



NVLAP LAB CODE 200707-0



# FCC PART 90 TYPE APPROVAL EMI MEASUREMENT AND TEST REPORT

For

## Klein Electronics, Inc.

349 N. Vinewood St. Escondido, CA 92029, USA

**FCC ID: U7GBLACKBOXU**

<b>Report Type:</b> Original Report	<b>Product Type:</b> BlackBox, Two-way Radio
<b>Test Engineer:</b> <u>Alvin Huang</u>	<i>Alvin Huang</i>
<b>Report Number:</b> <u>RSZ09020902</u>	
<b>Report Date:</b> <u>2009-04-10</u>	
<b>Reviewed By:</b> <u>EMC Engineer</u>	<i>Simon Mo</i>
<b>Prepared By:</b> 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	

**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. 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.

\* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "\*" doc-2

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**DOCUMENT REVISION HISTORY**

<b>Revision Number</b>	<b>Report Number</b>	<b>Description of Revision</b>	<b>Date of Revision</b>
0	RSZ09020902	Original	2009-04-10

## GENERAL INFORMATION

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

The *Klein Electronics, Inc.*'s product, model number: *Blackbox+U* or the "EUT" as referred to in this report is a *UHF Two-Way Radio* that operates in the frequency band 430~470 MHz and with two channel spacing of 12.5 kHz (narrow-band)/25 kHz (wide-band). The EUT is measured approximately 3.2 cm L x 5.5 cmW x 11.1 cmH, powered by 7.4 VDC, 1300mAh (Li-ion) battery.

\* All measurement and test data in this report was gathered from production sample serial number: 0902018 (Assigned by BACL, Shenzhen). The EUT was received on 2009-02-09.

Items	Technical Specification
Frequency Range	UHF: 430 ~ 470 MHz
Output Power	4 W / 1 W
Channel Spacing	12.5 kHz / 25 kHz
Emission Designator	16K0F3E / 11K0F3E
Modulation Limit	±2.5 kHz / ±5 kHz
Operation Voltage	7.4 Vdc

### Objective

This Type approval report is prepared on behalf of *Klein Electronics, Inc.* in accordance with Part 2, and Part 90 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 the Code of federal Regulations Title 47 Part 2, Sub-part J as well as the following individual parts:

Part 90 – Private Land Mobile Radio Service

Applicable Standards: TIA 603-C and ANSI 63.4-2003.

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 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 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. 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

No modifications were made to the unit tested.

### Configuration of Test Setup



Lie

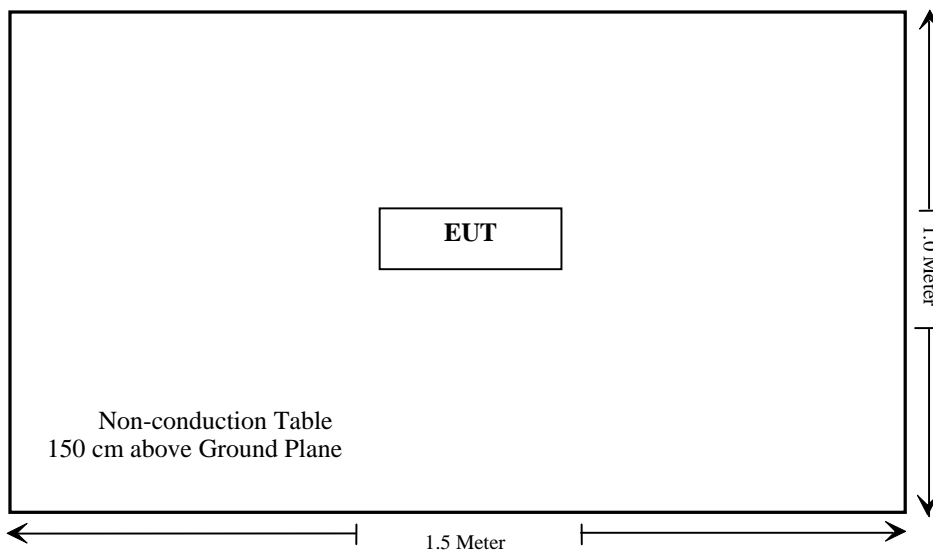


Side



Stand

### Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Results</b>
§1.1307(b) §2.1093	RF Exposure	Compliant *
§2.1046 §90.205	RF Output Power	Compliant
§2.1047 §90.207	Modulation Characteristic	Compliant
§2.1049, §90.209;210	Occupied Bandwidth & Emission Mask	Compliant
§2.1051 §90.210	Spurious Emission at Antenna Terminal	Compliant
§ 2.1053 § 90.210	Spurious Radiated Emissions	Compliant
§ 2.1055 § 90.213	Frequency stability	Compliant
§ 90.214	Transient Frequency Behavior	Compliant

Note: \* Please refer to SAR test report (report Number: R0901196-UHF-SAR)



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## **§1.1307(b) & §2.1093 - RF EXPOSURE**

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### **Applicable Standard**

According to FCC §1.1307(b) and §2.1093, portable device operates Part 90 should be subjected to routine environmental evaluation for RF exposure prior or equipment authorization or use.

**Result:** Compliance.

Please refer to SAR Report. (SAR Report number: R0901196-UHF-SAR)

## **§2.1046 and §90.205- RF OUTPUT POWER**

### **Applicable Standard**

CFR47 2.1046, and §90.205.

### **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>
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2008-08-28	2009-08-27

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

### **Test Procedure**

Conducted RF Output Power:

TIA-603-C section 2.2.1

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

Spectrum Analyzer setting:

<b><i>RBW</i></b>	<b><i>Video B/W</i></b>
<i>100 kHz</i>	<i>300 kHz</i>

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56%
<b>ATM Pressure:</b>	100.1 kPa

*The testing was performed by Alvin Huang on 2009-02-12.*

*Test Mode: Transmitting*

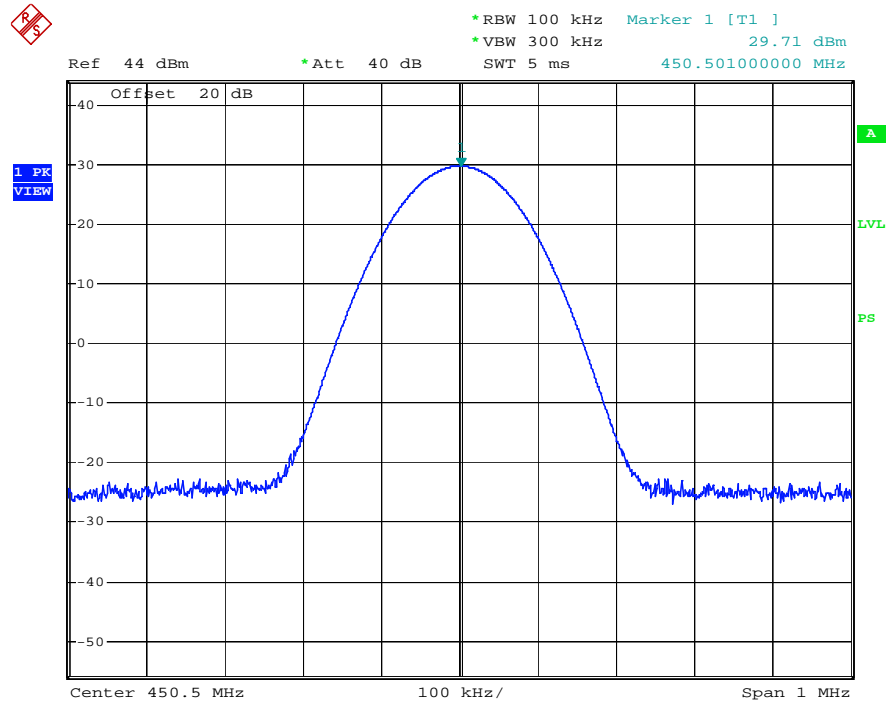
**Test Result:** Compliance.

Please refer to following plots

Conducted Output Power:

Channel Spacing (kHz)	Frequency (MHz)	Output Power (dBm)	Output Power in (Watt)	Comment
12.5	450.5	36.76	4.742	High power
12.5	450.5	29.71	0.935	Low power
25	450.5	36.73	4.710	High power
25	450.5	29.71	0.935	Low power

