



NVLAP LAB CODE 200707-0



## FCC PART 15 B

# MEASUREMENT AND TEST REPORT

For

## Racing Electronics

840 Derita Road, Concord, NC28027, USA

**FCC ID: WZ5-RE3000**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Racing Scanning Receiver
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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

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

The *Racing Electronics*'s product, model *RE3000* or the "EUT" as referred to in this report is a *Scanning receiver operates at 450-470 MHz*, which measures approximately 20.0cm L x 5.5cm W x 3.0cm H.

*\* All measurement and test data in this report was gathered from production sample serial number: 0812086 (Assigned by BACL, Shenzhen). The EUT was received on 2008-12-30.*

### Objective

The following test report is prepared on behalf of *Racing Electronics* in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine compliance with FCC Part 15.109, 15.121.

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

No related submittal(s).

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at 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 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 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).



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

## SYSTEM TEST CONFIGURATION

### Justification

The system was configured for testing in receiving mode with 3 fixed channels (Low, Middle and High) and the scanning across the entire tuning range mode; the EUT communicated with PC via the cable also has been checked.

### EUT Exercise Software

N/A

### Special Accessories

N/A

### Equipment Modifications

No modifications were made to the EUT.

### Local Support Equipment List and Details

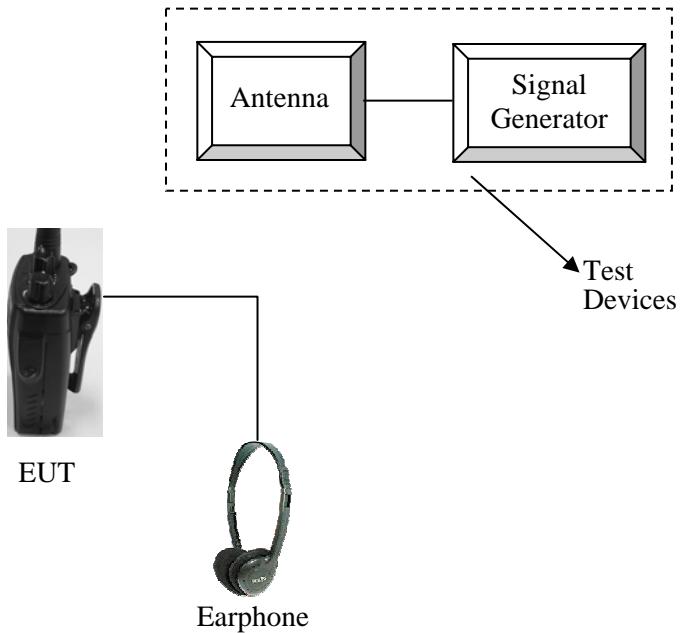
Manufacturer	Description	Model	Serial Number	FCC ID
IBM	Notebook	T40	N/A	DoC

### External Cable List and Details

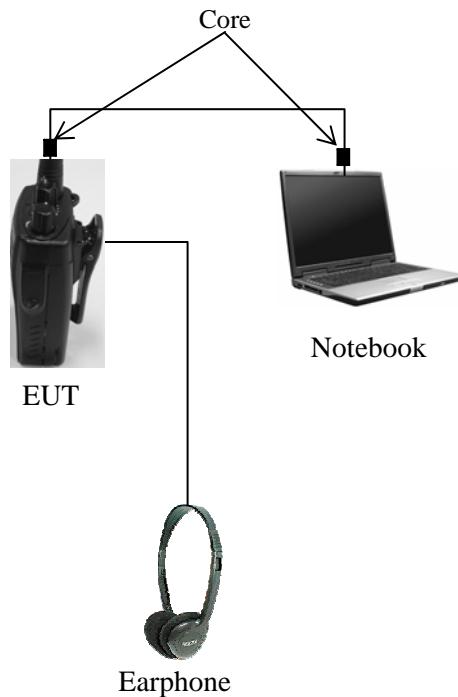
Cable Description	Length (m)	From/Port	To
Unshielded Detachable USB Cable (with Two Core)	0.6	EUT	Teat PC
Unshielded Detachable Earphone	1.0	EUT	/

