



NVLAP LAB CODE 200707-0



FCC PART 95

EMI MEASUREMENT AND TEST REPORT

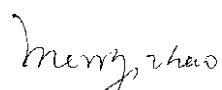
For

JOYO Electronics Company Limited

Unit D, 13/F, World Tech Centre, 95 How Ming Street,

Kwun Tong, Kowloon, Hong Kong

FCC ID: R4G20106M6001

Report Type: Original Report	Product Type: P&F Walkie Talkie
Test Engineer: <u>Sula Huang</u> 	
Report Number: <u>RSZ10080303</u>	
Report Date: <u>2010-08-25</u>	
Reviewed By: <u>Merry Zhao</u> 	
Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008	

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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)

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *JOYO Electronics Company Limited*'s product, model number: *6M6 (FCC ID: R4G20106M6001)* or the "EUT" as referred to in this report is a *P&F Walkie Talkie*. The EUT is measured approximately: 4.0 cm (L) x 6.0 cm (W) x 16.5 cm (H), rated input voltage: DC 1.5 V × 4 Battery.

**All measurement and test data in this report was gathered from production sample serial number: 1008020 (Assigned by BACL, Shenzhen). The EUT was received on 2010-08-03.*

Objective

This Type approval report is prepared on behalf of *JOYO Electronics Company Limited* 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 Part 95 Subpart B and Subpart E of the Federal Communication Commissions rules.

All emissions measurement was performed and Bay Area Compliance Laboratories 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 Laboratories Corp. (Shenzhen) to collect test 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 Laboratories 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 21, 2007. 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. 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 Laboratories Corp. (Shenzhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



NVLAP LAB CODE 200707-0

The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

SYSTEM TEST CONFIGURATION

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 Laboratories Corp. (Shenzhen) has not done any modification on the EUT.

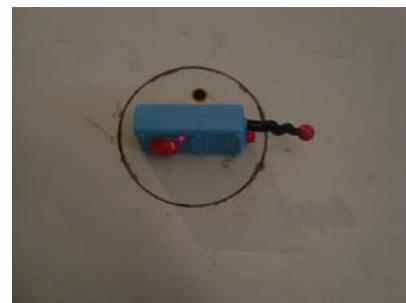
Configuration of Test Setup



Standing View



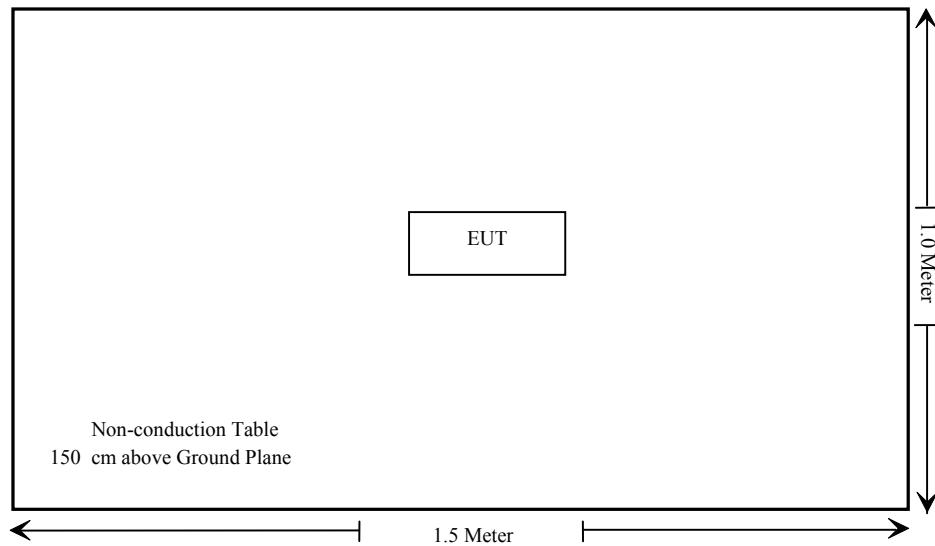
Lying View



Side 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

FCC Rules	Description of Test	Results
§1.1307(b) (1)	RF Exposure	Compliance
§2.1046, §95.639(a), §95.639(d)	RF Output Power	Compliance
§2.1047, §95.637(a)	Modulation Characteristic	Compliance
§2.1049, §95.633(a) (c)	Occupied Bandwidth	Compliance
§2.1053, §95.635(b) (7)	Spurious Radiated Emissions	Compliance
§2.1055(d), §95.627(b), §95.621	Frequency Stability	Compliance