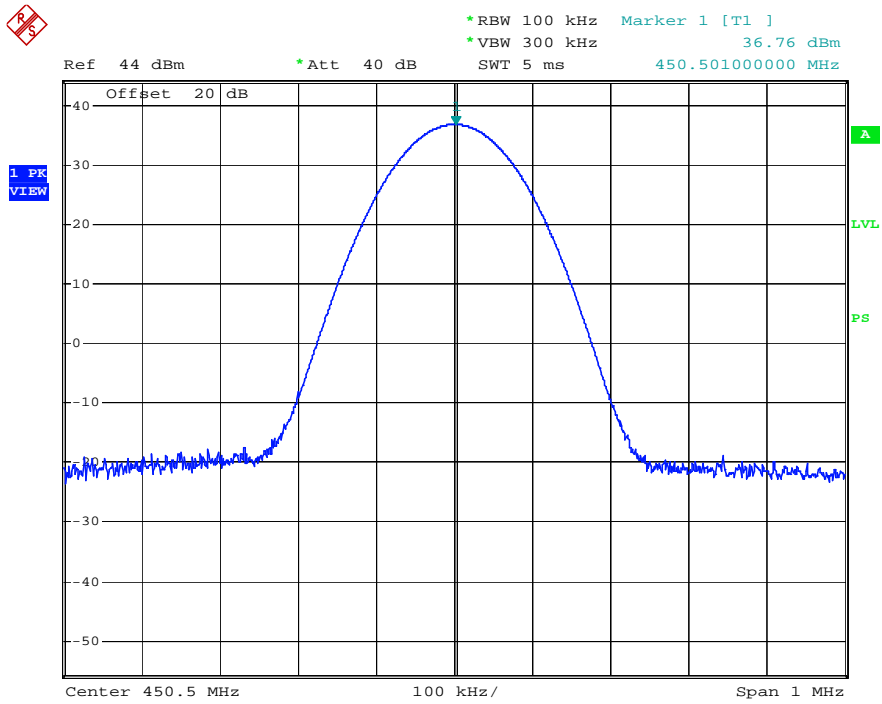
### 12.5 kHz Channel Spacing (Low Power)



output power(low)-narrowband middle channel

Date: 12.FEB.2009 19:21:56

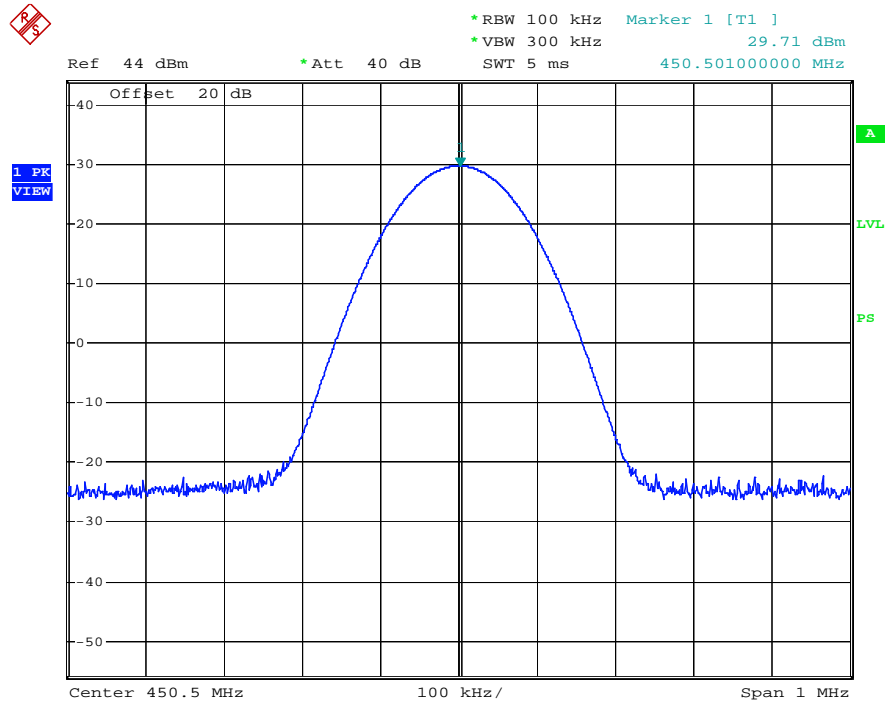
### 12.5 kHz Channel Spacing (High Power)



output power(high)-narrowband middle channel

Date: 12.FEB.2009 19:23:08

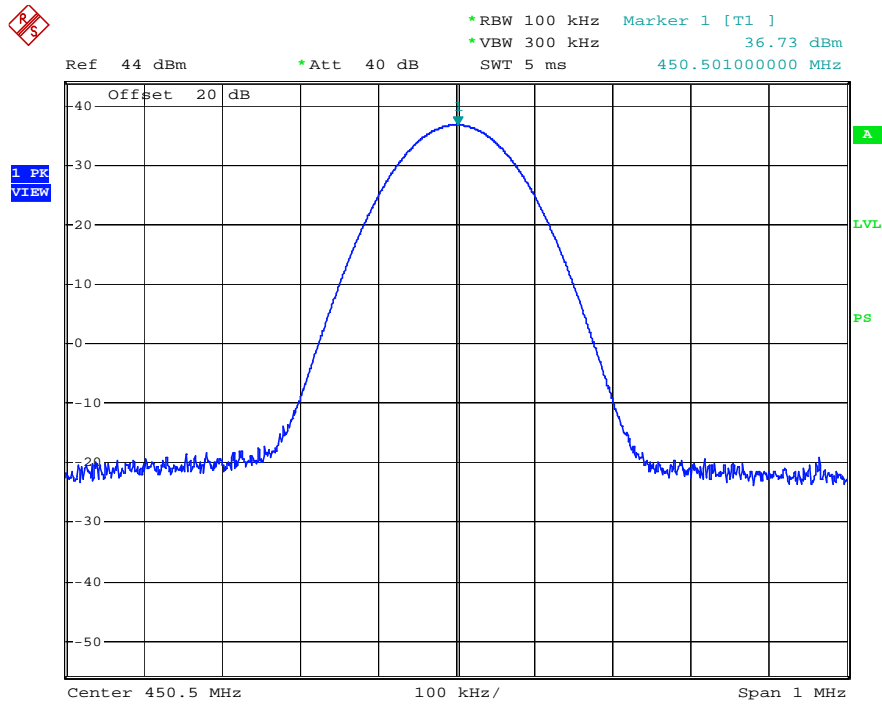
### 25 kHz Channel Spacing (Low Power)



output power(low)-wideband middle channel

Date: 12.FEB.2009 19:24:36

### 25 kHz Channel Spacing (High Power)



output power(high)-wideband middle channel

Date: 12.FEB.2009 19:26:22

## §2.1047, and §90.207 - MODULATION CHARACTERISTIC

### Applicable Standard

§2.1047 & §90.207:

- (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.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Modulation Analyzer	8901B	3438A05208	2008-04-11	2009-04-11
NANYAN	Audio Generator	NY2201	019829	2008-12-23	2009-12-23

\* **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 Procedure

Test Method: TIA/EIA-603 2.2.3

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56%
<b>ATM Pressure:</b>	100.1 kPa

*The testing was performed by Alvin Huang from 2009-02-20 to 2009-03-07.*

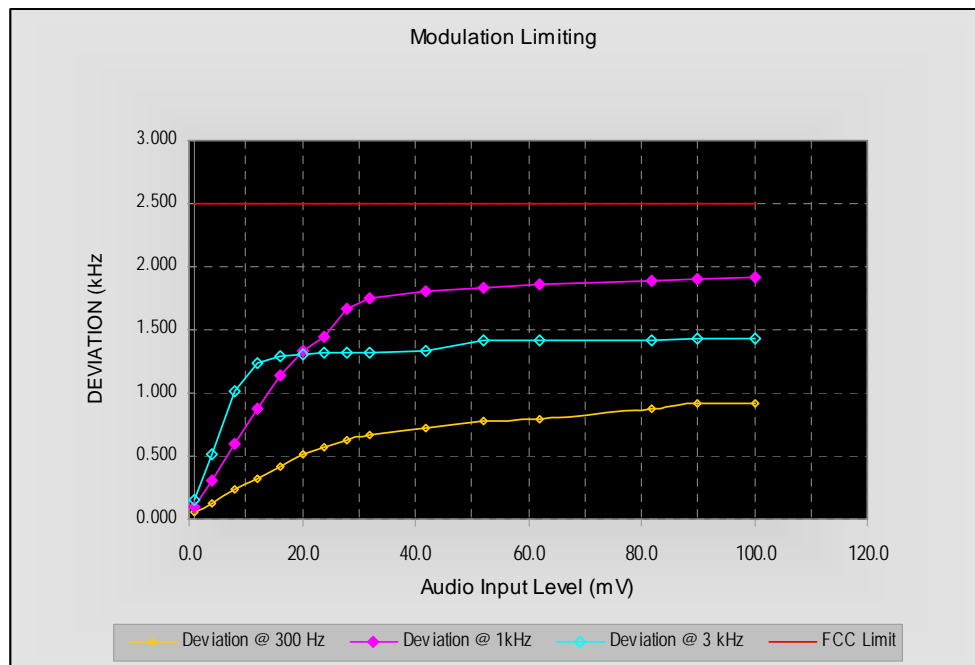
*Test Mode: Transmitting*



### MODULATION LIMITING

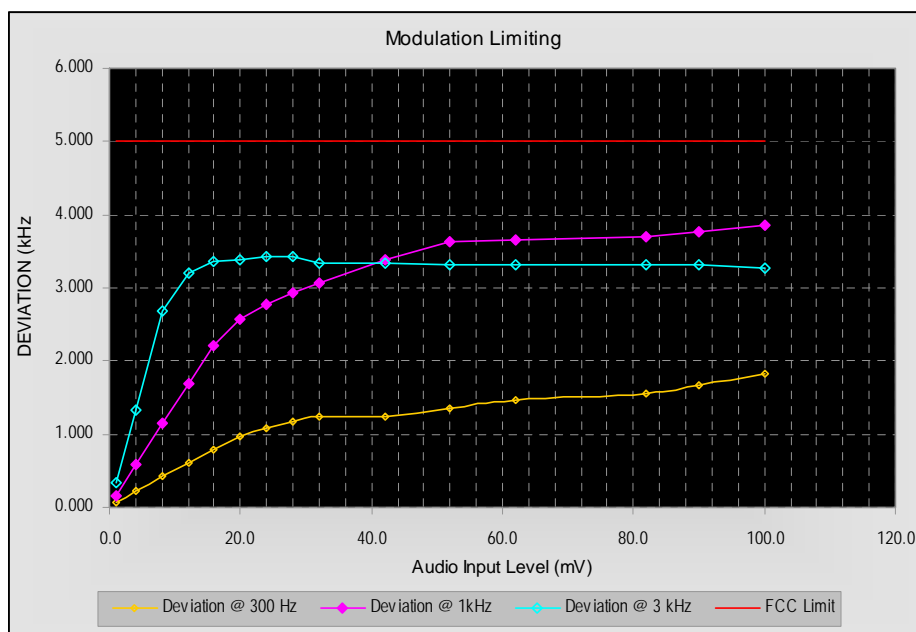
Carrier Frequency: 450.5 MHz; Channel Sacing = 12.5 kHz

