



## **ELECTROMAGNETIC COMPATIBILITY (EMC) REPORT**

**EMISSIONS ONLY**

**Aerielle Group International, Inc.**

**Model: ATBPA6V100**

**FCC ID: RKVATBPA6V100**

**October 27, 2003**

**Project No.: 03CA37236**

**Test Report No.: NC5311-102703**

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## REPORT DIRECTORY

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## 1.0 General Information

### 1.1 Scope

Underwriters Laboratories Inc., authorizes the above named company to reproduce this Report, provided it is reproduced in its entirety. The data in this Report reflects only the items tested in the configurations and mode of operations described. All data recorded and photographs represents testing under the worst case conditions permitted by the requirements applied to the product. It is the manufacturer's responsibility to assure that additional production units are manufactured with identical electrical and mechanical components. Any modifications necessary for compliance made during testing must be implemented in all production units for compliance to be maintained.

Underwriters Laboratories Inc., shall have no liability for any deductions, inferences or generalizations drawn from this report. This report shall not be used by the client to claim product endorsement by NVLAP or any agency of the United States government

### 1.2 Purpose

Testing was performed to the following regulations:

Emissions Standards used: CFR 47 Part 15 Subpart C

### 1.3 Test Results

#### Transmitter Requirements

Environmental Phenomena	Frequency Range	FCC Section	Test Result
Conducted Emissions, AC Mains	0.15 – 30 MHz	15.207	Not Required
Spurious Radiated Emissions	30 – 1000 MHz	15.209,15.239(b)	Complies
Occupied Bandwidth (200 kHz)	88 – 108 MHz	15.239(a)	Complies
Antenna Requirements	88 – 108 MHz	15.203	Complies

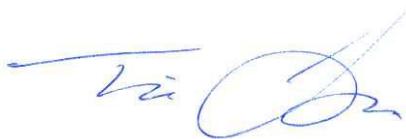
### 1.4 Documentation Review/Approval

**Project Management:**



Asim Tirmizi  
Project Engineer  
International EMC Services  
Department 3014A

**Technical Review By:**



Tim Lee  
Staff Engineer  
International EMC Services  
Department 3014A

## 2.0 General Product Description

Applicant	:	Texas Instruments
Manufactured By	:	Same as Applicant
License Holder	:	Not Applicable
Applicant Address	:	10350 Johnson Avenue Cupertino, CA 95014
Applicant Contact	:	Art Cohen
Model/Type No.	:	ATBPA6V100
FCC ID	:	RKVATBPA6V100
Date of Issue	:	October 27, 2003
File No.	:	NC5311
Test Report No.	:	NC5311-102703
Project No.	:	03CA37236

### Product Description

The Aerielle ATBPA6V100 is a low-powered FM Stereo Transmitter designed to operate in the commercial FM broadcast band used in many parts of the world and utilizes a standard 38 kHz L-R subcarrier signal format. Housed in a 'Cigarette Lighter Adaptor', it also incorporates a switching power supply to convert vehicle-supplied 12VDC to lower voltage to power portable audio devices such as MP3 and CD players.

### Equipment Size, Mobility, and Identification

Dimensions: 3.660 by 1.75 by 0.785 in.  
Mobility: To be connected to an automobile cigarette lighter.  
Serial No: 7A6

### Electrical Ratings

	<u>Voltage</u> <u>[Volts]</u>	<u>Current or</u> <u>Power</u>	<u>Frequency</u> <u>[Hz]</u>	<u>Phase</u>
EUT	12 Vdc	25 mA	--	--

### Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

<u>Voltage</u>	<u>Frequency</u>
12 Vdc	--

### Tunable Channels

The ATBPA6V100 can be tuned to the following channels:

88.1, 88.3, 88.5, 88.7, 107.1, 107.3, 107.5, and 107.7 MHz

### Equipment Type

Pre-Production

## Model Differences

Any other model(s) represented by the models tested in this investigation will be documented by the manufacturer.

## Device Modifications

The following modifications were necessary for compliance: None

## EUT and Peripherals

Description	Manufacturer	Model/Part #	Serial Number
EUT	Aerielle	ATBP6V100	Unknown
CD Player	Panasonic	SL-MP80	FB3HB003098
Power System	MVP	I-6001	Unknown

## Cables

Cable Type	Shield	Length (meters)	Ferrite	Connector	Connection Point 1	Connection Point 2
I/O	No	1.5	No	Pwr & headphones	EUT	Laptop

### 2.1 FCC Section 15.203 Antenna Requirements

The antenna is permanently attached to the PCB and the antenna is internal on the EUT. Therefore, it meets the 15.203 requirements.

### 2.2 Justification of Configuration

EUT was considered to be operating in a typical mode of operation.