## Configuration of Test Setup

*Receiving Mode:*

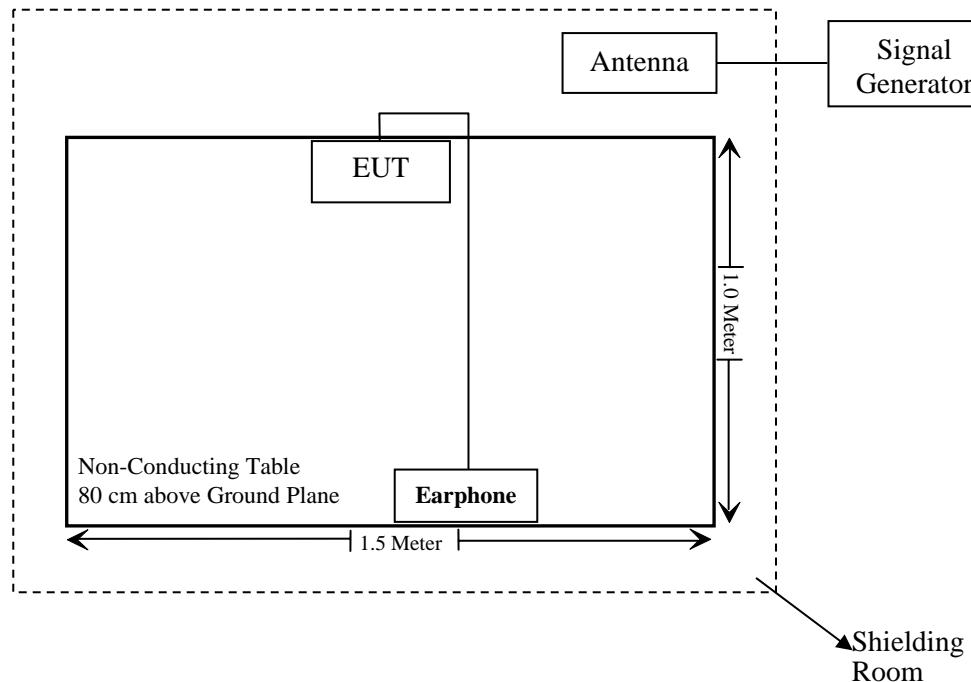


*EUT Communicated with PC Mode:*

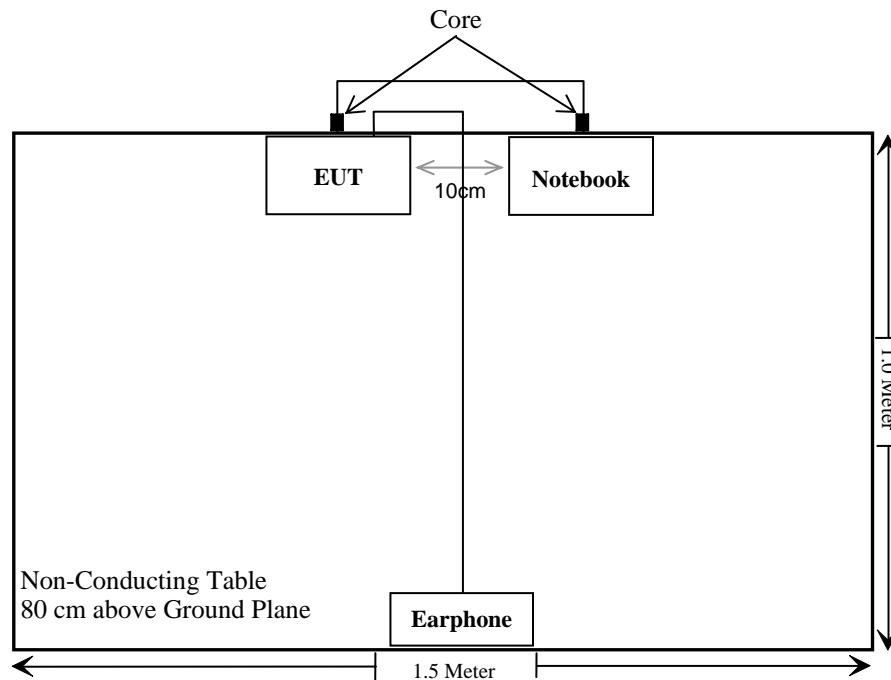


## Block Diagram of Test Setup

*Receiving Mode:*



*EUT Communicated with PC Mode:*



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Results
§15.107	Conducted Emissions	N/A*
§15.109	Radiated Emissions	Compliant
§15.33	Frequency of Investigation	Compliant
§15.27	Special Accessories	Compliant
§15.121 (b)	Cellular Band Rejection	Compliant

Note: \* The EUT is battery operation.