Audio Input Level [mV]	Frequency Deviation (@300Hz) [kHz]	Frequency Deviation (@ 1kHz) [kHz]	Frequency Deviation (@ 3kHz) [kHz]	FCC Limit [kHz]
1.0	0.060	0.100	0.147	2.5
4.0	0.120	0.300	0.520	2.5
8.0	0.230	0.600	1.020	2.5
12.0	0.320	0.870	1.230	2.5
16.0	0.420	1.140	1.290	2.5
20.0	0.520	1.330	1.300	2.5
24.0	0.570	1.450	1.320	2.5
28.0	0.620	1.667	1.325	2.5
32.0	0.668	1.748	1.326	2.5
42.0	0.727	1.802	1.329	2.5
52.0	0.782	1.835	1.412	2.5
62.0	0.793	1.862	1.421	2.5
82.0	0.869	1.893	1.420	2.5
90.0	0.920	1.898	1.430	2.5
100.0	0.923	1.914	1.432	2.5



Carrier Frequency: 450.5 MHz; Channel Spacing = 25.0 kHz

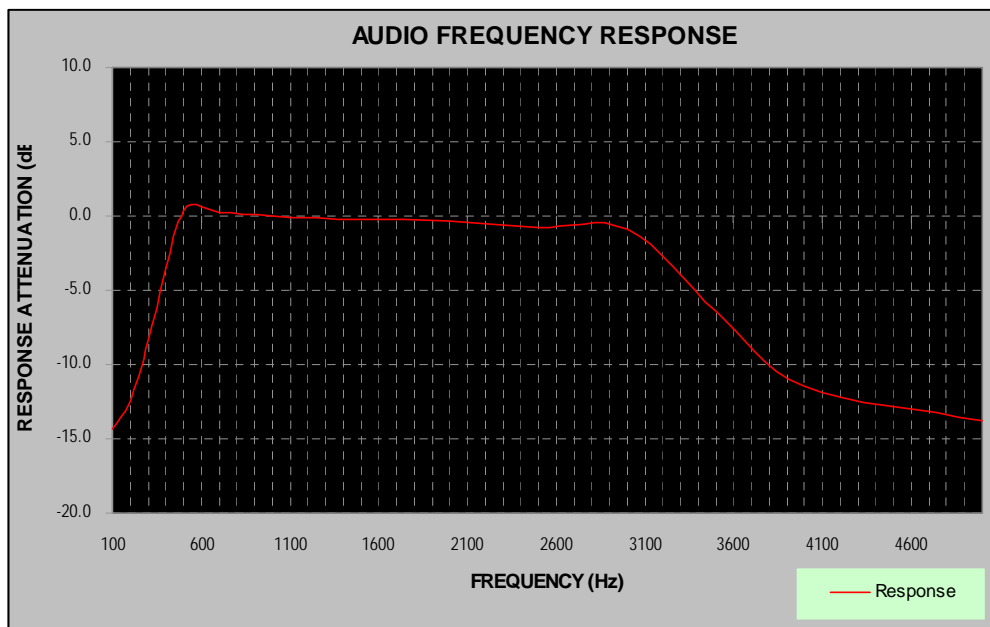
Audio Input Level [mV]	Frequency Deviation (@300Hz) [kHz]	Frequency Deviation (@ 1kHz) [kHz]	Frequency Deviation (@ 3kHz) [kHz]	FCC Limit [kHz]
1.0	0.078	0.163	0.340	5.0
4.0	0.222	0.578	1.330	5.0
8.0	0.430	1.150	2.680	5.0
12.0	0.620	1.688	3.210	5.0
16.0	0.789	2.200	3.350	5.0
20.0	0.972	2.570	3.390	5.0
24.0	1.085	2.780	3.420	5.0
28.0	1.164	2.930	3.430	5.0
32.0	1.242	3.070	3.335	5.0
42.0	1.245	3.394	3.339	5.0
52.0	1.361	3.638	3.314	5.0
62.0	1.468	3.648	3.319	5.0
82.0	1.556	3.703	3.314	5.0
90.0	1.667	3.756	3.308	5.0
100.0	1.824	3.856	3.270	5.0



### AUDIO FREQUENCY RESPONSE

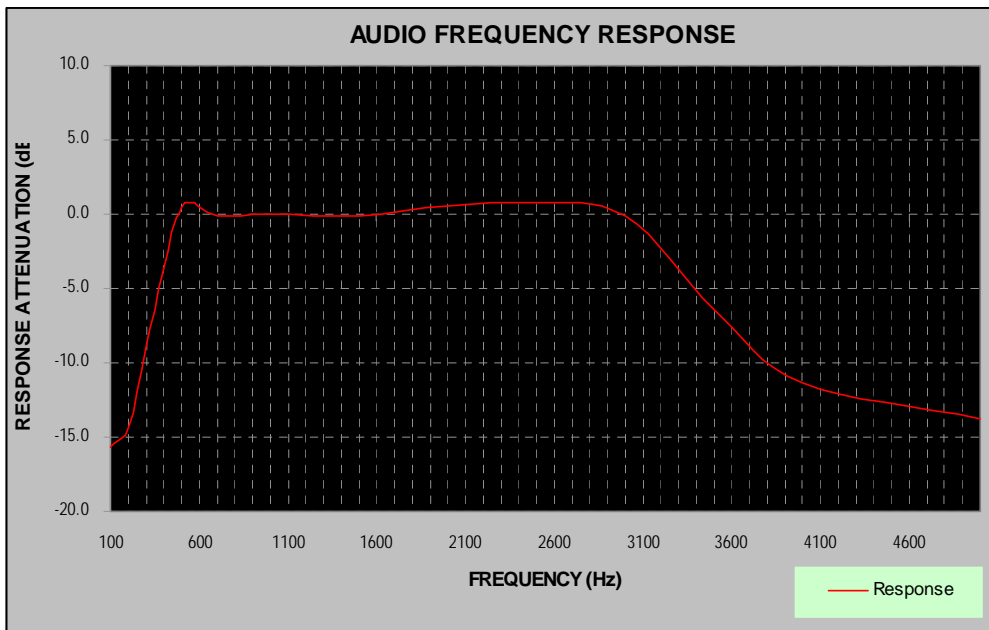
Carrier Frequency: 450.5 MHz; Channel Spacing = 12.5 kHz

Audio Frequency (Hz)	Response Attenuation (dB)
100	-14.3
200	-12.4
300	-8.2
500	0.3
700	0.2
1000	0.0
1500	-0.2
2000	-0.3
2500	-0.8
3000	-0.9
3500	-6.4
4000	-11.5
5000	-13.7



Carrier Frequency: 450.5 MHz; Channel Spacing = 25.0 kHz

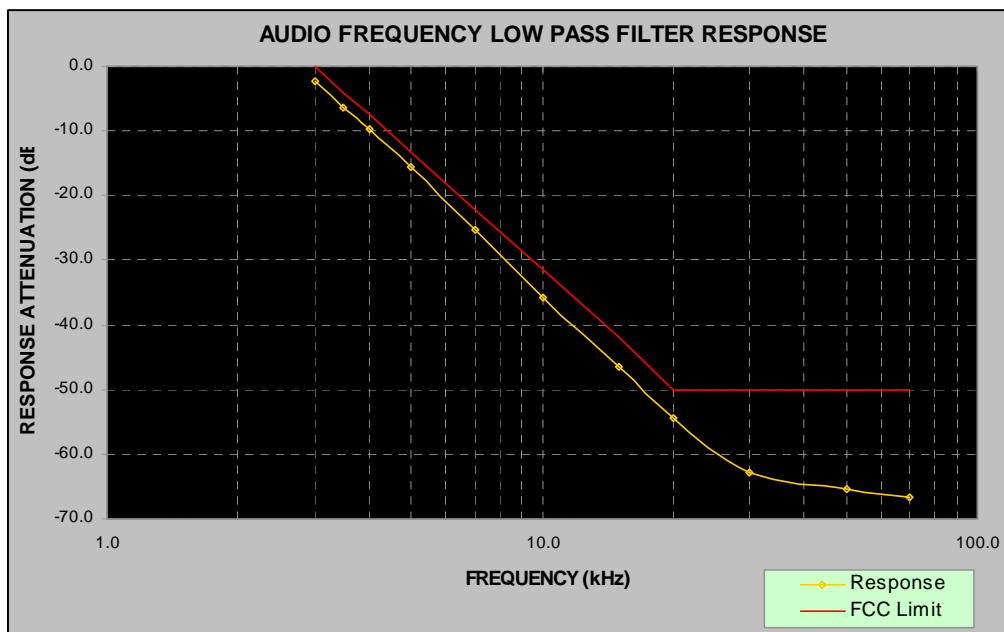
Audio Frequency (Hz)	Response Attenuation (dB)
100	-15.7
200	-14.4
300	-8.7
500	0.5
700	-0.1
1000	0.0
1500	-0.1
2000	0.6
2500	0.8
3000	-0.1
3500	-6.4
4000	-11.3
5000	-13.8