### 2.3 EUT Operating Mode(s)

Equipment under test was operated during the measurement under the following conditions:

The EUT was connected to a portable cd player and operated both with and without 1 kHz tone depending on the test performed.

### **3.0 Environmental Conditions in Test Lab**

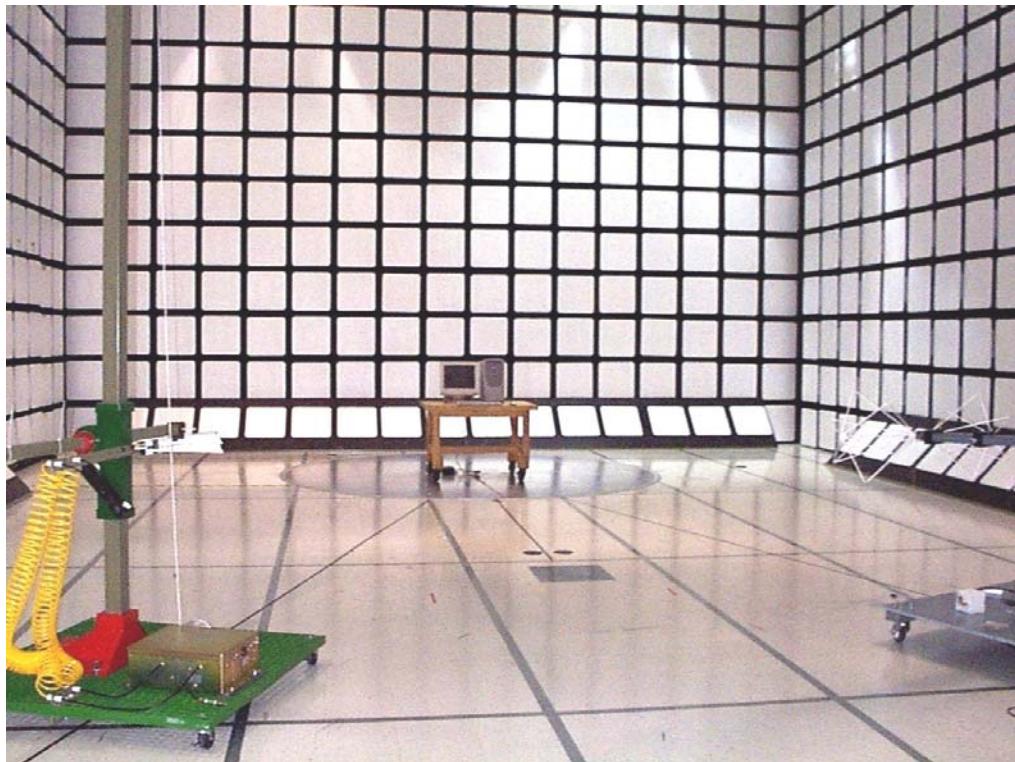
Temperature: 20-25 °C      Atmospheric Pressure: 680-1060 mbar  
Relative Humidity: 30-60%      20.1-31.3 in. Hga

### **4.0 Calibration Details of Equipment Used for Measurement**

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST), therefore, all test data recorded in this report is traceable to NIST.

## 5.0 Test Facility

Underwriters Laboratories Inc.  
1655 Scott Blvd.  
Santa Clara, CA 95050  
Phone: (408) 876-2905 Fax: (408) 556-6071



## 6.0 Accreditations and Authorizations



**NVLAP:** Recognized under the National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. The specific scope includes IEC/CISPR 22:1997, Amendment 1:1995, Amendment 2:1997, EN 55022:1998, AS/NZS 1044, CNS 13438:1997, ANSI C63.4, FCC Method - 47 CFR Part 15, AS/NZS 3548, IEC 61000-3-2, EN 61000-3-2, CISPR 14-1, EN 55014-1, CNS 13783-1, CISPR 22, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, and IEC 61000-4-11 testing.

NVLAP Lab code: 200252-0.



**FCC:** Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland and accepted in a letter dated September 24, 1997 (Ref. No. 31040/SIT 1300F2).



**Industry of Canada:** Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP 100, Issue 7, Section 3.3.

File #: IC 2704



**VCCI:** Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration Nos.: (Radiated Emissions) R-672, (Conducted Emissions) C-689.



**ICASA:** ICASA (Independent Communications Authority of South Africa) has appointed UL as a Designated Test Laboratory to test Telecommunications equipment for type approval in compliance with CISPR 22 to assist in fulfilling its mandate under section 54(1) of the Telecommunications Act, 1996 (Act 103 of 1996).



**NIST/CAB:** Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 89/336/EEC, Article 10 (2). Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, Annex III and IV, Identification Number: 0983.