FCC §1.1307(b)(1) - RF EXPOSURE

Applicable Standard

According to FCC §1307(b) (1), 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 OET KDB447498 D01 section 5, Push-to-talk (PTT) devices²⁶:

a) RF exposure is evaluated with a duty factor of 50% when the actual operating duty factor is $\leq 50\%$.²⁷ Devices supporting higher duty factors shall be evaluated at the maximum duty factor; for example, devices supporting operator-assisted PSTN calls. Contact the FCC Laboratory when unable to test a device at the required duty factor due to hardware limitations or other reasons.

b) Portable PTT devices

i) The power thresholds and operating conditions in Table 1 are used to determine SAR test requirements for PTT radios required to comply with the general population exposure limit. When the occupational exposure limit applies, these power thresholds are increased by a factor of five (5) to determine the test requirements. SAR is required for PTT devices with maximum output power greater than these thresholds.²⁸ SAR evaluation is also required for separation distances smaller than those in Table 1. Contact the FCC Laboratory to determine if SAR evaluation is necessary for other frequencies or when the SAR is very low.

Table 1 - SAR Evaluation Power Thresholds for PTT devices, $f \leq 0.5$ GHz

Exposure Conditions	mW
Held to face ≥ 2.5 cm	250
Body-worn ≥ 1.5 cm	200
Body-worn ≥ 1.0 cm	150

Notes:

1. The time-averaged output power, corresponding to the required PTT duty factor, is compared with these thresholds.
2. The closest distance between the user and the device or its antenna is used to determine the power thresholds.

ii) Additional SAR evaluation with a SAM phantom is required for PTT devices with held-to-ear operating mode.²⁹ Contact the FCC Laboratory for device operating and test configurations.

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:

According to FCC KDB4478498 generic portable criteria, the Max output power is 24.27 mW < 150 mW, stand-alone SAR evaluation is not required.

FCC §2.1046, §95.639(a) & §95.639(d) - RF OUTPUT POWER

Applicable Standard

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

Per FCC §95.639 (a) (1), No GMRS transmitter, under any condition of modulation, shall exceed 50 W Carrier power when transmitting emission type A1D, F1D, G1D, A3E, F3E or G3E.

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Signal Generator	HP8657A	2849U00982	2009-10-28	2010-10-27
Rohde&Schwarz	EMI Test Receiver	ESCI	100035	2009-11-24	2010-11-24
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2010-03-11	2011-03-11
COM POWER	Dipole Antenna	AD-100	041000	2009-09-25	2010-09-25

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

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.5kPa

The testing was performed by Sula Huang on 2010-08-05.

Test Mode: Transmitting

Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level		Part 95 Limit (mW)
Frequency (MHz)	S.A. Reading (dBuV)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Cord.	Cable Loss (dB)	(dBm)	(mW)	
462.6625	65.51	176	1.90	H	462.6625	0.00	0	0.60	-0.60	0.87	500
462.6625	76.02	225	1.35	V	466.6625	14.45	0	0.60	13.85	24.27	500

Test Result: Compliance.

FCC §2.1047 & §95.637(a) - MODULATION CHARACTERISTIC

Applicable Standard

As per FCC §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 Procedure

TIA/EIA-603-C

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	RF Communication Test Set	HP8920A	3438A05201	2009-12-30	2010-12-30

