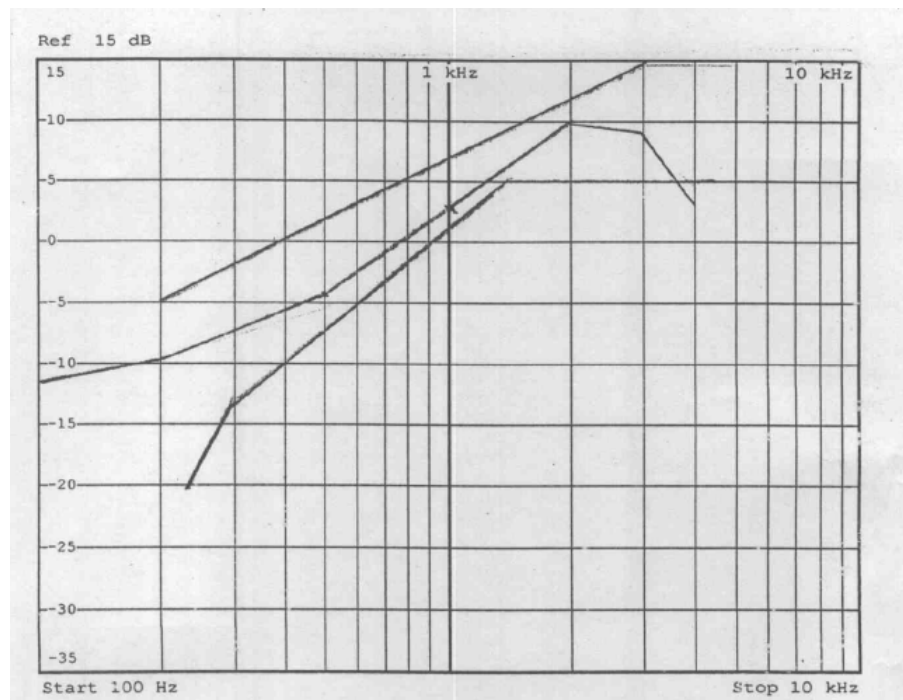
For 20 kHz Channel Bandwidth (GMRS – Channel 18):

| Audio Input (mV) | 300 Hz Deviation (kHz) | 1kHz Deviation (kHz) | 3 kHz Deviation (kHz) |
|------------------|------------------------|----------------------|-----------------------|
| 0.0              | 0.443                  | 0.440                | 0.437                 |
| 4.0              | 0.456                  | 0.702                | 0.577                 |
| 8.0              | 0.512                  | 1.312                | 0.786                 |
| 12.0             | 0.567                  | 1.680                | 0.905                 |
| 16.0             | 0.659                  | 1.923                | 1.119                 |
| 20.0             | 0.671                  | 2.062                | 1.286                 |
| 24.0             | 0.911                  | 2.117                | 1.302                 |
| 28.0             | 0.934                  | 2.129                | 1.428                 |
| 32.0             | 1.090                  | 2.207                | 1.525                 |
| 36.0             | 1.154                  | 2.106                | 1.587                 |

