

FCC PART 95
EMI MEASUREMENT AND TEST REPORT

For
Andus Technologies Ltd.

No.2-3, 9/F., Transport City Building, 1-7 Shing Wan Road, Tai Wai, Shatin, NT, Hong Kong.

FCC ID: UNSH61056

October 17, 2006

This Report Concerns: ☒ Original Report	Equipment Type: FRS/GMRS
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Report No.: RSZ06092703	
Test Date: October 10-11, 2006	
Reviewed By: EMC Manager: Boni Baniqued <i>Boni Baniqued</i>	
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Andus Technologies Ltd.*'s product, model number: H61056 or the "EUT" as referred to in this report is a FRS/GMRS. The EUT is measured approximately 13.0 cm L x 7.0 cmW x 5.5 cmH rated input voltage: DC 6 V Battery, with permanent Antenna.

** The test data gathered are from production sample, serial number: 0609032 provided by the manufacturer, we received the EUT on 2006-9-27.*

Objective

This Type approval report is prepared on behalf of *Andus Technologies 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 Part 95 Subpart B and Subpart E of the Federal Communication Commissions rules.

All emissions measurement was performed and Bay Area Compliance Lab 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 Lab 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 518038, P.R.China.

Test site at Bay Area Compliance Lab 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 Lab 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>

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 Lab Corp. (ShenZhen) has not done any modification on the EUT.

Configuration of Test Setup



Lying View



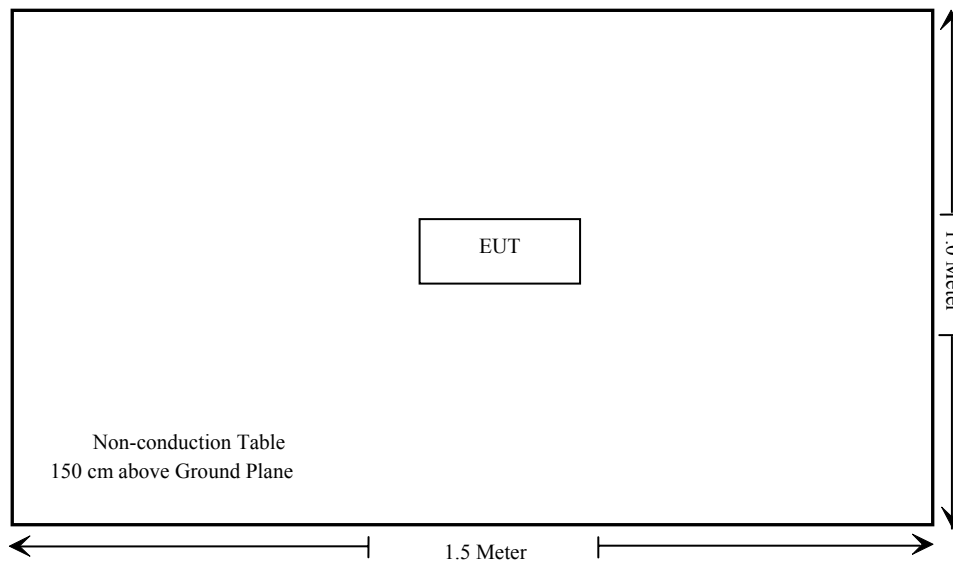
Side View



Standing View

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

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§1.1307(b) (1)	RF 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 §95.635(b) (7)	Spurious Radiated Emissions	Compliant
§2.1055 (d), §95.627(b) and §95.621	Frequency stability	Compliant

§1.1307(b) (1) RF EXPOSURE

Standard Applicable

According to § 1.1307(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 FCC Exclusion list, In the following table, f_{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	$(60/f_{\text{GHz}}) \text{ mW}, d < 2.5 \text{ cm}$ $(120/f_{\text{GHz}}) \text{ mW}, d \geq 2.5 \text{ cm}$	$(900/f_{\text{GHz}}) \text{ mW}, d < 20 \text{ cm}$
occupational	$(375/f_{\text{GHz}}) \text{ mW}, d < 2.5 \text{ cm}$ $(900/f_{\text{GHz}}) \text{ mW}, d \geq 2.5 \text{ cm}$	$(2250/f_{\text{GHz}}) \text{ mW}, d < 20 \text{ cm}$

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 $85\text{mW} < 258\text{mW} = (60/0.462\text{GHz})\text{mW} \times 2$

The SAR measurement is not necessary.