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

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	50%
ATM Pressure:	100.5kPa

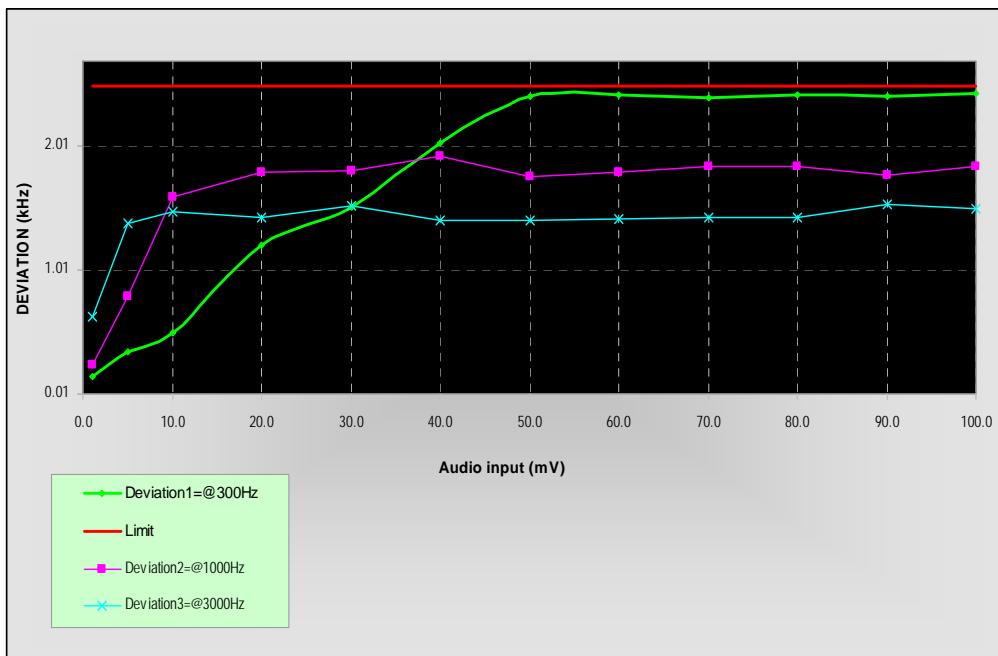
The testing was performed by Sula Huang on 2010-08-07.

Please refer to the following tables and plots.

Test Mode: Transmitting

FRS – Channel 5 (462.6625 MHz)

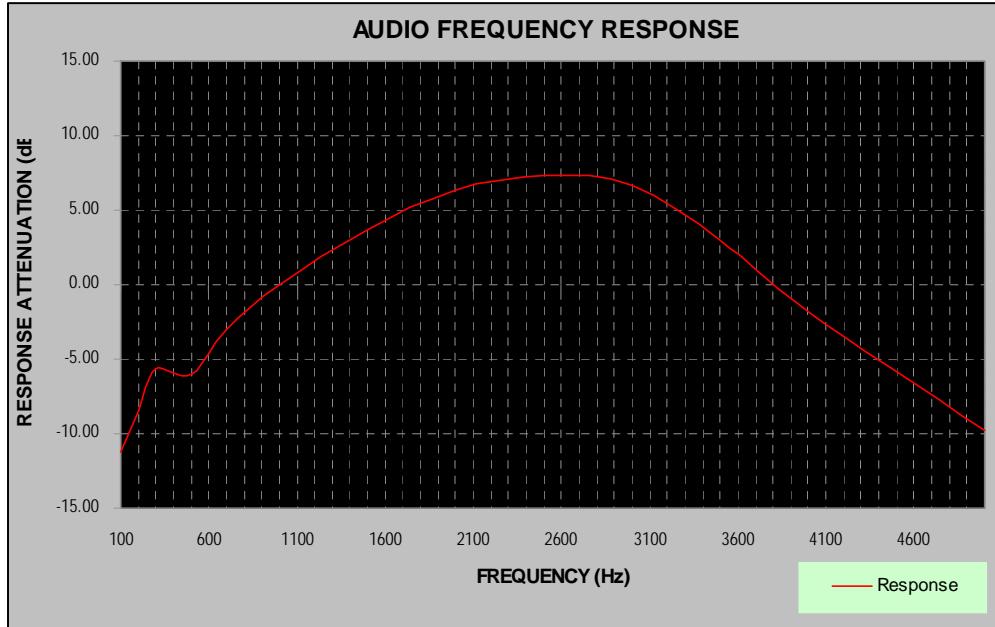
Audio Input Level (mV)	Frequency Deviation (kHz)			FCC Limit (kHz)
	(@ 300 Hz)	(@ 1000 Hz)	(@ 3000 Hz)	
1.0	0.152	0.241	0.635	2.500
5.0	0.356	0.795	1.390	2.500
10.0	0.510	1.605	1.483	2.500
20.0	1.215	1.798	1.442	2.500
30.0	1.523	1.810	1.536	2.500
40.0	2.034	1.935	1.415	2.500
50.0	2.422	1.765	1.413	2.500
60.0	2.432	1.800	1.424	2.500
70.0	2.408	1.854	1.433	2.500
80.0	2.434	1.856	1.438	2.500
90.0	2.422	1.774	1.544	2.500
100.0	2.446	1.845	1.505	2.500



Audio Frequency Response:

FRS – Channel 5 (462.6625 MHz)

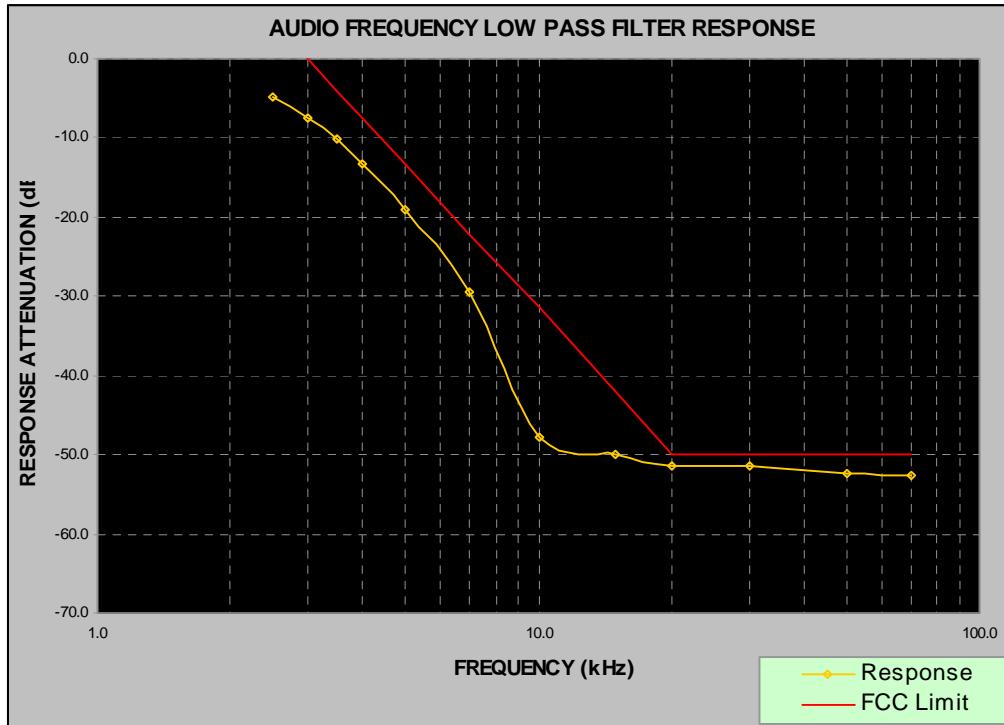
Audio Frequency (Hz)	Response Attenuation (dB)
100	-11.18
200	-8.40
300	-5.68
500	-6.02
700	-2.95
1000	0.00
1500	3.66
2000	6.29
2500	7.38
3000	6.66
3500	2.97
4000	-1.83
5000	-9.74



Audio frequency Low Pass Filter Response

FRS – Channel 5 (462.6625 MHz)

Audio Frequency (kHz)	Response Attenuation (dB)	FCC Limit (dB)
2.5	-4.90	
3.0	-7.38	0.0
3.5	-10.20	-4.0
4.0	-13.24	-7.5
5.0	-19.04	-13.3
7.0	-29.36	-22.1
10.0	-47.72	-31.4
15.0	-50.05	-42.0
20.0	-51.34	-50.0
30.0	-51.43	-50.0
50.0	-52.26	-50.0
70.0	-52.67	-50.0

**Test result:** Compliance.

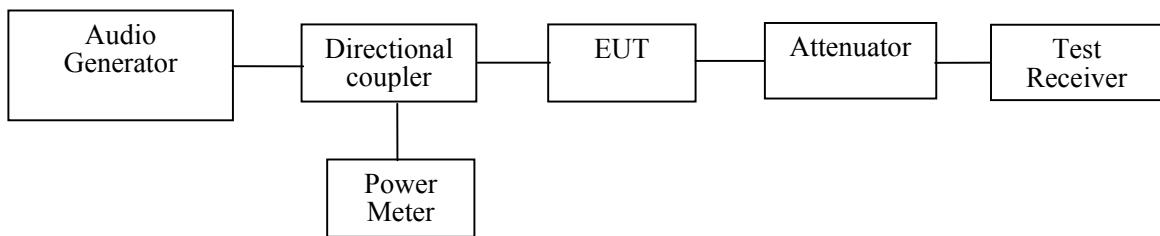
FCC §2.1049 & §95.633(a)(c) - OCCUPIED BANDWIDTH AND EMISSION MASK