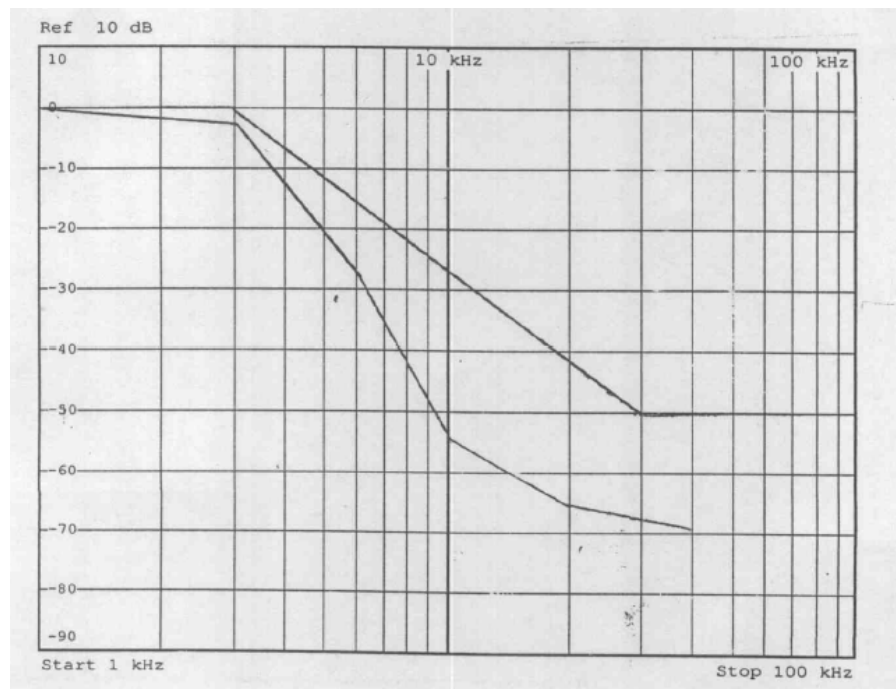
Modulation Limit



Audio frequency response:



Audio Low Pass Filter:



## §2.1049 and § 95.633(a) (c) – OCCUPIED BANDWIDTH

### Applicable Standard

Per FCC §2.1049 and FCC §95.633(a) (c), the authorized bandwidth for emission type F3E or F2D transmitted by an FRS Unit is 12.5 kHz. and The authorized bandwidth for emission type F1D, G1D, F3E or G3E transmitted by an GMRS Unit is 20 kHz.

### Test Equipment List and Details

| Manufacturer  | Description       | Model  | Serial Number | Calibration Date | Calibration Due Date |
|---------------|-------------------|--------|---------------|------------------|----------------------|
| NANYAN        | Audio Generator   | NY2201 | 019829        | 2006-12-23       | 2007-12-23           |
| Rohde&Schwarz | EMI Test Receiver | ESCI   | 100035        | 2006-08-17       | 2007-08-17           |

\* **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### Test Procedure

The antenna was disconnected from the transmitter and the short cable was connected to the transmitter RF output.

The RF output was connected to the input of the spectrum analyzer through sufficient attenuation.

### Test Data

#### Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 25 ° C   |
| Relative Humidity: | 50%      |
| ATM Pressure:      | 1005mbar |

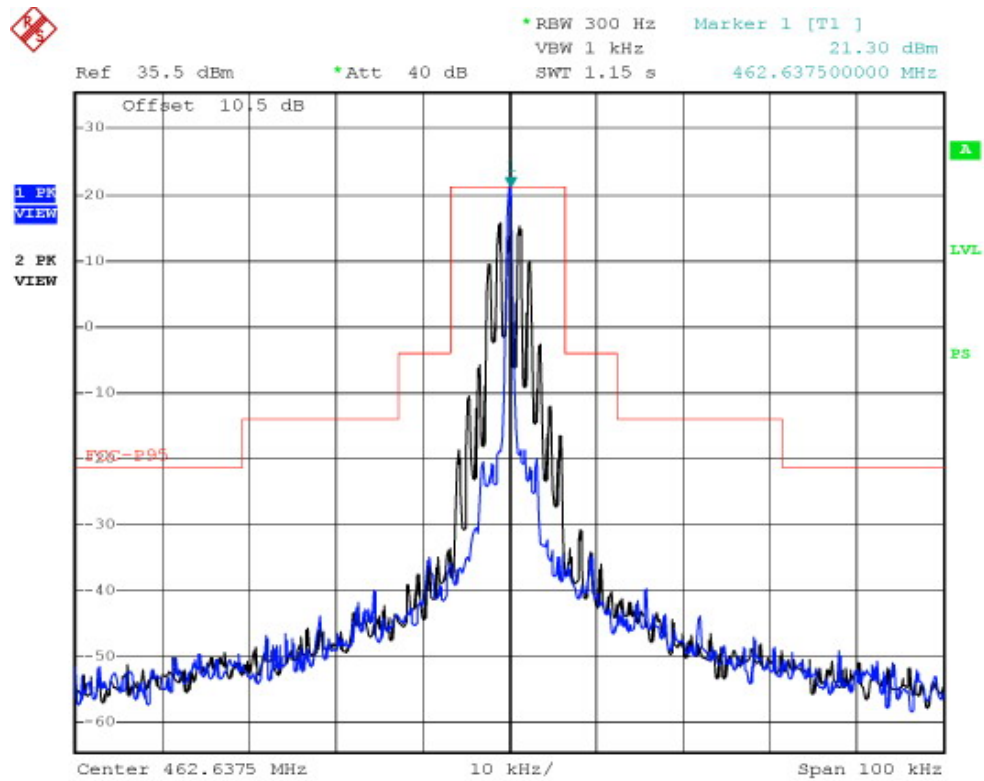
*The testing was performed by William Chan on 2007-03-14.*