### AUDIO FREQUENCY LOW PASS FILTER RESPONSE

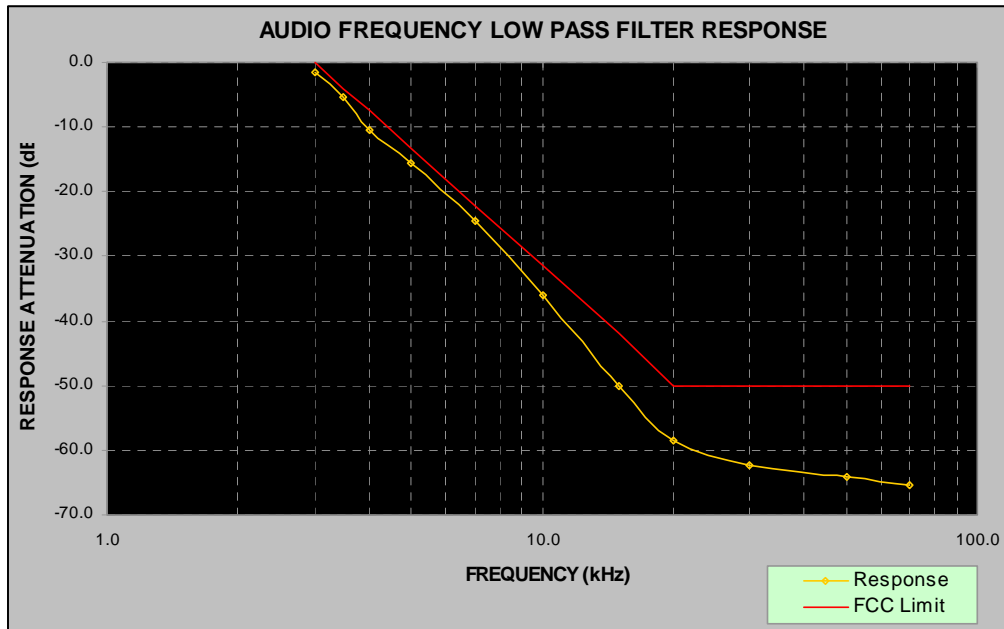
Carrier Frequency: 450.5 MHz; Channel Spacing = 12.5 kHz

Audio Frequency (kHz)	Response Attenuation (dB)	FCC Limit (dB)
3.0	-2.2	0.0
3.5	-6.4	-4.0
4.0	-9.7	-7.5
5.0	-15.5	-13.3
7.0	-25.2	-22.1
10.0	-35.8	-31.4
15.0	-46.6	-42.0
20.0	-54.3	-50.0
30.0	-62.8	-50.0
50.0	-65.3	-50.0
70.0	-66.8	-50.0



Carrier Frequency: 450.5 MHz; Channel Spacing = 25.0 kHz

Audio Frequency (kHz)	Response Attenuation (dB)	FCC Limit (dB)
3.0	-1.6	0.0
3.5	-5.4	-4.0
4.0	-10.5	-7.5
5.0	-15.5	-13.3
7.0	-24.4	-22.1
10.0	-36.1	-31.4
15.0	-50.2	-42.0
20.0	-58.5	-50.0
30.0	-62.4	-50.0
50.0	-64.2	-50.0
70.0	-65.4	-50.0



## **§2.1049 and § 90.209 – OCCUPIED BANDWIDTH**

### **Applicable Standard**

CFR47 §2.1049, §90.209 and §90.210

Emission Mask D—12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- 1) For any frequency removed from the center of the authorized bandwidth  $f_0$  to 5.625kHz removed from  $f_0$ , 0dB.
- 2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.626kHz but no more than 12.5kHz, at least 7.27 ( $f_d - 2.88$ kHz) dB.
- 3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5kHz at least:

$$50 + 10 \log P = 50 + 10 \log(4.742) = 56.76 \text{ dB}$$

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- 1) 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.
- 2) 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.
- 3) On any frequency removed from the center of the assigned channel by more than 250 percent at least:

$$43 + 10 \log P = 43 + 10 \log(4.710) = 49.73 \text{ dB}$$

The resolution bandwidth was 300Hz or greater for measuring up to 250kHz from the edge of the authorized frequency segment, and 30kHz or greater for measuring more than 250kHz from the authorized frequency segment.

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

<b>Manufacturers</b>	<b>Descriptions</b>	<b>Models</b>	<b>Serial Numbers</b>	<b>Calibration Dates</b>	<b>Calibration Due Dates</b>
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2008-11-07	2009-11-06
HP	Modulation Analyzer	8901B	3438A05208	2008-04-11	2009-04-11
NANYAN	Audio Generator	NY2201	019829	2008-12-23	2009-12-23

\* **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 Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 300 Hz and the spectrum was recorded in the frequency band  $\pm 50$  KHz from the carrier frequency.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56%
<b>ATM Pressure:</b>	100.1 kPa

*The testing was performed by Alvin Huang on 2009-02-13.*

*Test mode: Transmitting*

Please refer to the hereinafter plots.

### Emission Designator:

- 1) 450.5 MHz Channel spacing = 12.5 kHz

According to CFR47 §2.201 & §2.202

$$B_n = 2M + 2DK$$

$$M = 3000$$

$$D = 2.5 \text{ kHz}$$

$$K = 1$$

$$B_n = 2*(3000) + 2*(2500) = 11$$

Type of Emission: 11K0F3E

- 2) 450.5 MHz channel spacing = 25.0 kHz

According to CFR47 §2.201 & §2.202

$$B_n = 2M + 2DK$$

$$M = 3000$$

$$D = 5.0 \text{ kHz}$$

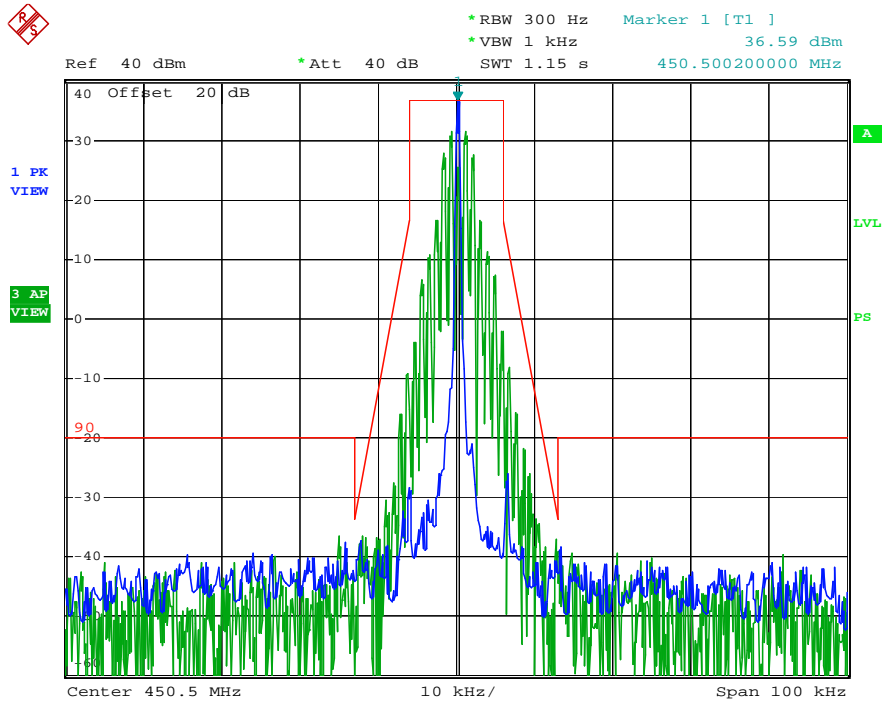
$$K = 1$$

$$B_n = 2*(3000) + 2*(2500) = 16$$

Type of Emission: 16K0F3E



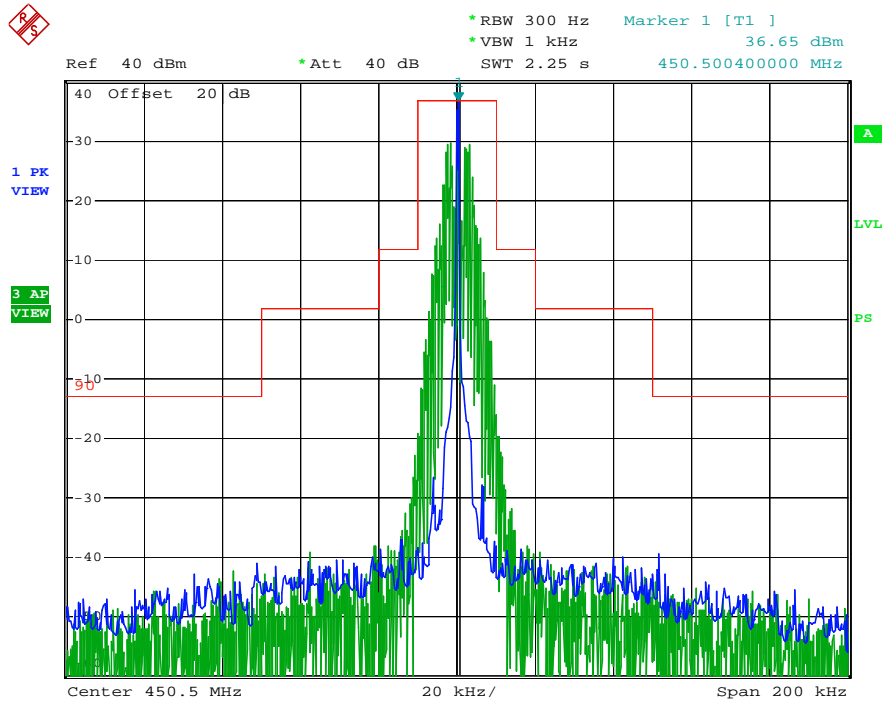
### Emission Mask D for 12.5 kHz Channel Spacing



emission mask for narrowband middel channel

Date: 13.FEB.2009 22:16:34

### Emission Mask B for 25.0 kHz Channel Spacing



emission mask for wideband middel channel

Date: 13.FEB.2009 21:52:18

## **§2.1051 and §90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

### **Applicable Standard**

Emission Mask D—12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- 1) For any frequency removed from the center of the authorized bandwidth  $f_0$  to 5.625kHz removed from  $f_0$ , 0dB.
- 2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.626kHz but no more than 12.5kHz, at least 7.27 ( $f_d - 2.88$ kHz) dB.
- 3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5kHz at least:

$$50+10\log P=50+10\log(4.742)=56.76\text{dB}$$

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- 1) 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.
- 2) 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.
- 3) On any frequency removed from the center of the assigned channel by more than 250 percent at least:

$$43+10\log P=43+10\log(4.710)=49.73\text{dB}$$

The resolution bandwidth was 300Hz or greater for measuring up to 250kHz from the edge of the authorized frequency segment, and 30kHz or greater for measuring more than 250kHz from the authorized frequency segment.