§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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Signal Generator	HP8657A	2849U00982	2006-2-28	2007-2-28
Agilent	Spectrum Analyzer	8564E	3943A01781	2005-12-8	2006-12-8
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2006-4-28	2007-4-28
COM POWER	Dipole Antenna	AD-100	041000	N/A	N/A

* **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 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 David Zhang on 2006-10-11.

Test Mode: Transmitting

Indicated		Table	Test Antenna		Substituted			Antenna Gain Correction	Cable Loss dB	FCC Part 95			
Frequency MHz	Reading dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V			Absolute Level dBm	Absolute Level in W	Limit in W	Comments
462.6375	86.69	90	1.0	V	462.6375	24.37	V	0	5.07	+19.3	0.085	0.5	FRS
467.6375	85.69	90	1.0	V	467.6375	23.47	V	0	5.07	+18.4	0.069	0.5	FRS
462.6250	85.76	90	1.0	V	462.625	23.57	V	0	5.07	+18.5	0.071	5	GMRS

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	2006-3-1	2007-3-1
NANYAN	Audio Generator	NY2201	019829	2005-12-23	2006-12-23

* **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 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 David Zhang on 2006-10-11.

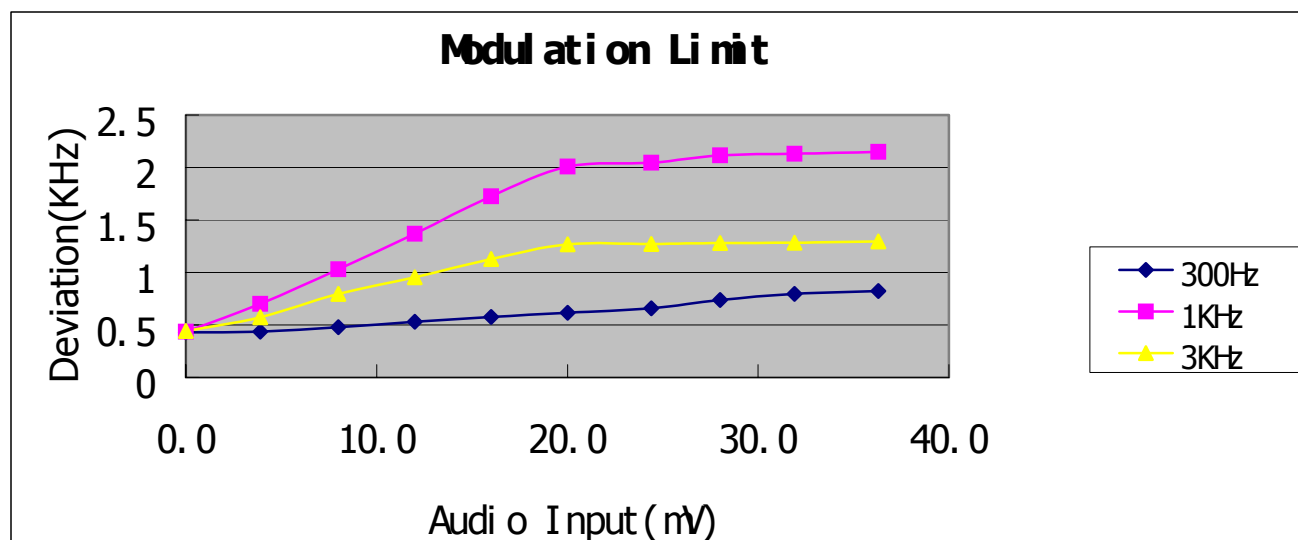
Test Result: Pass

Test Mode: Transmitting

For 12.5 kHz Channel Bandwidth:

FRS

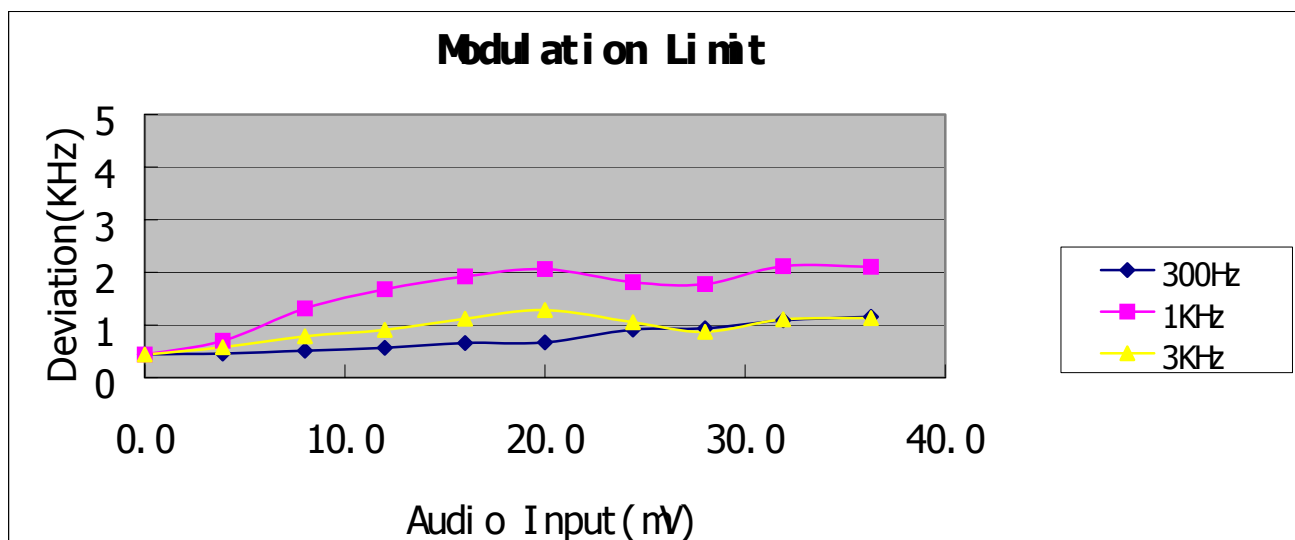
Audio Input (mV)	300Hz Deviation (kHz)	1kHz Deviation (kHz)	3kHz Deviation (kHz)
0.0	0.431	0.435	0.442
4.0	0.435	0.701	0.572
8.0	0.478	1.031	0.796
12.0	0.530	1.368	0.953
16.0	0.576	1.726	1.128
20.0	0.615	2.010	1.268
24.0	0.659	2.047	1.271
28.0	0.737	2.117	1.279
32.0	0.796	2.130	1.285
36.0	0.824	2.150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



For 20 kHz Channel Bandwidth:

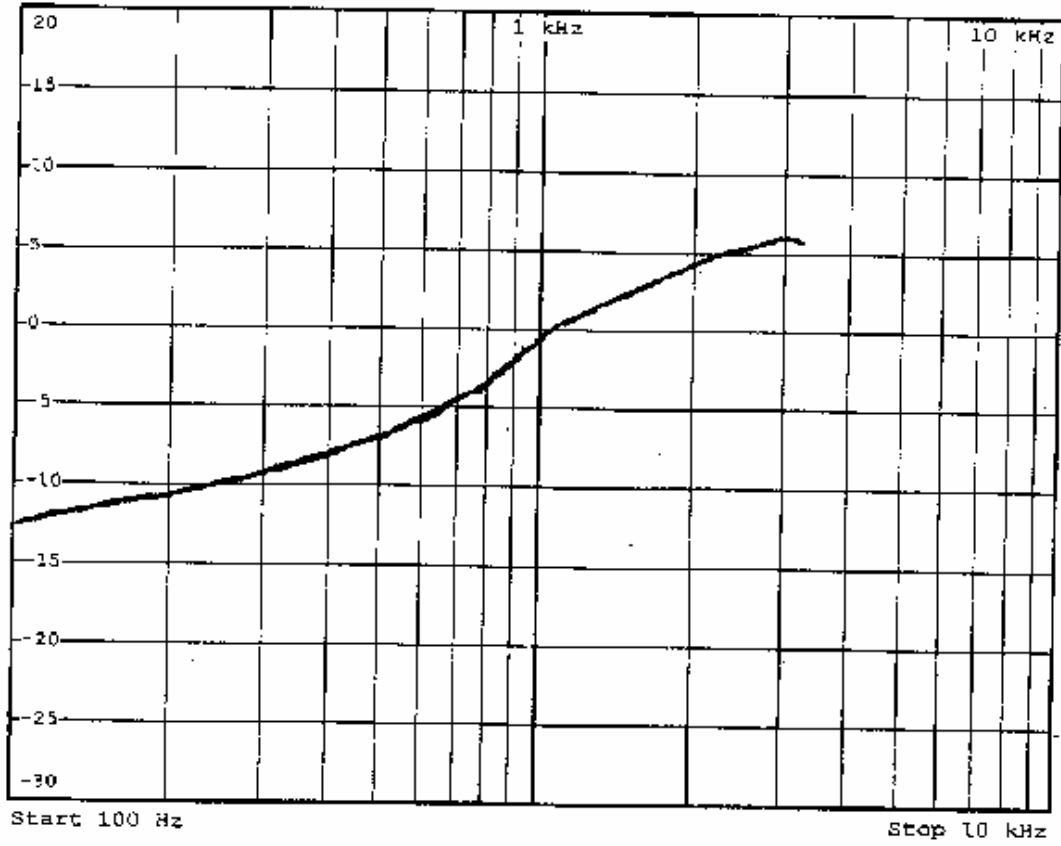
GMRS

Audio Input (mV)	300Hz Deviation (kHz)	1kHz Deviation (kHz)	3kHz 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	1.810	1.050
28.0	0.934	1.779	0.870
32.0	1.090	2.116	1.108
36.0	1.154	2.106	1.129





Ref 20 dB



§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	2005-12-23	2006-12-23
Rohde&Schwarz	EMI Test Receiver	ESCI	100035	2006-8-17	2007-8-17

* **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 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

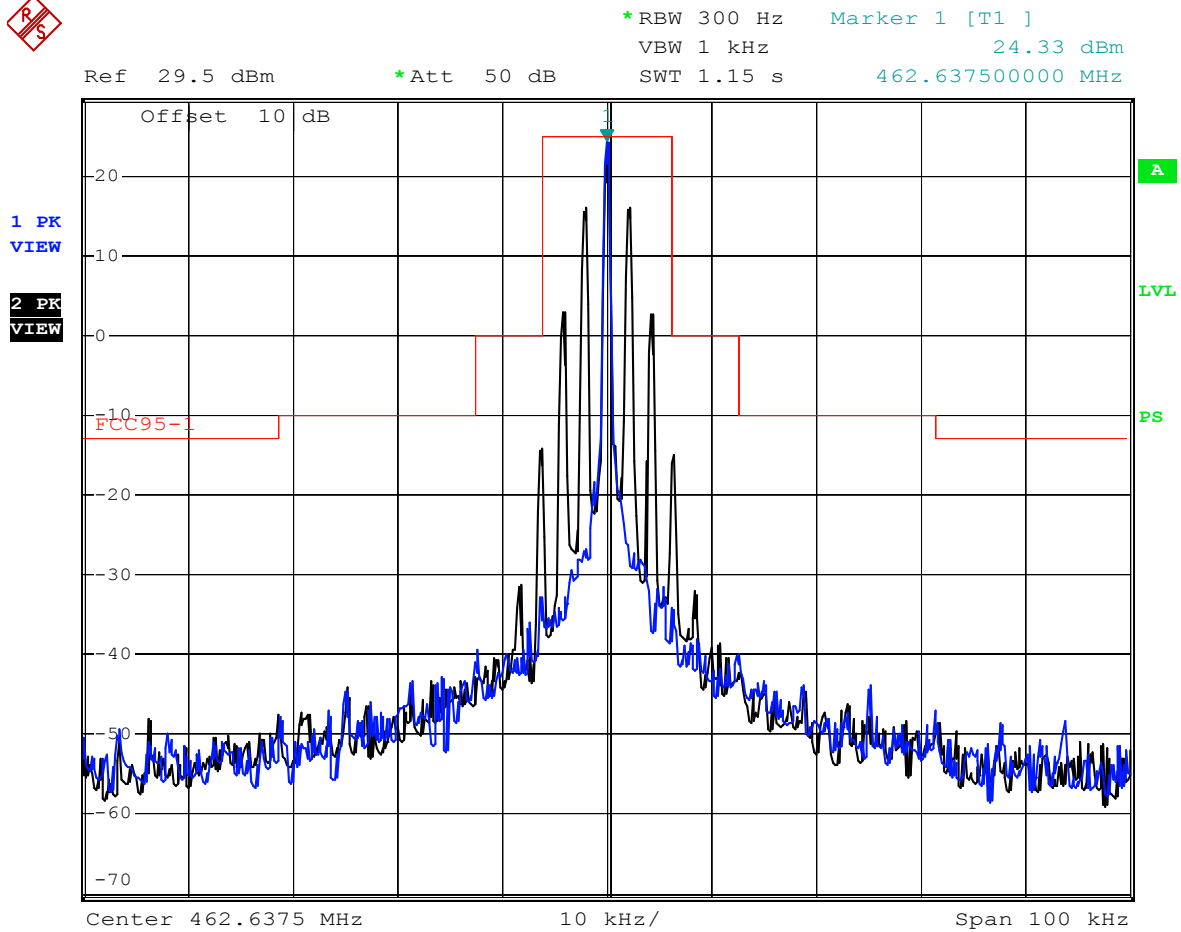
The testing was performed by David Zhang on 2006-10-12.