**NIST/CAB:** Provisioned to act as a U.S. Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the Asia Pacific Economic Cooperation (APEC) MRA between the American Institute in Taiwan (AIT) and the United States. Our laboratory is considered qualified to test equipment subject to the applicable EMC regulations of the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) which require testing to CNS 13438 (CISPR 22).

**NIST/CAB:** Recognized by the Infocomm Development Authority of Singapore (IDA) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Our laboratory is provisionally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA. Our scope of designation includes IDA TS EMC (CISPR 22), IEC 61000-4-2, -4-3, -4-4, -4-5, and -4-6.

U.S. Identifier Number: US0114

## 7.0 Emissions Test Regulations

The emissions tests were performed according to following regulations:

----- United States -----

CFR 47 Part 15 Subpart C : 2003

Code of Federal Regulations, Part 15, Subpart C, Radio Frequency Devices -  
Intentional Radiators

## 7.1 Equipment Classifications

**Class A Digital Device:** *A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.*

**Class B Digital Device:** *A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computer, calculators, and similar electronic devices that are marketed for use by the general public.*

## 7.2 Field Strength Calculations

The field strength is calculated by adding the Transducer Factor (Antenna Factor) and Gain/Loss (Cable Loss, Preamp Gain) Factor to the Meter Reading. The basic equation with a sample calculation is as follows:

Field Strength = Meter Reading + Transducer Factor + Gain/Loss

Assume a receiver reading of 53.2 dB $\mu$ V is obtained. The Transducer Factor of 5.1 dB and a Gain/Loss of -31 dB is added, giving a field strength of 27.3 dB $\mu$ V.

$$FS = 53.2 + 5.1 + (-31) = 27.3 \text{ dB}\mu\text{V}$$

Use the following formula to convert dB $\mu$ V to  $\mu$ V:  $x = 10^{(y/20)}$ , where  $x$  is the value in  $\mu$ V and  $y$  is the value in dB $\mu$ V.

$$\text{Level in } \mu\text{V} = 10^{(27.3/20)} = 23.2 \mu\text{V}$$

## 7.3 Measurement Uncertainty

When a measurement is made the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its “true” value.

		Uncertainty (dB)					
		Biconical Antenna			Log Periodic Antenna		
Test Distance	Probability Distribution	10m +18 deg	10m -14 deg	3m	10m +18 deg	10m -14 deg	3m
Combined Standard Uncertainty $u_c(y)$	Normal	$\pm 1.24$	$\pm 1.25$	$\pm 1.29$	$\pm 1.14$	$\pm 1.13$	$\pm 1.9$
Expanded uncertainty $U$ (level of confidence = 95%)	Normal (k = 2)	$\pm 2.47$	$\pm 2.49$	$\pm 2.59$	$\pm 2.28$	$\pm 2.27$	$\pm 2.76$

Conducted Voltage Emissions	Probability Distribution
Combined Standard Uncertainty $u_c(y)$	Normal
Expanded uncertainty $U$ (level of confidence = 95%)	$\pm 1.08$ Normal (k = 2) $\pm 2.16$

$u_c(y)$  = square root of the sum of squares of the individual standard deviation uncertainties.

$U$  = combined standard uncertainty multiplied by the coverage factor: k. This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required then k=3 (CL=97%) can be used.

“ISO Guide to the Expression of Uncertainty in Measurements” and ‘NIS81: The Treatment of Uncertainty in EMC Measurements’ were the basis for determining the uncertainty levels of our measurements. Details of those calculations are available upon request.

## 7.4 Measurement Bandwidths

Frequency Range (MHz)	Peak Data BW (kHz)	Quasi-Peak Data BW (kHz)	Average Data BW (kHz)
<b>0.01 - 0.15</b>	<b>1</b>	<b>3</b>	<b>0.2</b>
<b>0.15 - 30</b>	<b>10</b>	<b>9</b>	<b>100</b>
<b>30 - 1000</b>	<b>100</b>	<b>120</b>	<b>120</b>
<b>Above 1000</b>	<b>1000</b>	<b>N/A</b>	<b>1000</b>

## 7.5 Conducted Voltage Emissions; Section 15.207

### UL Procedure

3314-LPG-004

Conducted voltage emissions are performed using a calibrated line impedance stabilization network (LISN), which isolates product emissions. The LISN is connected to a spectrum analyzer which scans the frequency range of measurement.

### Remarks

The EUT is powered by an automobile cigarette lighter, therefore, would not connect to the ac mains. This test was not performed.