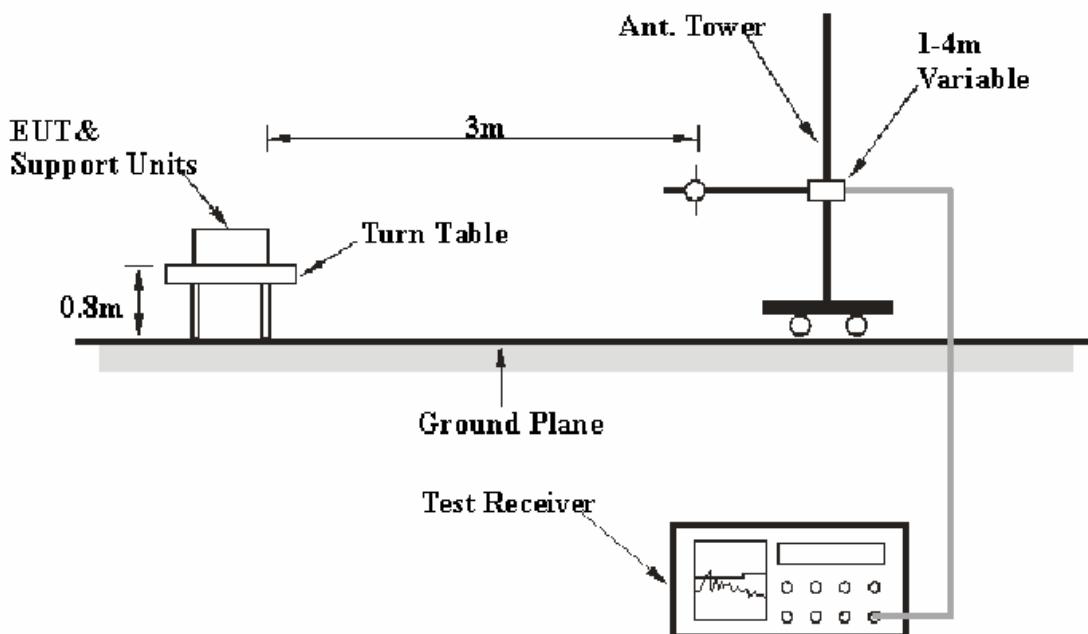
## CFR47 §15.109 - RADIATED EMISSIONS

### Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, the Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is  $\pm 4.0$  dB.

### EUT Setup



The radiated emission tests were performed in the 3 meters chamber B test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC Part 15.109 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver Setup

The system was investigated from 30 MHz to 1000 MHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

<b><i>Frequency Range</i></b>	<b><i>RBW</i></b>	<b><i>Video B/W</i></b>	<b><i>IF B/W</i></b>
30 – 1000 MHz	100 kHz	300 kHz	120 kHz

## 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	Amplifier	8447E	1937A01046	2008-08-02	2009-08-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100224	2008-11-07	2009-11-06
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2008-04-12	2009-04-11
COM-POWER	Dipole Antenna	AD-100-DB4	40109	2008-10-16	2009-10-15
HP	Signal Generator	8657A	2849U00982	2008-10-16	2009-10-15

**\* 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

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detection mode.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.109, with the worst margin reading of:

Receiving mode (Low Channel: 450.2375 MHz):

**1.2 dB at 857.196500 MHz** in the **Vertical** polarization

Receiving mode (Middle Channel: 460.1000 MHz):

**9.3 dB at 460.100000 MHz** in the **Vertical** polarization

Receiving mode (High Channel: 469.9750 MHz):

**3.1 dB at 896.705050 MHz** in the **Vertical** polarization

Scanning all channel mode:

**1.8 dB at 896.700325 MHz** in the **Vertical** polarization

EUT Communicated with PC mode:

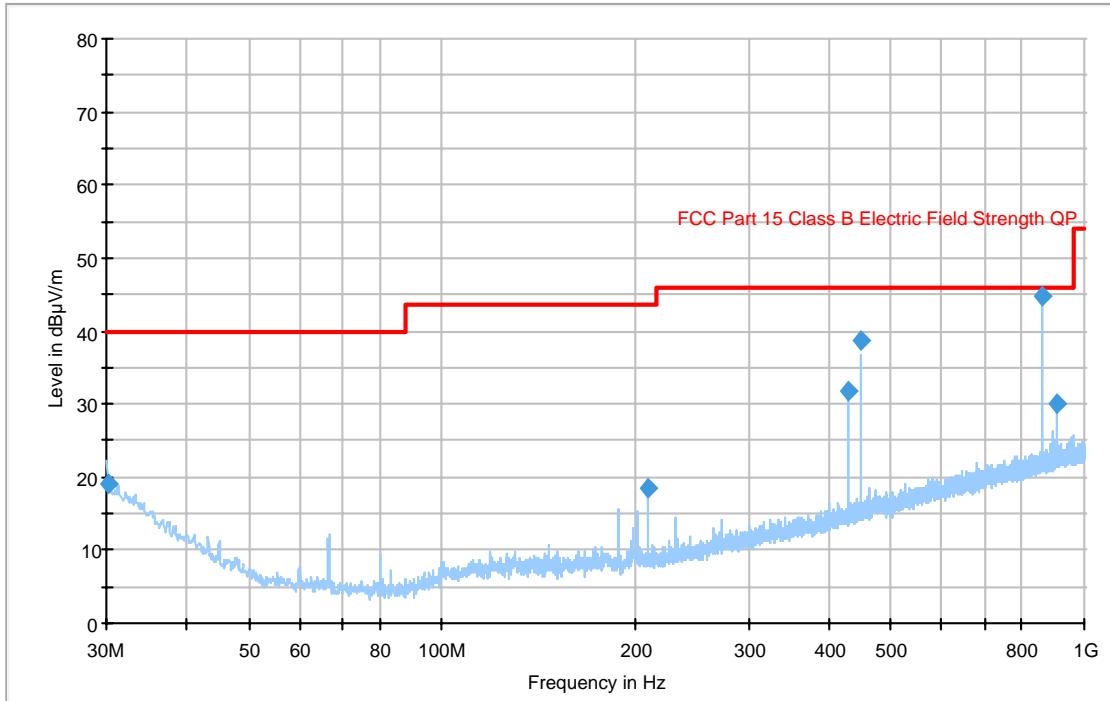
**6.8 dB at 896.706925 MHz** in the **Vertical** polarization

## Test Data

### Environmental Conditions

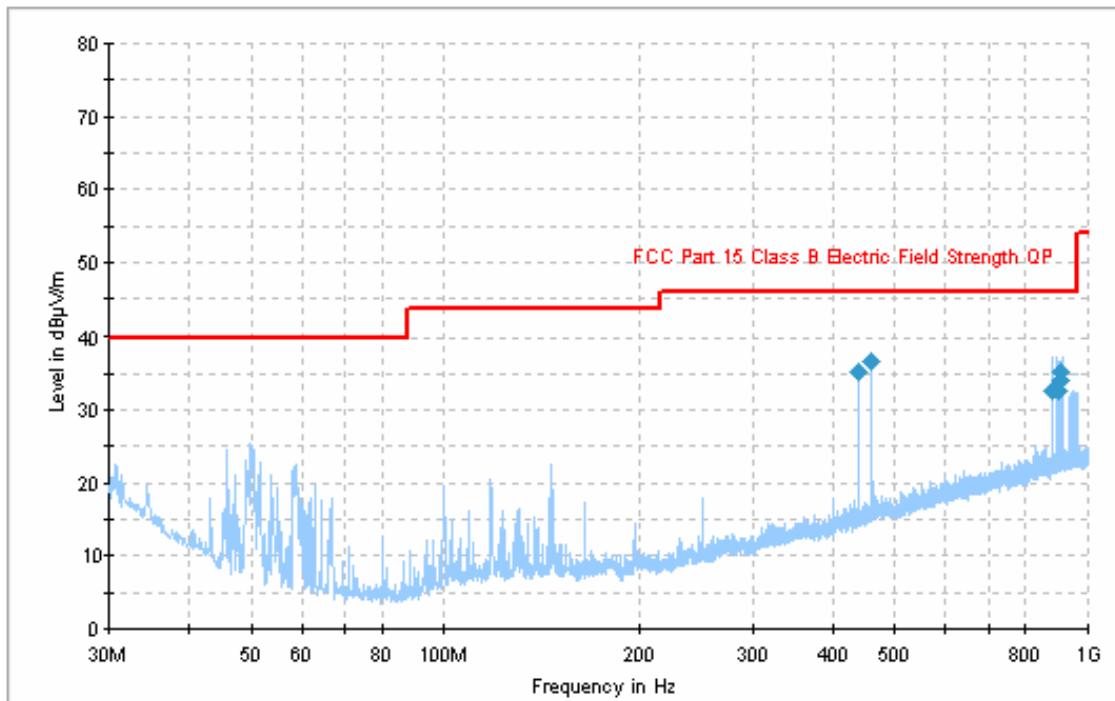
<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56%
<b>ATM Pressure:</b>	100.2kPa