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

<b>Manufacturers</b>	<b>Descriptions</b>	<b>Models</b>	<b>Serial Numbers</b>	<b>Calibration Dates</b>	<b>Calibration Due Dates</b>
Rohde&Schwarz	Spectrum Analyzer	FSEM30	849720/019	2008-08-28	2009-08-27
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2008-11-07	2009-11-06

\* **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 Procedure

The RF output of the BlackBox 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 10<sup>th</sup> harmonic.

### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56%
ATM Pressure:	100.1 kPa

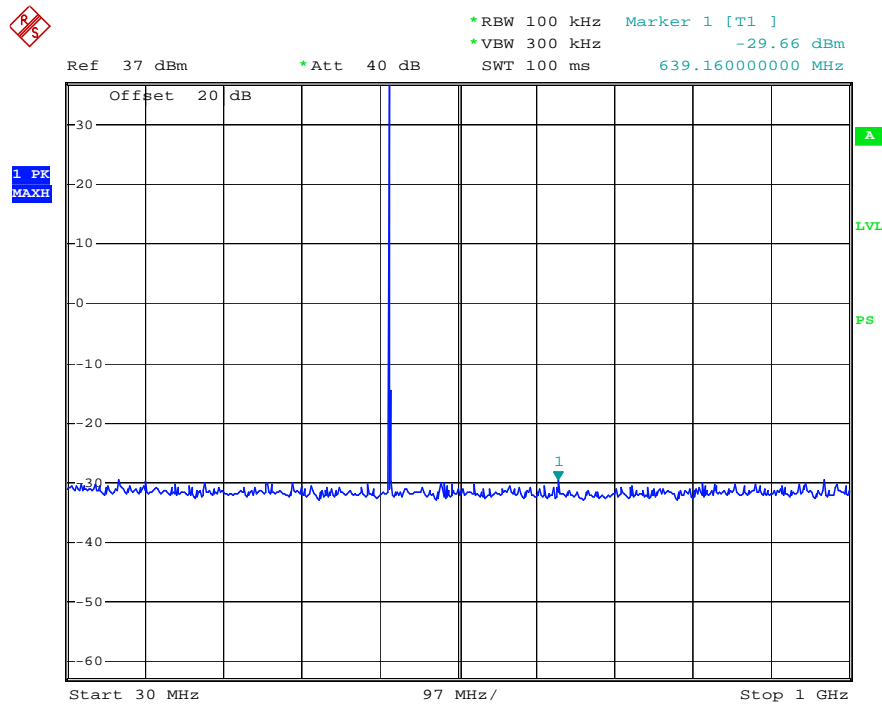
The testing was performed by Alvin Huang on 2009-02-12 to 2009-02-13.

Test Mode: Transmitting

Test result: Pass.