**Test Result:** Pass.

*Test Mode: Transmitting*

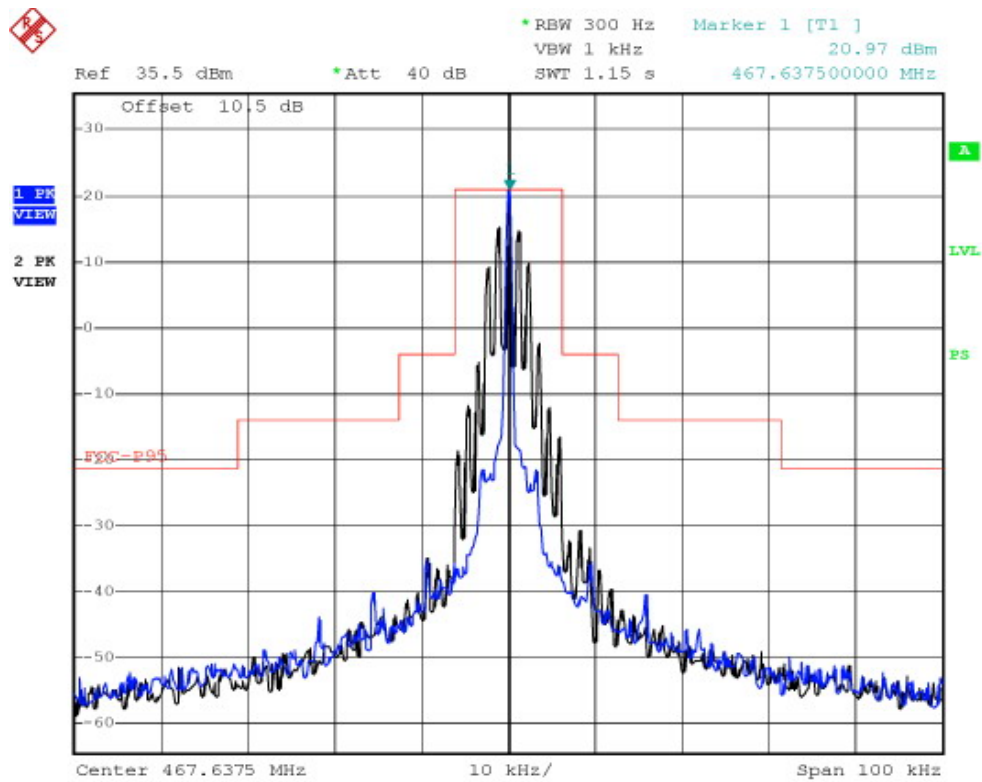
Please refer to the hereinafter plots.