## 7.6 Spurious Radiated Electric Field Emissions; Section 15.209, 15.239(b)(c)

### Test Location

10 Meter Semi-Anechoic Chamber (Test Station 2) (Last NSA: 2/28/03; Next NSA 2/28/04)

Date Tested: 10/25/03

### Test Instruments

Instrument	Manufacturer	Model	ID#	Last	Cal	Next
Spectrum Analyzer	Hewlett-Packard	8566B	8034	5/6/03		5/6/04

### Test Accessories

Instrument	Manufacturer	Model	ID#	Last	Cal	Next
Biconical Antenna	Electro-Metrics	EM-6912A	8018	12/9/02		12/9/03
Log Periodic Antenna	Electro-Metrics	EM-6950	8017	11/27/02		11/27/03
6dB Res Band Display	Hewlett-Packard	85662A	8031	5/6/03		5/6/04
Quasi-Peak Detector	Hewlett-Packard	85650A	8030	5/6/03		5/6/04
Switch Driver	Hewlett-Packard	11713A	8036	5/6/03		5/6/04
Preselector	Hewlett-Packard	85685A	8037	5/6/03		5/6/04
Pre-amplifier	Sonoma Instruments	310N	8085	11/27/02		11/27/03

### UL Procedure

3314-LPG-013

Radiated spurious emissions applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in 15.209. The limit for the fundamental emission is listed in 15.239(b) to be 250  $\mu$ V/m @ 3m, or 37.5 dB $\mu$ V/m @ 10m. Radiated spurious emissions tests were performed in a semi-anechoic chamber using a remote controlled turntable and the appropriate measuring antenna. Both antenna and turntable are adjusted to determine maximum emissions levels. The spectrum analyzer scanned up to 1 GHz.

### Frequency Range of Measurement

30 MHz to 1 GHz

### Measurement Distance

10 meters (30MHz to 1 GHz)

### Test Results

The requirements are:

(Tuned to 88.1 MHz)

MET minimum margin is 0.1 dB ( $\mu$ V/m) at 88.1002 MHz.

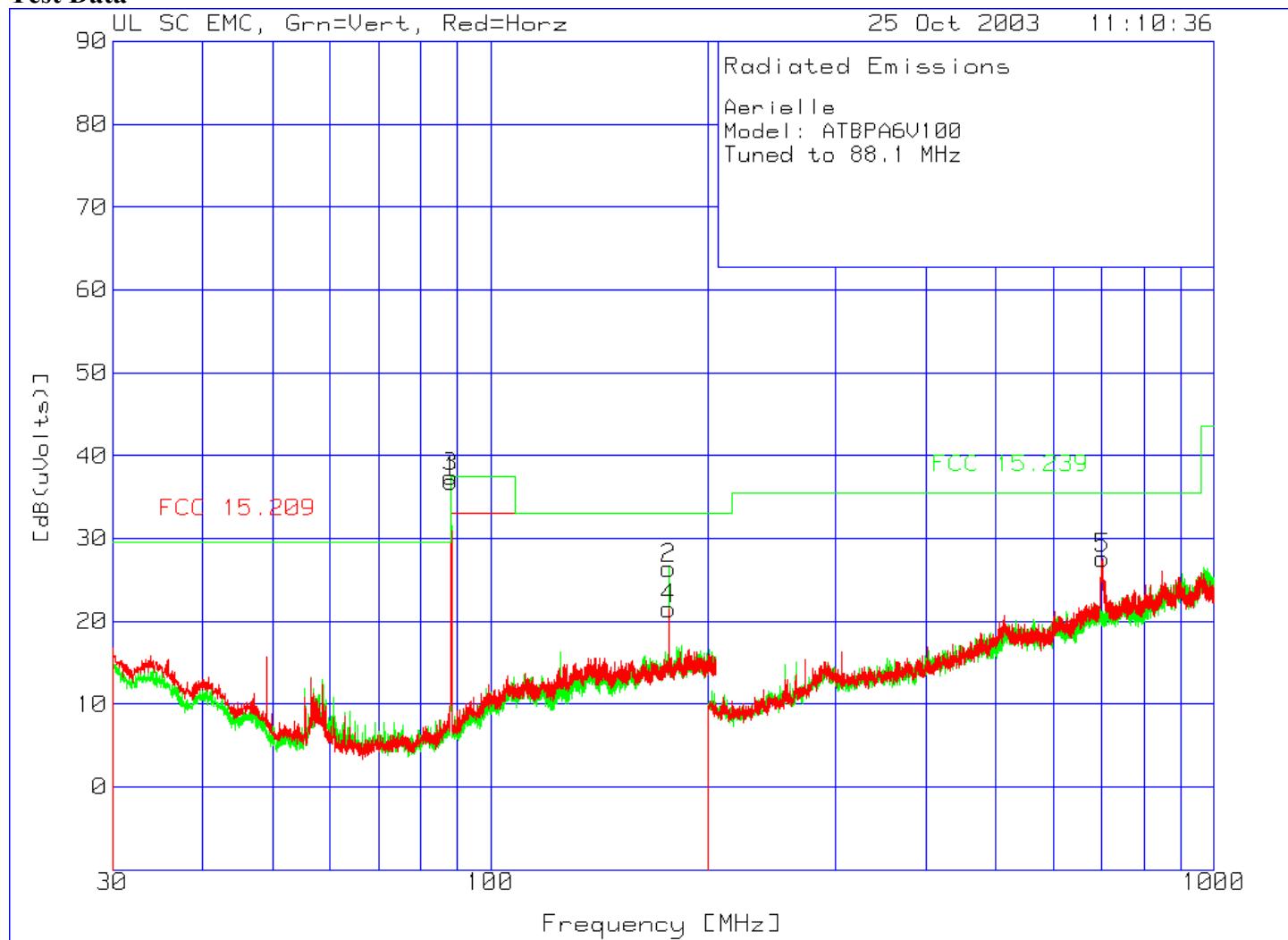
(Tuned to 107.7 MHz)