### 12.5 kHz Low Channel

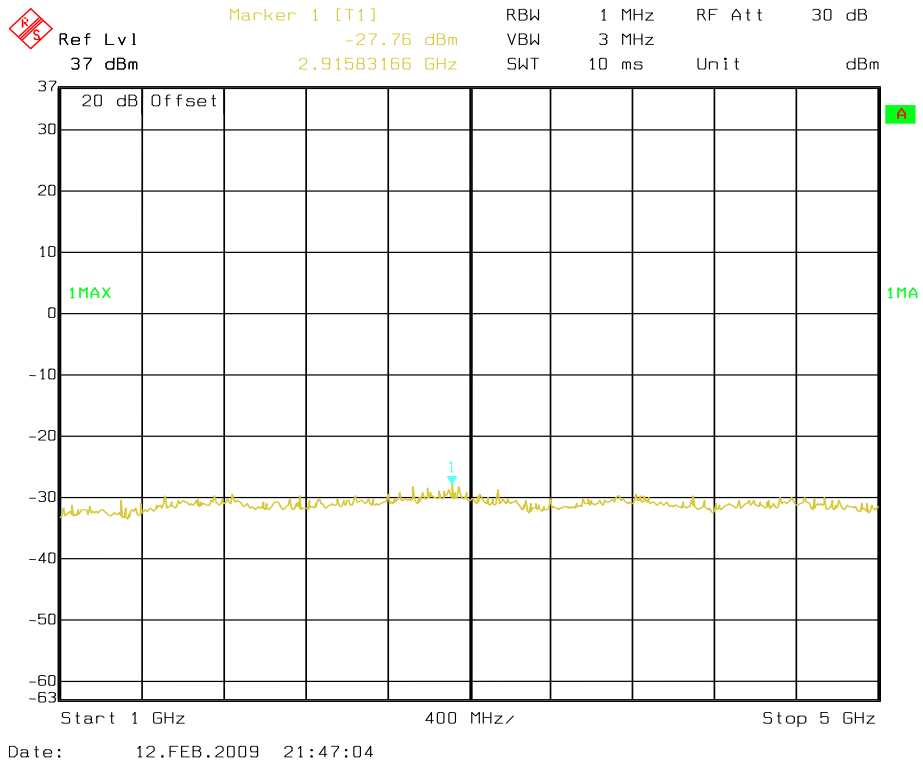
30 MHz - 1 GHz



conducted smission-narrowband low channel

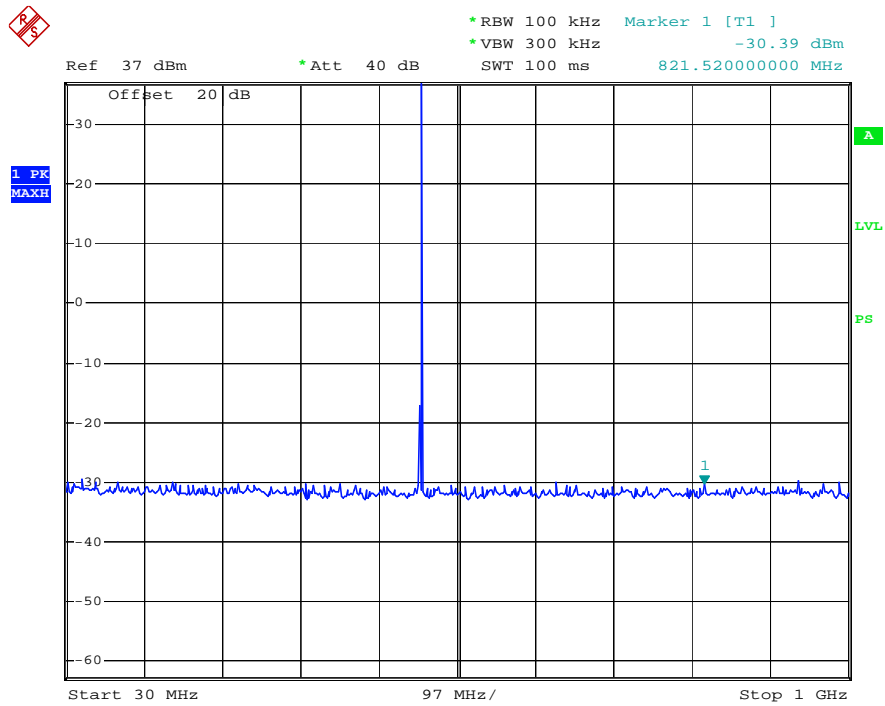
Date: 13.FEB.2009 00:13:13

1 GHz - 5 GHz



### 12.5 kHz High Channel

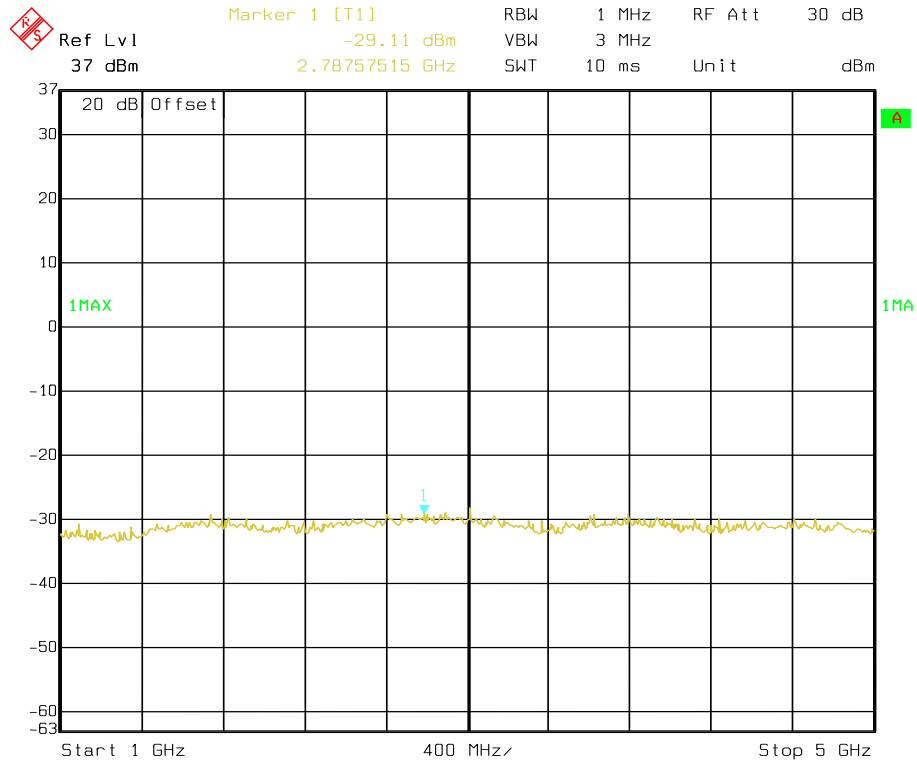
30 MHz – 1 GHz



conducted emission-narrowband high channel

Date: 13.FEB.2009 00:14:47

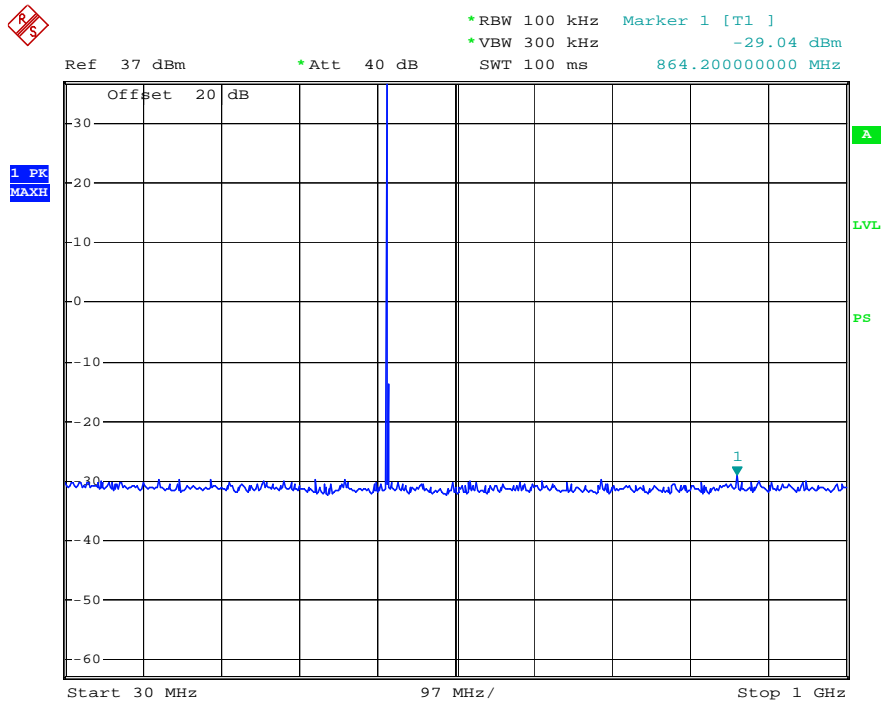
1 GHz – 5 GHz



Date: 12.FEB.2009 21:49:46

### 25.0 kHz Low Channel

30 MHz – 1 GHz

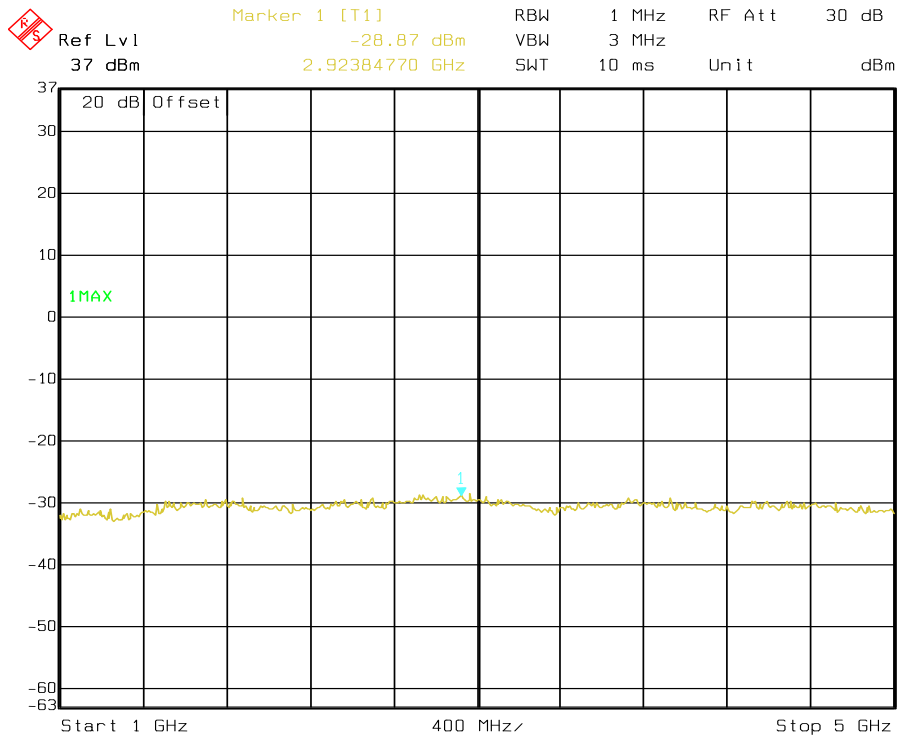


conducted emission-wideband low channel

Date: 13.FEB.2009 00:12:23

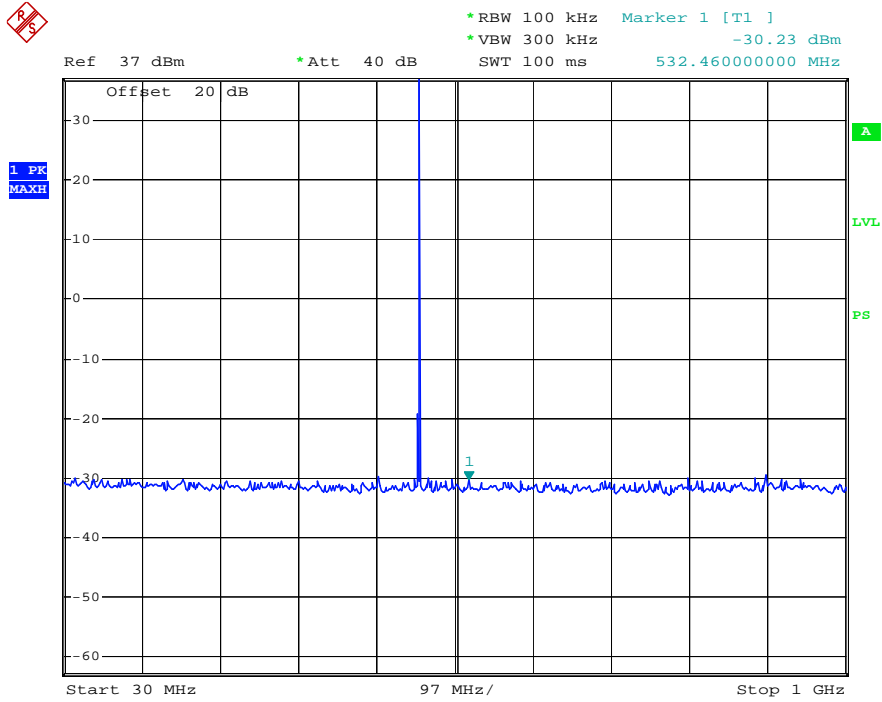


1 GHz – 5 GHz



### 25.0 kHz High Channel

30 MHz – 1 GHz

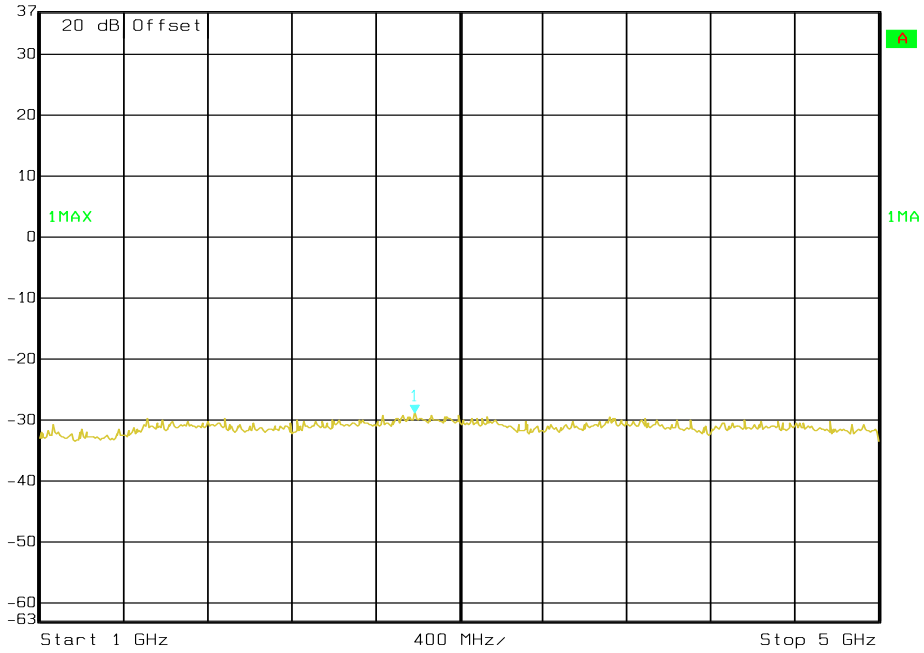


conducted smission-wideband high channel

Date: 13.FEB.2009 00:14:05

1 GHz – 5 GHz

Ⓚ Ⓢ
Ref Lvl
Marker 1 [T1]
RBW 1 MHz
 RF Att 30 dB  
37 dBm
-28.98 dBm
VBW 3 MHz  
2.78757515 GHz
SWT 10 ms
 Unit dBm



Date: 12.FEB.2009 21:48:16

## §2.1053 and §90.210 - RADIATED SPURIOUS EMISSIONS

### Applicable Standard

CFR47 §2.1053 and §90.210

### Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Due Dates
Sunol Sciences	Horn Antenna	DRH-118	A052604	2008-09-25	2009-09-25
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2008-03-11	2009-03-11
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2008-04-12	2009-04-11
Rohde&Schwarz	Spectrum Analyzer	FSEM30	849720/019	2008-08-28	2009-08-27
HP	Signal Generator	HP8657A	2849U00982	2008-10-16	2009-10-16
A.H. System	Horn Antenna	SAS-200/571	135	2008-05-17	2009-05-17
HP	Synthesized Sweeper	8341B	2624A00116	2008-11-07	2009-11-06

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

Spurious attenuation limit in dB =  $50 + 10 \lg_{10}(\text{power out in Watts})$  for EUT with a 12.5kHz channel bandwidth.