## Emission mask



Emission Mask (FRS -- Channel 4)

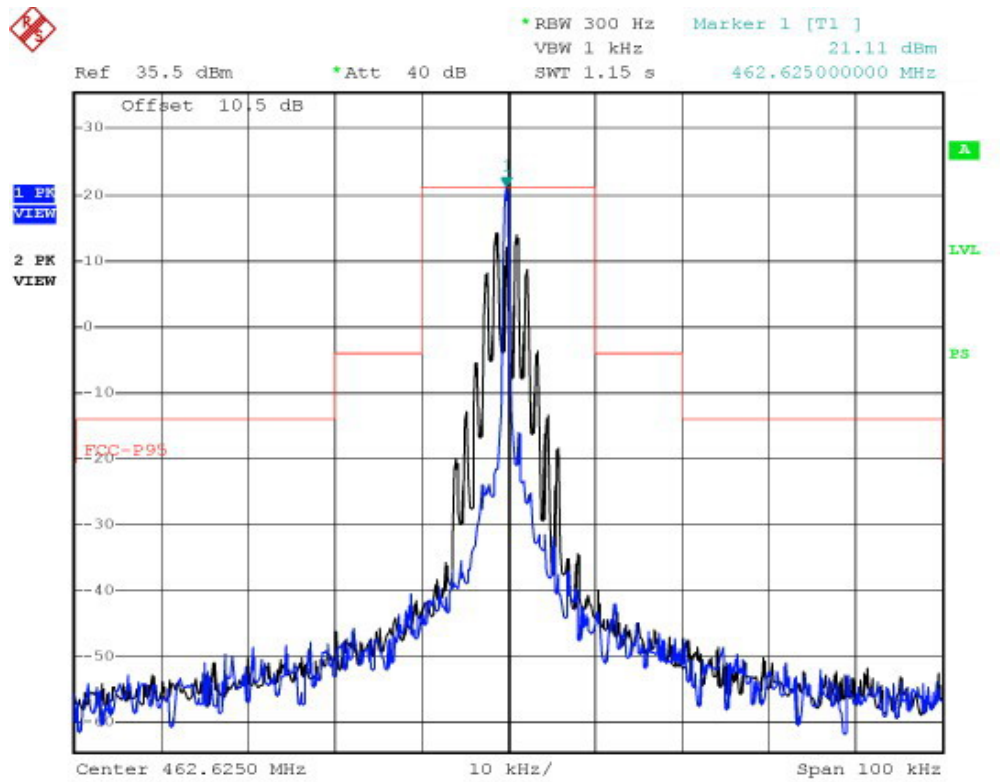
Date: 14.MAR.2007 23:27:28



Emission Mask (FRS -- Channel 11)

Date: 14.MAR.2007 23:21:02





Emission Mask (GMRS -- Channel 18)

Date: 14.MAR.2007 23:51:33

## **§2.1053 and §95.635(b) (7) - UNWANTED RADIATION EMISSIONS**

### **Applicable Standard**

§2.1053 and §95.635

### **Test Equipment List and Details**

| <b>Manufacturer</b> | <b>Description</b> | <b>Model</b> | <b>Serial Number</b> | <b>Calibration Date</b> | <b>Calibration Due Date</b> |
|---------------------|--------------------|--------------|----------------------|-------------------------|-----------------------------|
| HP                  | Signal Generator   | HP8657A      | 2849U00982           | 2006-09-29              | 2007-09-29                  |
| Agilent             | Spectrum Analyzer  | 8564E        | 3943A01781           | 2006-11-22              | 2007-11-22                  |
| Sunol Sciences      | Broadband Antenna  | JB1          | A040904-1            | 2006-08-14              | 2007-08-14                  |
| COM POWER           | Dipole Antenna     | AD-100       | 041000               | 2006-09-25              | 2007-09-25                  |
| SUNOL SCIENCES      | Horn Antenna       | DRH-118      | A052604              | 2006-09-25              | 2007-09-25                  |