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 Procedure

- 1) Set-up the test equipment in the following configuration:



- 2) Set the level of audio signal Generator to obtain 16 dB greater than required for 50% modulation.
- 3) The Occupied Bandwidth is measured within the Spectrum Analyzer set at 3 kHz/div scan and 10dB/div.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
NANYAN	Audio Generator	NY2201	019596	2010-05-05	2011-05-05
Rohde&Schwarz	EMI Test Receiver	ESCI	100035	2009-11-24	2010-11-24

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

Test Data

Environmental Conditions

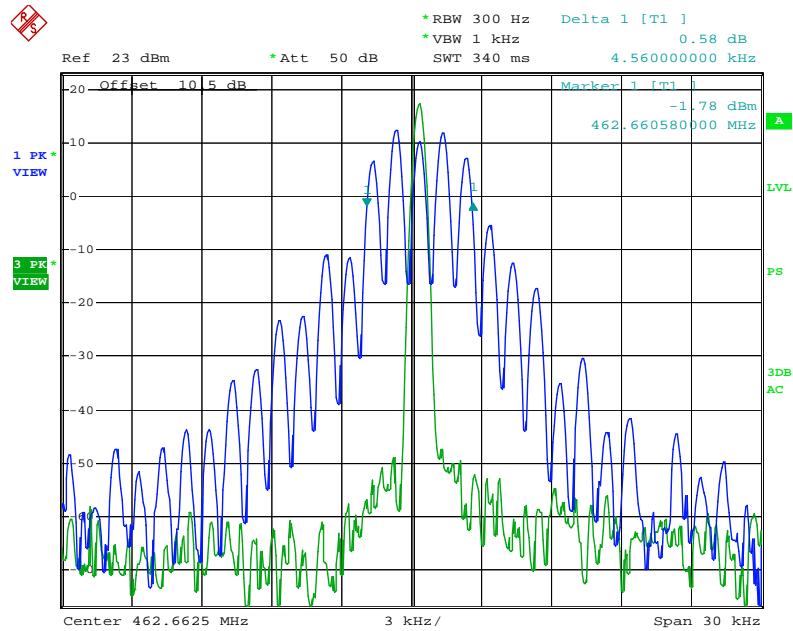
Temperature:	25 °C
Relative Humidity:	50%
ATM Pressure:	100.5kPa

The testing was performed by Sula Huang on 2010-08-10 and 2010-08-23.

Test Mode: Transmitting

Occupied bandwith

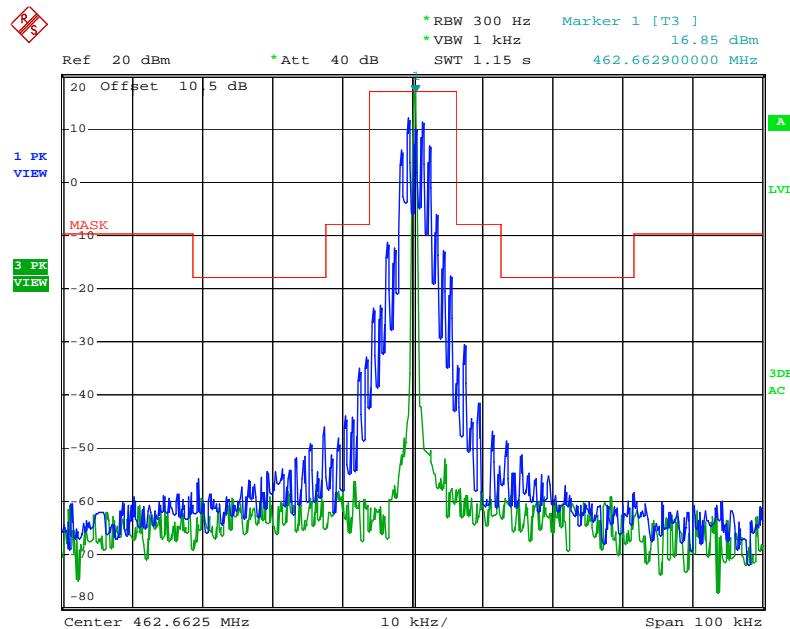
FRS – Channel 5 (462.6625 MHz)



Date: 10.AUG.2010 16:19:03

Emission Mask

FRS – Channel 5 (462.6625 MHz)



Date: 23.AUG.2010 15:45:59

Test result: Compliance.