Test Result: Pass.

Test Mode: Transmitting

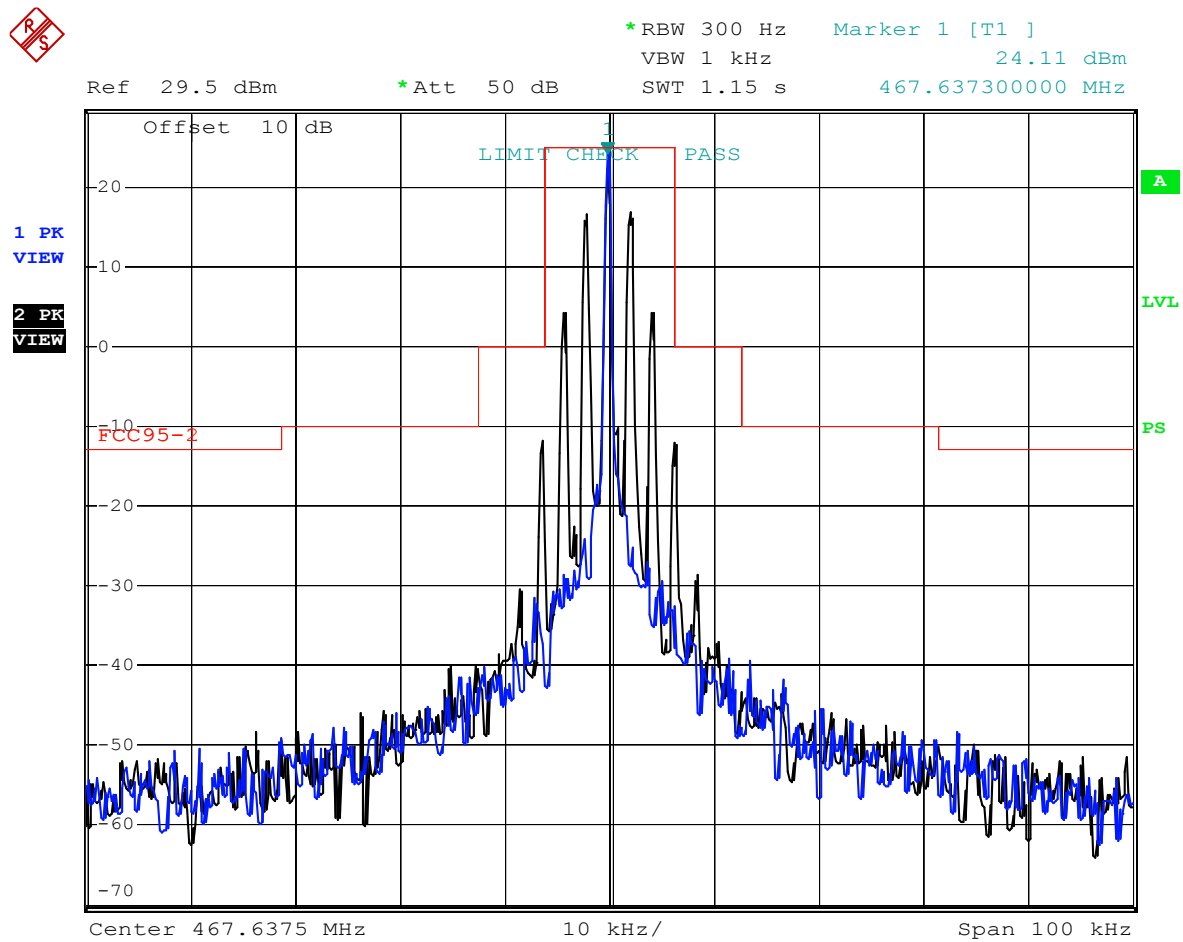
Please refer to the hereinafter plots.