\* **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### **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 (TXpwr in Watts/0.001)-the absolute level

Spurious attenuation limit in dB = 43+10 Log<sub>10</sub> (power out in Watts)

### **Test Results Summary**

For channel 4: 23.79 dB at 2775.825 MHz. (FRS)  
 For channel 11: 22.19 dB at 2805.825 MHz. (FRS)  
 For channel 18: 22.38 dB at 2775.75 MHz. (GMRS)

**Test Data****Environmental Conditions**

|                    |          |
|--------------------|----------|
| Temperature:       | 25 ° C   |
| Relative Humidity: | 50%      |
| ATM Pressure:      | 1005mbar |

*The testing was performed by William Chan on 2007-03-12.*

*Test Mode: Transmitting (Channel 4, 462.6375MHz)*

*FRS*

| Frequency (MHz) | ERP (dBm) | Polar H/V | Transmission power (dBm) | Attenuation (dBc) | Spurious Attenuation Limit (dB) | Margin (dB) |
|-----------------|-----------|-----------|--------------------------|-------------------|---------------------------------|-------------|
| 2775.825        | -36.71    | V         | 17.16                    | 53.87             | 30.08                           | 23.79       |
| 1850.55         | -37.13    | V         | 17.16                    | 54.29             | 30.08                           | 24.21       |
| 2775.825        | --37.91   | H         | 17.16                    | 55.07             | 30.08                           | 24.99       |
| 1387.9125       | -38.53    | H         | 17.16                    | 55.69             | 30.08                           | 25.61       |
| 1850.55         | -39.03    | H         | 17.16                    | 56.19             | 30.08                           | 26.11       |
| 925.2750        | -39.12    | V         | 17.16                    | 56.28             | 30.08                           | 26.20       |
| 925.2750        | -39.72    | H         | 17.16                    | 56.88             | 30.08                           | 26.80       |
| 1387.9125       | -40.63    | V         | 17.16                    | 57.79             | 30.08                           | 27.71       |
| 2313.1875       | -42.28    | H         | 17.16                    | 59.44             | 30.08                           | 29.36       |
| 3238.4625       | -43.47    | H         | 17.16                    | 60.63             | 30.08                           | 30.55       |
| 2313.1875       | -43.82    | V         | 17.16                    | 60.98             | 30.08                           | 30.90       |
| 3238.4625       | -45.67    | V         | 17.16                    | 62.83             | 30.08                           | 32.75       |

**NOTE:**

Transmission Power = 0.051w =17.16 dBm

Spurious Attenuation Limit = 43 + log (0.051) = 30.08 dB

Test Mode: Transmitting (Channel 11, 467.6375MHz)

FRS

| Frequency (MHz) | ERP (dBm) | Polar H/V | Transmission power (dBm) | Attenuation (dBc) | Spurious Attenuation Limit (dB) | Margin (dB) |
|-----------------|-----------|-----------|--------------------------|-------------------|---------------------------------|-------------|
| 2805.825        | -35.21    | V         | 18.98                    | 54.19             | 32.0                            | 22.19       |
| 1870.550        | -36.53    | V         | 18.98                    | 55.51             | 32.0                            | 23.51       |
| 2805.825        | --38.41   | H         | 18.98                    | 57.39             | 32.0                            | 25.39       |
| 1402.9125       | -38.63    | V         | 18.98                    | 57.61             | 32.0                            | 25.61       |
| 935.275         | -38.92    | V         | 18.98                    | 57.90             | 32.0                            | 25.90       |
| 1870.550        | -38.93    | H         | 18.98                    | 57.91             | 32.0                            | 25.91       |
| 935.275         | -40.22    | H         | 18.98                    | 59.20             | 32.0                            | 27.20       |
| 1402.9125       | -40.93    | H         | 18.98                    | 59.91             | 32.0                            | 27.91       |
| 2338.1875       | -41.82    | V         | 18.98                    | 60.80             | 32.0                            | 28.80       |
| 3273.4625       | -43.57    | V         | 18.98                    | 62.55             | 32.0                            | 30.55       |
| 2338.1875       | -44.52    | H         | 18.98                    | 63.50             | 32.0                            | 31.50       |
| 3273.4625       | -45.07    | H         | 18.98                    | 64.05             | 32.0                            | 32.05       |