## Test Results Summary

**9.7 dB at 861 MHz** in the **Horizontal** polarization (Low Channel, 12.5 kHz)  
**10.5 dB at 939 MHz** in the **Horizontal** polarization (High Channel, 12.5 kHz)

**15.8 dB at 861 MHz** in the **Horizontal** polarization (Low Channel, 25 kHz)

**17.4 dB at 3286.5 MHz** in the **Vertical** polarization (High Channel, 25 kHz)

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56%
<b>ATM Pressure:</b>	100.1 kPa

The testing was performed by Alvin Huang on 2009-02-20.

Test Mode: Transmitting

Indicated		Table Angle Degree	Test Antenna		Substituted					Absolute Level (dBm)	FCC Part 90	
Frequency (MHz)	S.A. Amp. (dBμV/m)		Height (m)	Polar (H/V)	Frequency (MHz)	S.G. Level (dBm)	Polar (H/V)	Ant. Gain Cord. (dBi)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
Low Channel 430.5 MHz (12.5 kHz)												
861	44.71	180	1.5	H	861	-29.0	H	0	0.7	-29.7	-20	9.7
861	40.69	0	1.3	V	861	-32.0	V	0	0.7	-32.7	-20	12.7
1291.5	64.0	360	1.2	V	1291.5	-44.0	V	6.3	0.8	-38.5	-20	18.5
3013.5	57.97	356	2	H	3013.5	-45.2	H	7.5	1.3	-39	-20	19.0
1291.5	59.52	90	2	H	1291.5	-45.6	H	6.3	0.8	-40.1	-20	20.1
3013.5	52.03	360	1.2	V	3013.5	-47.5	V	7.5	1.3	-41.3	-20	21.3
2583	51.74	62	1.4	V	2583	-48.2	V	7.3	1.2	-42.1	-20	22.1
2152.5	52.76	178	1	V	2152.5	-48.2	V	6.7	1.1	-42.6	-20	22.6
2583	54.57	360	1.8	H	2583	-50.4	H	7.3	1.2	-44.3	-20	24.3
2152.5	54.5	97	2	H	2152.5	-50.5	H	6.7	1.1	-44.9	-20	24.9
High Channel 469.5 MHz (12.5 kHz)												
939	42.49	0	1.6	H	939	-29.8	H	0	0.7	-30.5	-20	10.5
3286.5	61.47	193	1.2	V	3286.5	-37.6	V	6.9	1.4	-32.1	-20	12.1
3286.5	62.60	360	1.8	H	3286.5	-39.2	H	6.9	1.4	-33.7	-20	13.7
939	35.84	61	1.3	V	939	-36.1	V	0	0.7	-36.8	-20	16.8
3756	53.92	180	1.2	V	3756	-45.6	V	6.9	1.5	-40.2	-20	20.2
3756	53.41	157	1.8	H	3756	-46.2	H	6.9	1.5	-40.8	-20	20.8
1408.5	57.97	0	1.9	H	1408.5	-47.1	H	6.4	0.9	-41.6	-20	21.6
1408.5	58.84	08	1.4	V	1408.5	-48.7	V	6.4	0.9	-43.2	-20	23.2

Indicated		Table Angle Degree	Test Antenna		Substituted					Absolute Level (dBm)	FCC Part 90	
Frequency (MHz)	S.A. Amp. (dBμV/m)		Height (m)	Polar (H/V)	Frequency (MHz)	S.G. Level (dBm)	Polar (H/V)	Ant. Gain Cord. (dBi)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
Low Channel 430.5 MHz (25 kHz)												
861	45.06	0	2.0	H	861	-28.1	H	0	0.7	-28.8	-13	15.8
861	41.25	270	1.0	V	861	-31.5	V	0	0.7	-32.2	-13	19.2
3013.5	61.18	98	2.0	H	3013.5	-41.8	H	7.5	1.3	-35.6	-13	22.6
2152.5	56.49	156	1.0	V	2152.5	-44.5	V	6.7	1.1	-38.9	-13	25.9
2583	55.01	90	1.2	V	2583	-45	V	7.3	1.2	-38.9	-13	25.9
1291.5	63.02	160	1.2	V	1291.5	-45	V	6.3	0.8	-39.5	-13	26.5
3013.5	53.66	270	1.6	V	3013.5	-45.9	V	7.5	1.3	-39.7	-13	26.7
1291.5	59.33	168	1.7	H	1291.5	-45.8	H	6.3	0.8	-40.3	-13	27.3
1722	60.64	360	1.0	V	1722	-46.1	V	6.1	1.0	-41.0	-13	28.0
1722	57.67	360	2.0	H	1722	-46.5	H	6.1	1.0	-41.4	-13	28.4
High Channel 469.5 MHz (25 kHz)												
3286.5	63.16	256	1.1	V	3286.5	-35.9	V	6.9	1.4	-30.4	-13	17.4
939	42.0	360	1.6	H	939	-30.3	H	0	0.7	-31	-13	18.0
3286.5	64.49	297	1.7	H	3286.5	-37.4	H	6.9	1.4	-31.9	-13	18.9
939	34.59	136	1.2	V	939	-37.4	V	0	0.7	-38.1	-13	25.1
3756	55.44	270	1.2	V	3756	-44.1	V	6.9	1.5	-38.7	-13	25.7
3756	54.59	0	1.8	H	3756	-45.0	H	6.9	1.5	-39.6	-13	26.6
1408.5	56.52	186	1.8	H	1408.5	-48.5	H	6.4	0.9	-43	-13	30.0
1408.5	55.46	108	1.3	V	1408.5	-51.6	V	6.4	0.9	-46.1	-13	33.1

## §2.1055 and §90.213- FREQUENCY STABILITY

### Applicable Standard

CFR47 §2.1055& §90.213

### Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Due Dates
WUHUAN	Temperature & Humidity Chamber	HTP205	20021115	2008-05-09	2009-05-09
Hewlett-Packard	Frequency Counter	5342A	2317A08289	2008-04-22	2009-04-22

\* **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 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 counter.

The frequency stability shall be measured with variation of primary supply voltage as follows:

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

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56%
<b>ATM Pressure:</b>	100.1 kPa

*The testing was performed by Alvin Huang on 2009-02-20.*

*Test Mode: Transmitting*

Test result: Pass.

**For 12.5 kHz Channel Spacing**

## 1) Frequency Stability Versus temperature

<b>Reference Frequency: 450.5 MHz, Limit: 2.5 ppm</b>			
<b>Test Environment</b>		<b>Frequency Measured with Time Elapsed</b>	
<b>Temperature (°C)</b>	<b>Power Supplied (Vdc)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
55	7.4	450.50036	0.79911
40	7.4	450.50030	0.66593
30	7.4	450.50034	0.75472
20	7.4	450.50030	0.66593
10	7.4	450.50032	0.71032
0	7.4	450.50032	0.71032
-10	7.4	450.50034	0.75472
-20	7.4	450.50033	0.73252
-30	7.4	450.50034	0.75472

## 2) Frequency Stability versus Voltage

<b>Reference Frequency: 450.5 MHz, Limit: 2.5 ppm</b>			
<b>Test Environment</b>		<b>Frequency Measured with Time Elapsed</b>	
<b>Temperature (°C)</b>	<b>Power Supplied (Vdc)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
20	6.7	450.50036	0.79911



**For 25 kHz Channel Spacing**

## 1) Frequency Stability Versus temperature

<b>Reference Frequency: 450.5 MHz, Limit: 5.0 ppm</b>			
<b>Test Environment</b>		<b>Frequency Measured with Time Elapsed</b>	
<b>Temperature (°C)</b>	<b>Power Supplied (Vdc)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
55	7.4	450.50034	0.75472
40	7.4	450.50028	0.62153
30	7.4	450.50032	0.71032
20	7.4	450.50030	0.66593
10	7.4	450.5003	0.66593
0	7.4	450.50032	0.71032
-10	7.4	450.50030	0.66593
-20	7.4	450.50032	0.71032
-30	7.4	450.50036	0.79911

## 2) Frequency Stability versus Voltage

<b>Reference Frequency: 450.5 MHz, Limit: 5.0 ppm</b>			
<b>Test Environment</b>		<b>Frequency Measured with Time Elapsed</b>	
<b>Temperature (°C)</b>	<b>Power Supplied (Vdc)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
20	6.7	450.50032	0.71032

## §90.214 - TRANSIENT FREQUENCY BEHAVIOR

### Applicable Standard

CFR47 §90.214

### Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Due Dates
TEKTRONIX	Digital Phosphor Oscilloscope	TDS 7104	B020518	2008-04-11	2009-04-11
HP	Modulation Analyzer	8901B	3438A05208	2008-04-11	2009-04-11
HP	Signal Generator	HP8657A	2849U00982	2008-10-16	2009-10-16