MET minimum margin is 4.7 dB ( $\mu$ V/m) at 107.7511 MHz.

### Remarks

None

## Test Data



Aerielle

Model: ATBPA6V100

Tuned to 88.1 MHz

No.	Test Frequency [MHz]	Meter Reading [dB (uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB (uVolts)]	Limit:1	2
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Range: 1 30 - 205MHz -----

1	88.1002	55.4 pk	-27.8	9.3	36.9	33	37.5
	Azimuth:179	Height:100	Vert	Margin [dB]		3.9	-.6
2	176.3215	37.2 pk	-27.1	16.3	26.4	33	33
	Azimuth:79	Height:100	Vert	Margin [dB]		-6.6	-6.6

Range:2 30 - 205MHz -----

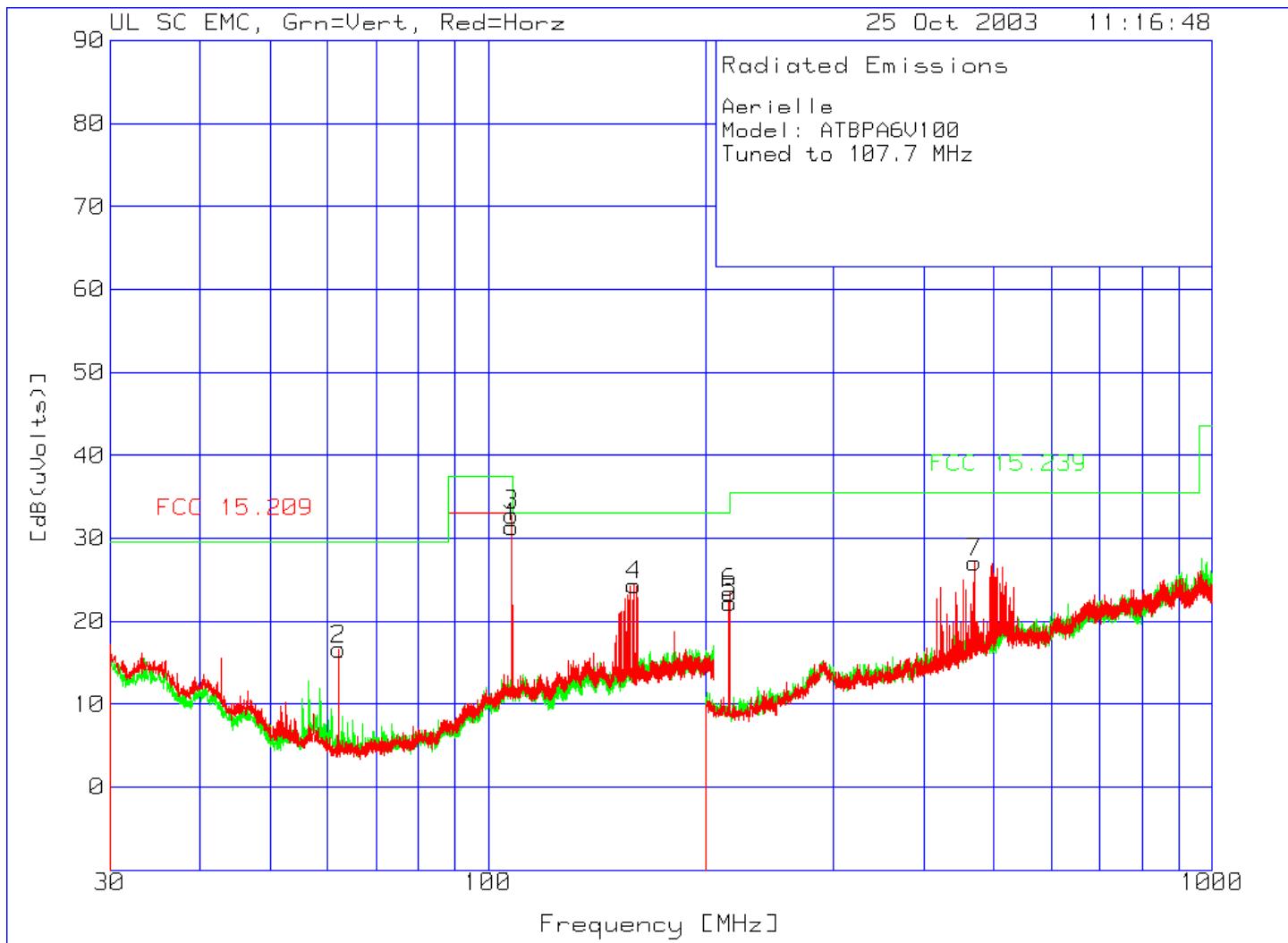
3	88.1002	55.7 pk	-27.8	9.5	37.4	33	37.5
	Azimuth:102	Height:299	Horz	Margin [dB]		4.4	-.1
4	176.2778	32.9 pk	-27.1	15.7	21.5	33	33
	Azimuth:60	Height:400	Horz	Margin [dB]		-11.5	-11.5