NOTE:

Transmission Power = 0.079w = 18.98 dBm

Spurious Attenuation Limit =  $43 + \log(0.079) = 32.0$  dB

Test Mode: Transmitting (Channel 18, 462.625MHz)

GMRS

| Frequency (MHz) | ERP (dBm) | Polar H/V | Transmission power (dBm) | Attenuation (dBc) | Spurious Attenuation Limit (dB) | Margin (dB) |
|-----------------|-----------|-----------|--------------------------|-------------------|---------------------------------|-------------|
| 2775.75         | -35.31    | V         | 17.39                    | 52.70             | 30.32                           | 22.38       |
| 1850.50         | -37.13    | V         | 17.39                    | 54.52             | 30.32                           | 24.20       |
| 925.25          | -37.82    | V         | 17.39                    | 55.21             | 30.32                           | 24.89       |
| 1387.875        | -38.03    | V         | 17.39                    | 55.42             | 30.32                           | 25.1        |
| 925.25          | -39.02    | H         | 17.39                    | 56.41             | 30.32                           | 26.09       |
| 1387.875        | -39.53    | H         | 17.39                    | 56.92             | 30.32                           | 26.6        |
| 1850.50         | -39.83    | H         | 17.39                    | 57.22             | 30.32                           | 26.90       |
| 2313.325        | -40.12    | V         | 17.39                    | 57.51             | 30.32                           | 27.19       |
| 3238.375        | -41.37    | V         | 17.39                    | 58.76             | 30.32                           | 28.44       |
| 2313.325        | -41.42    | H         | 17.39                    | 58.81             | 30.32                           | 28.49       |
| 2775.75         | -41.61    | H         | 17.39                    | 59.00             | 30.32                           | 28.68       |
| 3238.375        | -44.37    | H         | 17.39                    | 61.76             | 30.32                           | 31.44       |

NOTE:

Transmission Power = 0.054w = 17.39 dBm

Spurious Attenuation Limit =  $43 + \log(0.054) = 30.32$  dB

## §2.1055 (d), §95.627(b) and §95.621- FREQUENCY STABILITY

### Applicable Standard

According to FCC §2.1055(a)(1), the frequency stability shall be measure with variation of ambient temperature from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ , and according to FCC 2.1055(d)(2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

According to FCC §95.627(b), Each FRS Unit must be maintained within a frequency tolerance of 0.00025%.

According to FCC §95.621, Each GMRS transmitter for mobile station, small base station and control station operation must be maintained within a frequency tolerance of 0.0005%.

### Test Equipment List and Details

| Manufacturer  | Description       | Model | Serial Number | Calibration Date | Calibration Due Date |
|---------------|-------------------|-------|---------------|------------------|----------------------|
| Rohde&Schwarz | EMI Test Receiver | ESCI  | 100035        | 2006-09-29       | 2007-09-29           |

\* **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### 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 f Spectrum Analyzer via feed-through attenuators. The 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 Spectrum Analyzer.

**Frequency Stability vs. Voltage:** An external variable DC power supply Source. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the end point. The output frequency was recorded for each voltage.