\* **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 Procedure

TIA/EIA-603 2.2.19

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56%
<b>ATM Pressure:</b>	100.1 kPa

*The testing was performed by Alvin Huang on 2009-03-07.*

*Test Mode: Transmitting*

**For 12.5 kHz Channel Spacing:**

Frequency (MHz)	Channel Separation (kHz)	Transient Period (ms)	Transient Frequency	Result
450.5	12.5	10	<+/-12.5 kHz	Pass
		25	<+/-6.25 kHz	
		10	<+/-12.5 kHz	

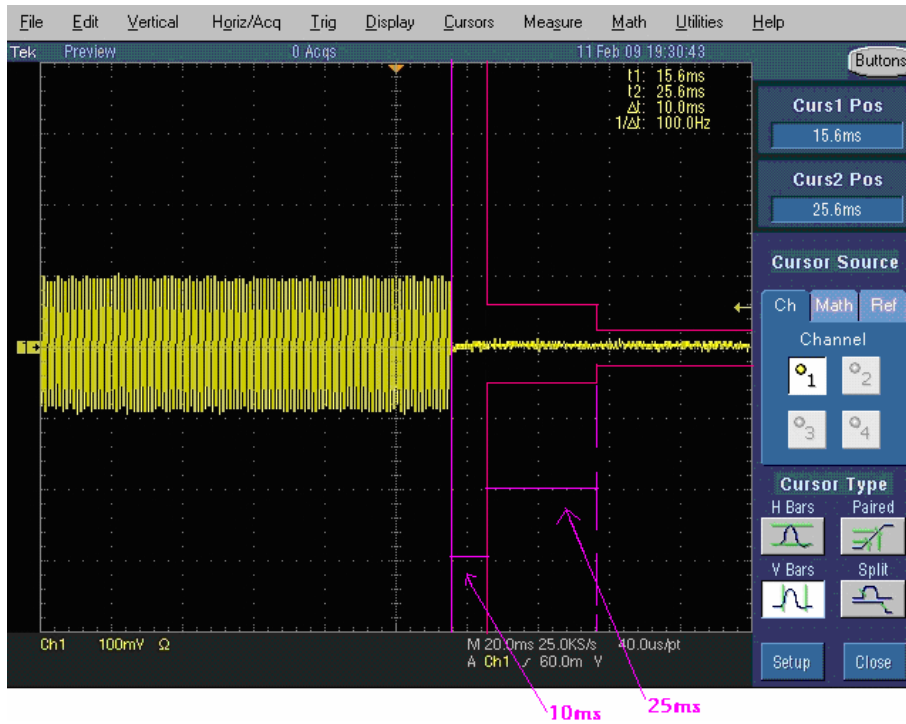
**For 25 kHz Channel Spacing:**

Frequency (MHz)	Channel Separation (kHz)	Transient Period (ms)	Transient Frequency	Result
450.5	25.0	10	<+/-25.0 kHz	Pass
		25	<+/-12.5 kHz	
		10	<+/-25.0 kHz	

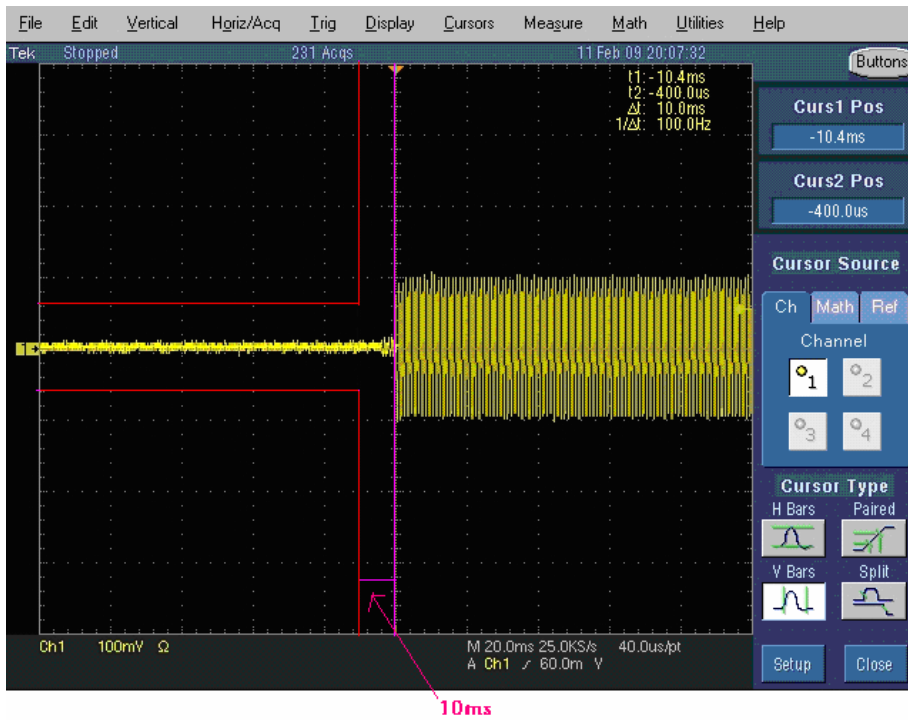
Please refer to the following plots.

**For 12.5 kHz Channel Spacing:**

**Switch on**

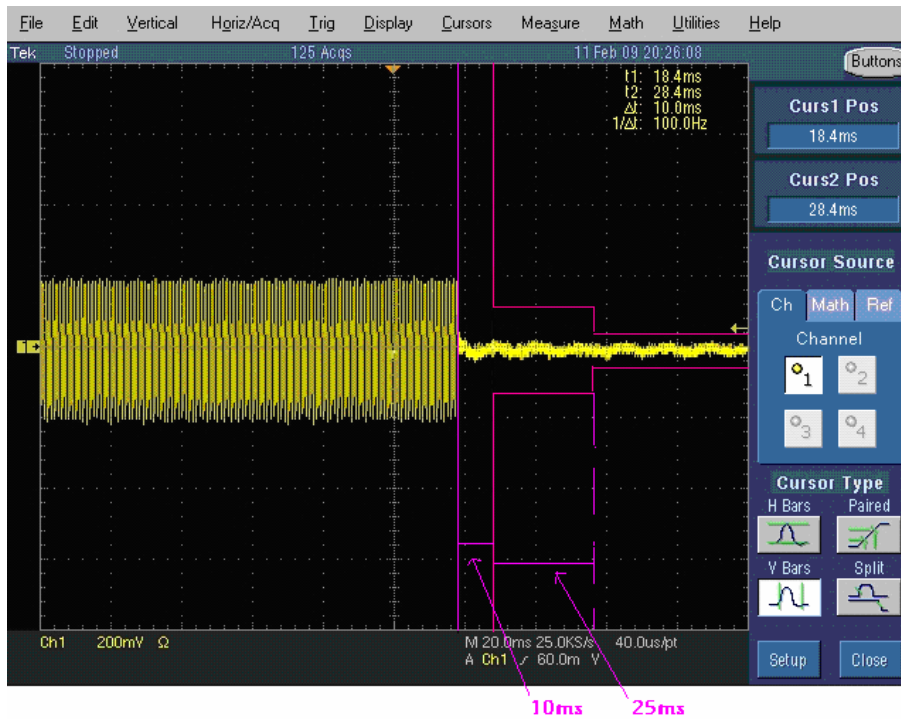


**Switch off**

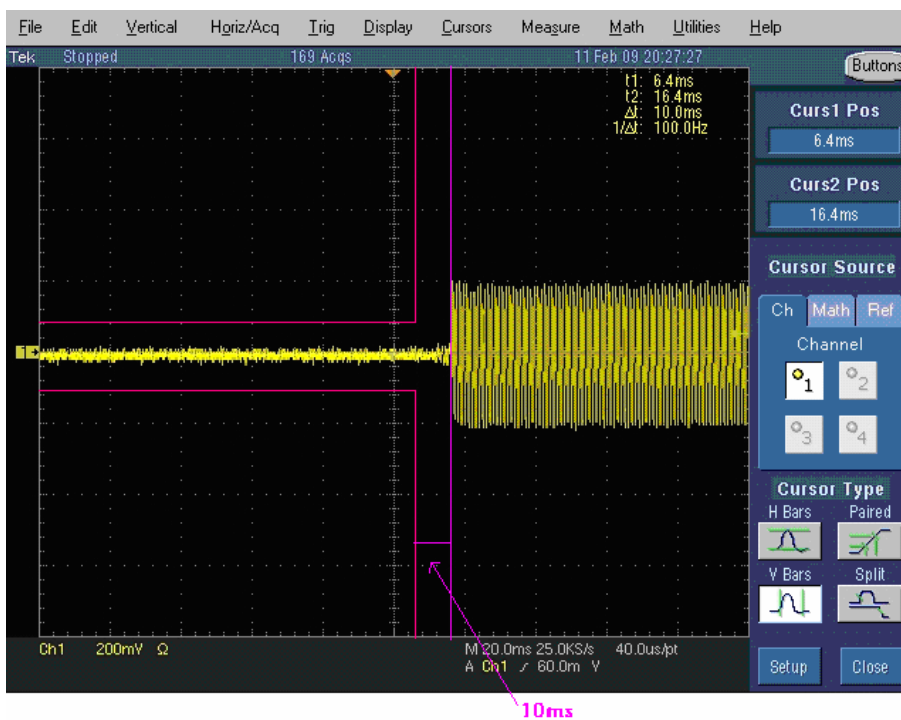


**For 25 kHz Channel Spacing:**

**Switch on**



**Switch off**



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