*The testing was performed by Allan An on 2009-01-05 to 2009-01-15*

**Test Mode: Receiving Mode (Low Channel: 450.2375 MHz)**

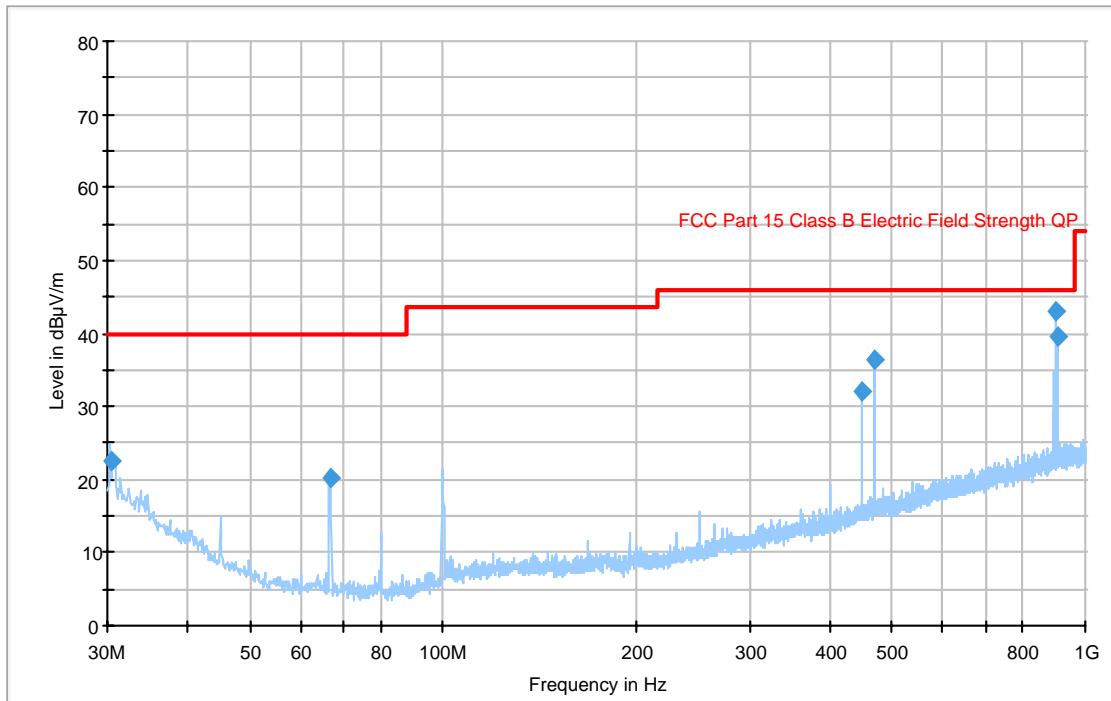
Frequency (MHz)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dB $\mu$ V/m)	Margin (dB)
857.196500	44.8	127.0	V	244.0	-4.5	46.0	1.2*
428.613025	31.8	103.0	H	267.0	-11.9	46.0	14.2
905.546250	29.9	235.0	V	254.0	-7.6	46.0	16.1
30.179550	19.2	401.0	H	296.0	-8.7	40.0	20.8
209.450000	18.4	302.0	V	235.0	-13.5	43.5	25.1

\* Within measurement uncertainty.