Range:4 200 - 1000MHz -----

5	701.0242	32.6 pk	-26	21	27.6	35.5	35.5
	Azimuth:334	Height:100	Horz	Margin [dB]		-7.9	-7.9

LIMIT 1: FCC 15.209

LIMIT 2: FCC 15.239



Aerielle

Model: ATBPA6V100

Tuned to 107.7 MHz

Test No.	Frequency [MHz]	Meter Reading [dB (uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB (uVolts)]	Limit:1	2
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Range: 1 30 - 205MHz -----

1	107.7729	46.3 pk	-27.5	12.5	31.3	33	37.5
		Azimuth:27	Height:199	Vert	Margin [dB]	-1.7	-6.2

Range:2 30 - 205MHz -----

2	62.1322	38.4 pk	-28.1	6.3	16.6	29.5	29.5
		Azimuth:320	Height:299	Horz	Margin [dB]	-12.9	-12.9
3	107.7511	48 pk	-27.5	12.3	32.8	33	37.5
		Azimuth:129	Height:399	Horz	Margin [dB]	-.2	-4.7
4	159.0532	36.2 pk	-27.3	15.4	24.3	33	33
		Azimuth:25	Height:100	Horz	Margin [dB]	-8.7	-8.7

Range:3 200 - 1000MHz -----

5	215.3885	38.3 pk	-27.3	11.2	22.2	33	33
		Azimuth:38	Height:100	Vert	Margin [dB]	-10.8	-10.8

Range:4 200 - 1000MHz -----

6	215.3885	39.9 pk	-27.3	10.8	23.4	33	33
		Azimuth:37	Height:300	Horz	Margin [dB]	-9.6	-9.6
7	469.5978	36.8 pk	-26.7	17	27.1	35.5	35.5
		Azimuth:196	Height:200	Horz	Margin [dB]	-8.4	-8.4