FCC §2.1053 & §95.635(b)(7) - RADIATED SPURIOUS EMISSION

Applicable Standard

FCC §2.1053 and §95.635

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 = $10 \log_{10} (\text{TXpwr in Watts}/0.001)$ - the absolute level

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Horn Antenna	DRH-118	A052604	2009-09-25	2010-09-25
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2010-03-11	2011-03-11
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2009-08-28	2010-08-27
HP	Amplifier	2VA-213+	T-E27H	2010-03-08	2011-03-07
HP	Signal Generator	HP8657A	2849U00982	2009-10-16	2010-10-15
HP	Amplifier	HP8447D	2944A09795	2010-08-02	2011-08-02
HP	Synthesized Sweeper	8341B	2624A00116	2009-11-07	2010-11-06
COM POWER	Dipole Antenna	AD-100	041000	2009-09-25	2010-09-25
A.H. System	Horn Antenna	SAS-200/571	135	2010-05-17	2011-05-17

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

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	50%
ATM Pressure:	100.5kPa

The testing was performed by Sula Huang on 2010-08-10.

Test Mode: Transmitting

Indicated		Table Angle Degree	Test Antenna		Substituted			Absolute Level (dBm)	Spurious Att. (dBc)	Att. Limit (dBc)	Margin (dB)
Frequency (MHz)	S.A. Reading (dBuV)		Height (m)	Polar (H/V)	Level (dBm)	Ant. Gain Cord.	Cable Loss (dB)				
Transmitting: FRS – Channel 5 (462.6625 MHz)											
925.3250	58.64	360	1.00	V	-38.35	0	0.74	-39.09	52.94	26.85	26.09
925.3250	47.57	0	2.15	H	-49.45	0	0.74	-50.19	64.04	26.85	37.19
1388.016	61.43	185	1.00	V	-41.57	6.40	0.89	-36.06	49.91	26.85	23.06
1388.016	59.06	360	1.32	H	-40.52	6.40	0.89	-35.01	48.86	26.85	22.01
1850.430	49.03	258	1.10	V	-49.94	6.10	1.00	-44.84	58.69	26.85	31.84
1850.430	50.97	354	2.15	H	-49.59	6.10	1.00	-44.49	58.34	26.85	31.49
4626.653	48.01	360	1.90	V	-47.26	8.20	1.66	-40.72	54.57	26.85	27.72
4626.653	50.82	160	2.20	H	-44.80	8.20	1.66	-38.26	52.11	26.85	25.26

Note: Spurious Attenuation = EUT ouput power (13.85 dBm) – Absolute level
 Spurious attenuation limit in dB = $43 + 10 \log_{10}$ (power out in Watts) = 26.85

FCC §2.1055 (d), §95.627(b) & §95.621 - FREQUENCY STABILITY**Applicable Standard**

According to FCC §2.1055(a) (1), the frequency stability shall be measured with variation of ambient temperature from -30°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 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. 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 Frequency Counter.

Frequency Stability vs. Voltage:

1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

The output frequency was recorded for each voltage.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Hewlett-Packard	Frequency Counter	5342A	2317A08289	2010-04-22	2011-04-22
WUHUAN	Temperature & Humidity Chamber	HTP205	20021115	2010-05-09	2011-05-09

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

Test Data**Environmental Conditions**

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.5kPa

The testing was performed by Sula Huang on 2010-08-09.

Test Mode: Transmitting

Frequency Stability Ver. Temperature

Reference Frequency: 462.6625 MHz, Limit: ±2.5 ppm			
Temperature (°C)	Power Supplied (Vdc)	Measured Frequency (MHz)	Frequency Error (ppm)
50	6.0	462.66316	+1.427
40	6.0	462.66315	+1.405
30	6.0	462.66318	+1.470
20	6.0	462.66314	+1.383
10	6.0	462.66314	+1.383
0	6.0	462.66316	+1.427
-10	6.0	462.66315	+1.405
-20	6.0	462.66318	+1.470
-30	6.0	462.66321	+1.534

Frequency Stability Ver. Input Voltage

Reference Frequency: 462.6625 MHz, Limit: ±2.5 ppm			
Temperature (°C)	Power Supplied (Vdc)	Measured Frequency (MHz)	Frequency Error (ppm)
20	4.0	462.66317	+1.448

Test result: Compliance.

***** END OF REPORT *****