### Test Data

#### Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 25 ° C   |
| Relative Humidity: | 50%      |
| ATM Pressure:      | 1005mbar |

*The testing was performed by William Chan on 2007-03-14.*

**Test Result:** Pass

*Test Mode: Transmitting*

**FRS Channel 4:**

| Reference Frequency: 462.6375 MHz, Limit: $\pm 2.5$ ppm |                      |                          |                       |
|---|----------------------|--------------------------|-----------------------|
| Environment Temperature (°C)                            | Power Supplied (VDC) | Measured Frequency (MHz) | Frequency Error (ppm) |
| 50  | 3.7                  | 462.63795                | + 0.97                |
| 40  | 3.7                  | 462.63782                | + 0.69                |
| 30  | 3.7                  | 462.63776                | + 0.56                |
| 20  | 3.7                  | 462.63765                | + 0.32                |
| 10  | 3.7                  | 462.63768                | + 0.38                |
| 0   | 3.7                  | 462.63741                | - 0.19                |
| -10   | 3.7                  | 462.63724                | - 0.56                |
| -20   | 3.7                  | 462.63709                | - 0.88                |
| -30   | 3.7                  | 462.63692                | - 1.25                |

| Reference Frequency: 462.6375 MHz, Limit: $\pm 2.5$ ppm |                      |                          |                       |
|---|----------------------|--------------------------|-----------------------|
| Environment Temperature (°C)                            | Power Supplied (VDC) | Measured Frequency (MHz) | Frequency Error (ppm) |
| 20  | 3.2                  | 462.63762                | +0.25                 |

**FRS Channel 11:**

| Reference Frequency: 462.6375 MHz, Limit: $\pm 2.5$ ppm |                      |                          |                       |
|---|----------------------|--------------------------|-----------------------|
| Environment Temperature (°C)                            | Power Supplied (VDC) | Measured Frequency (MHz) | Frequency Error (ppm) |
| 50  | 3.7                  | 467.63798                | + 1.03                |
| 40  | 3.7                  | 467.63784                | + 0.73                |
| 30  | 3.7                  | 467.63771                | + 0.45                |
| 20  | 3.7                  | 467.63758                | + 0.33                |
| 10  | 3.7                  | 467.63767                | + 0.36                |
| 0   | 3.7                  | 467.63732                | - 0.37                |
| -10   | 3.7                  | 467.63716                | - 0.72                |
| -20   | 3.7                  | 467.63704                | - 0.98                |
| -30   | 3.7                  | 467.63695                | - 1.21                |

| Reference Frequency: 462.6375 MHz, Limit: $\pm 2.5$ ppm |                      |                          |                       |
|---|----------------------|--------------------------|-----------------------|
| Environment Temperature (°C)                            | Power Supplied (VDC) | Measured Frequency (MHz) | Frequency Error (ppm) |
| 20  | 3.2                  | 467.63768                | + 0.38                |

**GMRS Channel 18:**

| Reference Frequency: 462.62500 MHz, Limit: $\pm 5$ ppm |                      |                          |                       |
|--|----------------------|--------------------------|-----------------------|
| Environment Temperature (°C)                           | Power Supplied (VDC) | Measured Frequency (MHz) | Frequency Error (ppm) |
| 50   | 3.7                  | 462.62544                | + 0.95                |
| 40   | 3.7                  | 462.62531                | + 0.67                |
| 30   | 3.7                  | 462.62519                | + 0.41                |
| 20   | 3.7                  | 462.62506                | + 0.12                |
| 10   | 3.7                  | 462.62485                | - 0.32                |
| 0  | 3.7                  | 462.62481                | - 0.41                |
| -10  | 3.7                  | 462.62476                | - 0.51                |
| -20  | 3.7                  | 462.62472                | - 0.60                |
| -30  | 3.7                  | 462.62465                | - 0.75                |

| Reference Frequency: 462.62500 MHz, Limit: $\pm 5$ ppm |                      |                          |                       |
|--|----------------------|--------------------------|-----------------------|
| Environment Temperature (°C)                           | Power Supplied (VDC) | Measured Frequency (MHz) | Frequency Error (ppm) |
| 20   | 3.2                  | 462.62472                | + 0.63                |