Emission mask:



Emission mask1

Date: 12.OCT.2006 11:49:16



Emission mask1

Date: 12.OCT.2006 12:00:56



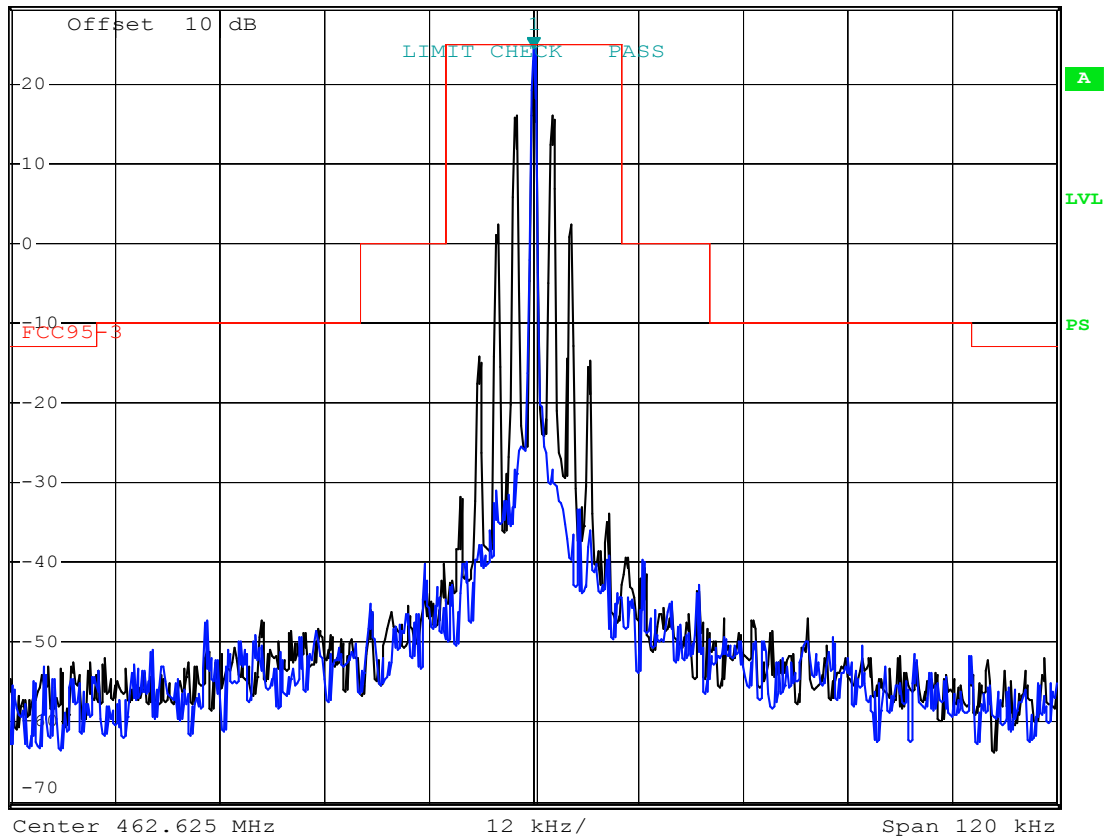
*RBW 300 Hz Marker 1 [T1]
VBW 1 kHz 24.38 dBm
SWT 1.35 s 462.62500000 MHz

Ref 29.5 dBm

*Att 50 dB

SWT 1.35 s

462.62500000 MHz

1 PK
VIEW2 PK
VIEW

Emission mask1

Date: 12.OCT.2006 12:05:55

§2.1053 and §95.635(b)(7) - RADIATED SPURIOUS EMISSION

Applicable Standard

§2.1053 and §95.635

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Signal Generator	HP8657A	2849U00982	2006-2-28	2007-2-28
Agilent	Spectrum Analyzer	8564E	3943A01781	2005-12-8	2006-12-8
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2006-4-28	2007-4-28
COM POWER	Dipole Antenna	AD-100	041000	N/A	N/A
SUNOL SCIENCES	Horn Antenna	DRH-118	A052604	2006-7-20	2007-7-20