**Test Mode: Receiving Mode (Middle Channel: 460.1000 MHz)**

Frequency (MHz)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dB $\mu$ V/m)	Margin (dB)
907.023300	35.2	106.0	V	130.0	-3.6	46.0	10.8
438.625000	35.1	248.0	V	0.0	-3.9	46.0	10.9
905.680850	33.9	314.0	H	9.0	-3.6	46.0	12.1
897.267425	32.7	256.0	H	0.0	-3.9	46.0	13.3
877.199675	32.6	143.0	V	7.0	-4.4	46.0	13.4

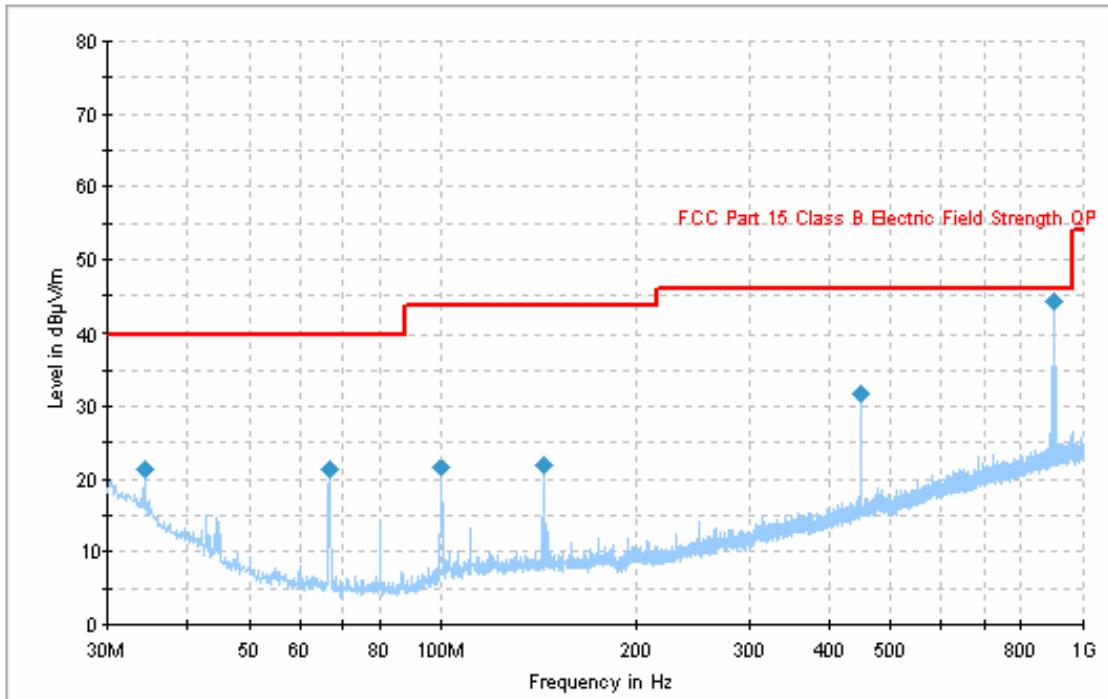
## Test Mode: Receiving Mode (High Channel: 469.9750 MHz)



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBµV/m)	Margin (dB)
896.705050	42.9	108.0	V	195.0	-3.9	46.0	3.1*
906.886275	39.5	112.0	V	142.0	-3.6	46.0	6.5
448.365000	32.1	140.0	V	14.0	-11.4	46.0	13.9
30.426676	22.5	109.0	V	243.0	-8.9	40.0	17.5
66.865425	20.2	110.0	V	266.0	-22.0	40.0	19.8

\* Within measurement uncertainty.