LIMIT 1: FCC 15.209

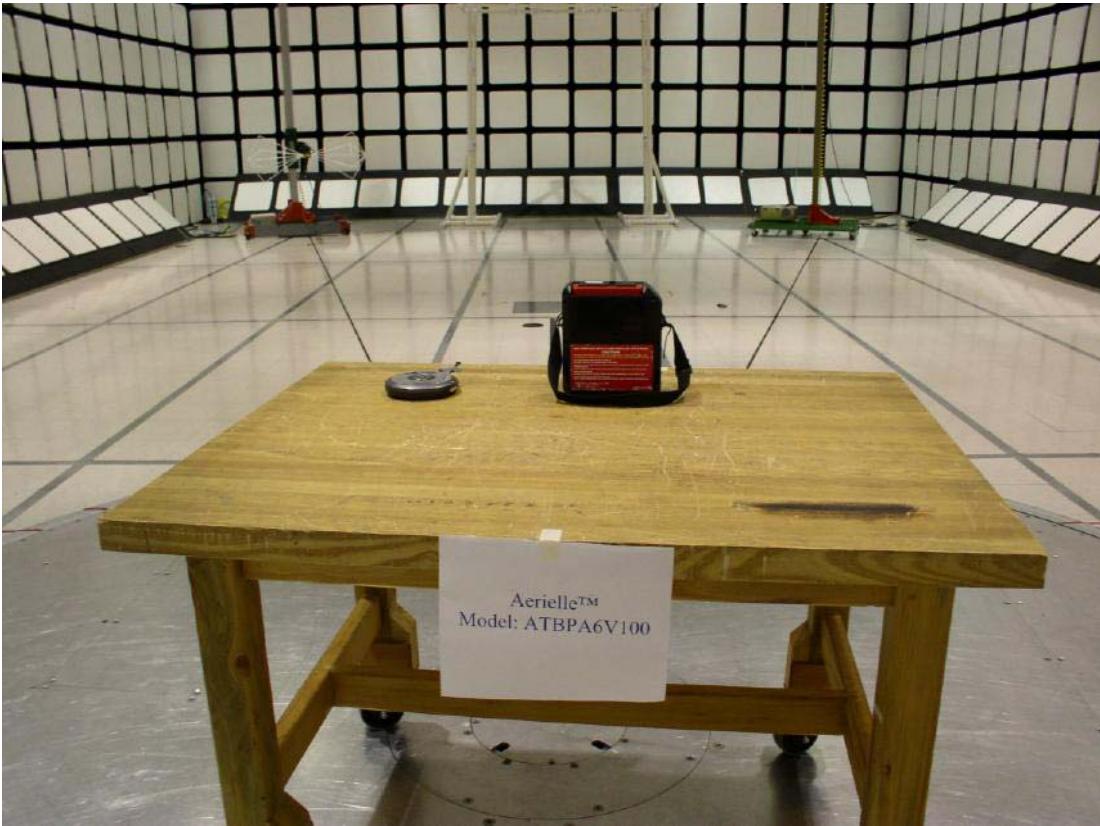
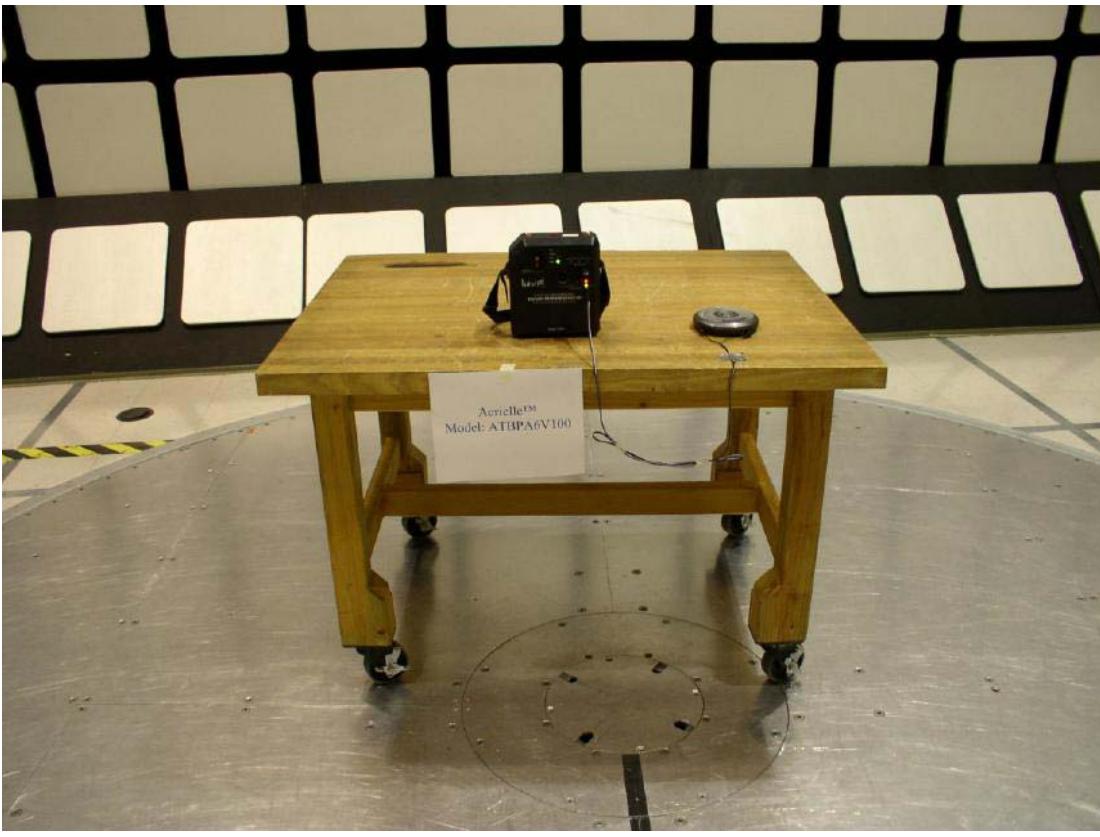
LIMIT 2: FCC 15.239

pk - Peak detector

qp - Quasi-Peak detector

av - Average detector

## Photographs



## 7.7 Occupied Bandwidth; Section 15.239(a)

### Test Location

Ground Plane #1 (Test Station 5)