* **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 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 dB = $43 + 10 \lg_{10}(\text{power out in Watts})$

Test Results Summary

For channel 4: -11.9 dB at 925.2750 MHz. (FRS)
For channel 11: -12.5 dB at 935.2750 MHz. (FRS)
For channel 18: -12.7 dB at 925.250 MHz. (GMRS)

Test Data**Environmental Conditions**

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

The testing was performed by David Zhang on 2006-10-11.

Test Mode: Transmitting (Channel 4, 462.6375MHz)

FRS

Indicated		Table	Test Antenna		Substituted			Antenna Gain Correction	Cable Loss dB	FCC Part 95		
Frequency MHz	Reading dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V			Absolute Level dBm	Limit dBm	Margin dB
925.2750	49.97	60	1.0	V	925.2750	-32.52	V	0	7.62	-24.9	-13	-11.9
925.2750	50.54	45	1.2	H	925.2750	-32.72	H	0	7.62	-25.1	-13	-12.1
2313.1875	52.50	90	1.4	V	2313.1875	-42.92	V	7.0	0.32	-35.6	-13	-22.6
2313.1875	51.67	87	1.2	H	2313.1875	-45.12	H	7.0	0.32	-37.8	-13	-24.8
1850.5500	35.67	56	1.8	V	1850.5500	-39.73	V	6.1	0.43	-33.2	-13	-30.2
1850.5500	34.67	152	1.4	H	1850.5500	-40.73	H	6.1	0.43	-34.2	-13	-31.2
1387.9125	41.33	26	1.3	V	1387.9125	-54.63	V	6.5	0.33	-47.8	-13	-34.8
3238.4625	43.50	23	1.3	V	3238.4625	-55.87	V	6.7	0.57	-48.6	-13	-35.6
1387.9125	40.00	324	1.2	H	1387.9125	-55.83	H	6.5	0.33	-49.0	-13	-36.0
2775.8250	43.00	54	1.2	V	2775.8250	-57.61	V	7.4	0.51	-49.7	-13	-36.7
2775.8250	41.67	157	1.2	H	2775.8250	-59.11	H	7.4	0.51	-51.2	-13	-38.2
3238.4625	41.00	214	1.4	H	3238.4625	-58.87	H	6.7	0.57	-51.6	-13	-38.6

Test Mode: Transmitting (Channel 11, 467.6375MHz)

FRS

Indicated		Table	Test Antenna		Substituted			Antenna Gain Correction	Cable Loss dB	FCC Part 95		
Frequency MHz	Reading dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V			Absolute Level dBm	Limit dBm	Margin dB
935.2750	51.09	60	1.0	V	935.2750	-33.12	V	0.0	7.62	-25.5	-13	-12.5
935.2750	51.06	45	1.2	H	935.2750	-33.12	H	0.0	7.62	-25.5	-13	-12.5
3273.4625	42.33	214	1.4	V	3273.4625	-33.97	V	6.7	0.57	-26.7	-13	-13.7
3273.4625	37.83	23	1.3	H	3273.4625	-37.87	H	6.7	0.57	-30.6	-13	-17.6
1870.5500	37.83	56	1.8	V	1870.5500	-37.23	V	6.1	0.43	-30.7	-13	-17.7
1870.5500	34.67	152	1.4	H	1870.5500	-39.63	H	6.1	0.43	-33.1	-13	-20.1
2338.1875	54.33	87	1.2	V	2338.1875	-46.22	V	7.0	0.32	-38.9	-13	-25.9
2805.8250	49.67	54	1.2	V	2805.8250	-47.51	V	7.4	0.51	-39.6	-13	-26.6
2338.1875	45.67	90	1.4	H	2338.1875	-50.12	H	7.0	0.32	-42.8	-13	-29.8
2805.8250	43.67	157	1.2	H	2805.8250	-52.01	H	7.4	0.51	-44.1	-13	-31.1
1402.9125	43.83	324	1.2	V	1402.9125	-51.93	V	6.5	0.33	-45.1	-13	-32.1
1402.9125	43.50	26	1.3	H	1402.9125	-52.23	H	6.5	0.33	-45.4	-13	-32.4