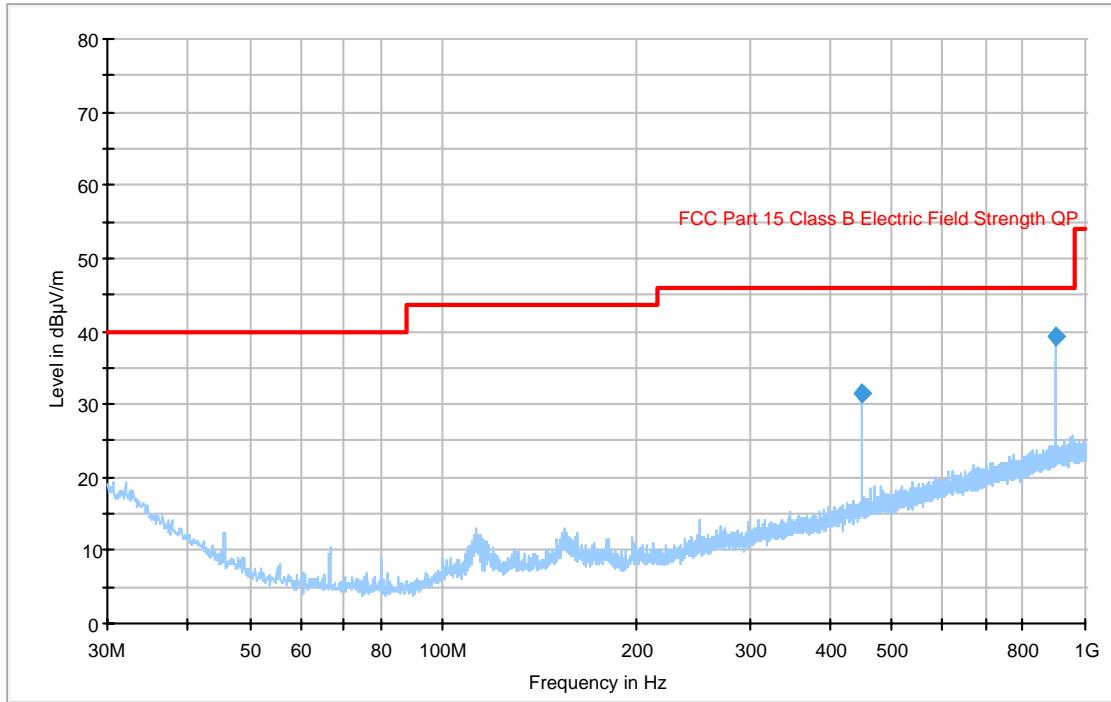
## Test Mode: Scanning all channel Mode



Frequency (MHz)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dB $\mu$ V/m)	Margin (dB)
896.700325	44.2	144.0	V	57.0	-3.9	46.0	1.8*
448.339275	31.8	104.0	H	80.0	-11.4	46.0	14.2
34.343875	21.3	393.0	V	357.0	-11.5	40.0	18.7
66.852510	21.1	104.0	V	80.0	-22.0	40.0	18.9
156.365200	22.1	102.0	V	180.0	-13.7	43.5	21.4
100.012500	21.4	100.0	V	105.0	-12.6	43.5	22.1

\* Within measurement uncertainty.

## Test Mode: EUT Communicated with PC Mode



Frequency (MHz)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dB $\mu$ V/m)	Margin (dB)
896.706925	39.2	111.0	V	326.0	-3.9	46.0	6.8
448.343925	31.4	109.0	H	76.0	-11.4	46.0	14.6

## CFR47 §15.121 (b) - Cellular Band Rejection

### Standard Applicable

Scanning receivers shall reject any signals from the Cellular Radiotelephone Service frequency bands that are 38dB or lower based upon a 12 dB SINAD measurement, which is considered the threshold where a signal can be clearly discerned from any interference that may be present;

### Test Method

A modulated signal generator is set to each of the above cellular band frequencies. The RF output level is set to 60 dB $\mu$ V (66dB above the -6 dB $\mu$ V level associated with the squelched threshold). The scanning receiver is set to scan all frequency ranges. Any image frequency that is detected by the scanning receiver is noted. The RF output of the signal generator is adjusted to achieve 12 dB SINAD on the receiver headphone output. This RF level is noted.

The image rejection ratio is determined by: RF SG – (-6dB $\mu$ V)

For example: If the level required to produce an image emission that causes a 12 dB SINAD response from the scanning receiver is 60 dB $\mu$ V, then the image rejection ratio would be: 60 – (-6) = 66 dB.

### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	45 %
ATM Pressure:	100.2kPa

*The testing was performed by Allan An on 2009-01-15*

Cellular Frequency (MHz)	Squelched Threshold (dB $\mu$ V)	RF Input Level (dB $\mu$ V)	Freq. Stopped on EUT (MHz)	Image Rejection Ration (dB)	Limit (dB)
824.01	-6	70	None	N/A	38
836.52	-6	70	None	N/A	38
848.98	-6	60.2	450.2375	66.2	38
	-6	58.5	460.1000	64.5	38
	-6	60.1	469.9750	66.1	38
869.01	-6	60.3	450.2375	66.3	38
	-6	60.5	460.1000	66.5	38
	-6	60.3	469.9750	66.3	38
881.52	-6	70	None	N/A	38
893.98	-6	58.8	450.2375	64.8	38
	-6	59.2	460.1000	65.2	38
	-6	60.1	469.9750	66.1	38

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