Date Tested: 10/25/03

### Test Instruments

Instrument	Manufacturer	Model	ID#	Last	Cal Next
Spectrum Analyzer	Hewlett-Packard	8546A	8098	11/13/02	11/13/03

### UL Procedure

Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz. The measurement was made with the spectrum analyzer's resolution bandwidth set to (RBW) = 10 kHz. The VBW = RBW. The frequency difference of two frequencies that are attenuated 26 dB from the peak of the unmodulated signal down the slopes of the modulated signal envelope fundamental are recorded. The difference of these two frequencies gives the occupied bandwidth.

### Test Data

Fundamental Frequency (MHz)	Bandwidth (kHz)
88.1	146.5
107.7	135.0

### Test Results

The requirements are:

MET                    maximum emission bandwidth is 146.5 kHz.

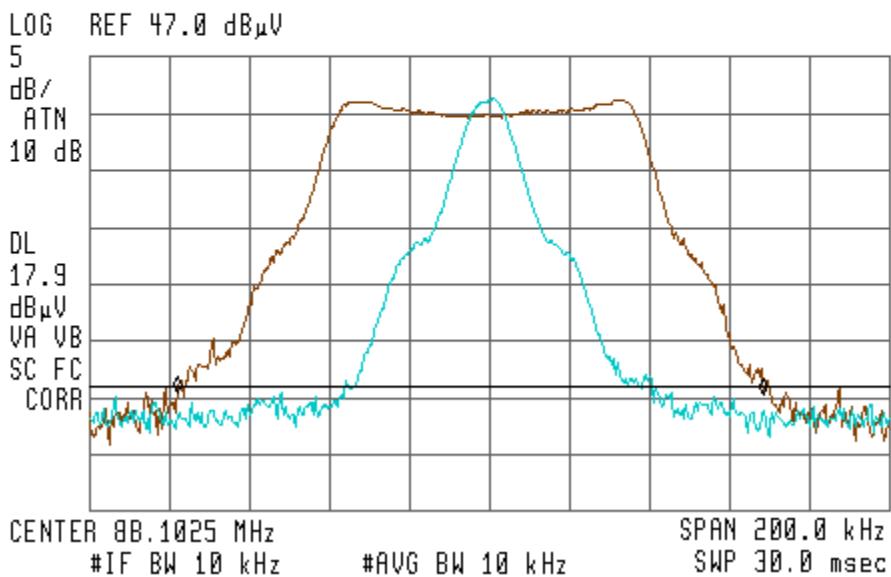
### Remarks

None

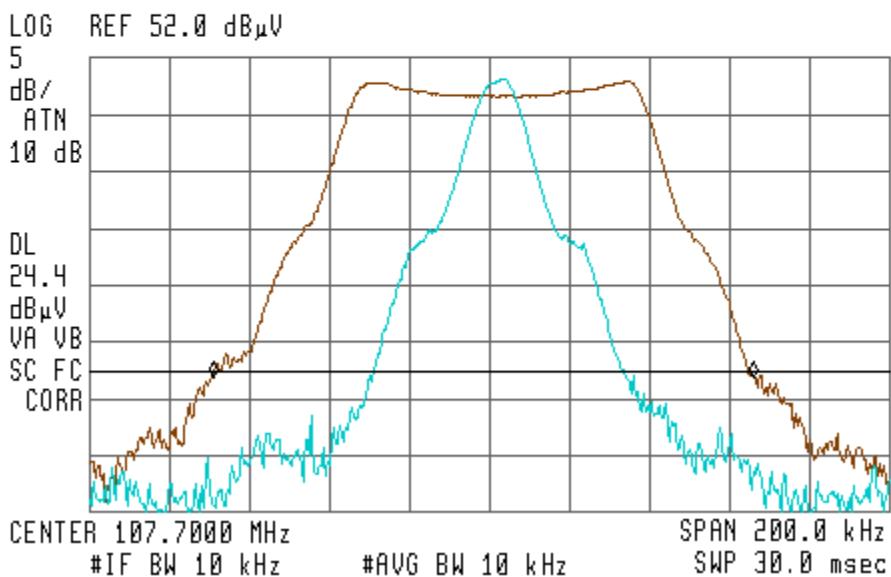
## Test Data



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR<sub>A</sub> 146.5 kHz  
.14 dB



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR<sub>A</sub> 135.0 kHz  
.00 dB



## Photographs