Test Mode: Transmitting (Channel 18, 462.625MHz)

GMRS

Indicated		Table	Test Antenna		Substituted			Antenna Gain Correction	Cable Loss dB	FCC Part 95		
Frequency MHz	Reading dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V			Absolute Level dBm	Limit dBm	Margin dB
925.250	49.88	60	1.0	V	925.250	-33.32	V	0.0	7.62	-25.7	-13	-12.7
925.250	49.76	45	1.2	H	925.250	-33.42	H	0.0	7.62	-25.8	-13	-12.8
1850.500	42.67	56	1.8	V	1850.500	-32.83	V	6.1	0.43	-26.3	-13	-13.3
2775.750	45.33	54	1.2	V	2775.750	-39.61	V	7.4	0.51	-31.7	-13	-18.7
1850.500	34.00	152	1.4	H	1850.500	-39.23	H	6.1	0.43	-32.7	-13	-19.7
2313.325	52.67	87	1.2	V	2313.325	-45.12	V	7.0	0.32	-37.8	-13	-24.8
3238.375	51.00	214	1.4	V	3238.375	-45.87	V	6.7	0.57	-38.6	-13	-25.6
1387.875	49.00	324	1.2	V	1387.875	-45.78	V	6.5	0.33	-38.9	-13	-25.9
2313.325	47.33	90	1.4	H	2313.325	-47.62	H	7.0	0.32	-40.3	-13	-27.3
2775.750	43.00	157	1.2	H	2775.750	-53.71	H	7.4	0.51	-45.8	-13	-32.8
1387.875	40.83	26	1.3	H	1387.875	-53.78	H	6.5	0.33	-46.9	-13	-33.9
3238.375	40.00	23	1.3	H	3238.375	-54.57	H	6.7	0.57	-47.3	-13	-34.3

§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°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	2006-8-17	2007-8-17

* **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 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 David Zhang on 2006-10-11.

Test Result: Pass

Test Mode: Transmitting

For Talk Channel (462.6375 MHz):

FRS

Reference Frequency: 462.6375 MHz, Limit: 2.5 ppm			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
		MCF (MHz)	PPM Error
50	6	462.638234	+1.59
40	6	462.638159	+1.42
30	6	462.637936	+0.94
20	6	462.637793	+0.63
10	6	462.637635	+0.29
0	6	462.637438	-0.13
-10	6	462.637296	-0.44
-20	6	462.636998	-1.09
-30	6	462.636972	-1.14

Frequency Stability Versus Input Voltage

Reference Frequency: 462.6375 MHz, Limit: 2.5 ppm		
Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
	Frequency (MHz)	PPM Error
4.6	462.637793	+0.63

For Talk Channel (467.6375 MHz):

FRS

Reference Frequency: 467.6375 MHz, Limit: 2.5 ppm			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
		MCF (MHz)	PPM Error
50	6	467.638304	+1.72
40	6	467.638163	+1.42
30	6	467.637975	+1.02
20	6	467.637802	+0.65
10	6	467.637658	+0.34
0	6	467.637425	-0.16
-10	6	467.637236	-0.56
-20	6	467.636983	-1.11
-30	6	467.636964	-1.15

Frequency Stability Versus Input Voltage

Reference Frequency: 467.6375 MHz, Limit: 2.5 ppm		
Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
	Frequency (MHz)	PPM Error
4.6	467.637802	+0.65

For Talk Channel (462.62500 MHz):

GMRS

Reference Frequency: 462.62500 MHz, Limit: 5 ppm			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
		MCF (MHz)	PPM Error
50	6	462.625934	+2.02
40	6	462.625713	+1.54
30	6	462.625525	+1.13
20	6	462.625389	+0.84
10	6	462.625017	+0.04
0	6	462.624935	-0.14
-10	6	462.624785	-0.46
-20	6	462.624521	-1.04
-30	6	462.624098	-1.95

Frequency Stability Versus Input Voltage

Reference Frequency: 462.625 MHz, Limit: 5 ppm		
Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
	Frequency (MHz)	PPM Error
4.6	462.625389	+0.84