

Product Name	Aperion Home Audio Link
Model No	HAL-1T
FCC ID.	BJM-HAL1T

Applicant	TATUNG CO.
Address	22, Chungshan N. Rd., 3rd Sec. Taipei, Taiwan, 104, R.O.C.

Date of Receipt	Dec 03, 2009
Issue Date	Dec. 15, 2009
Report No.	09C120R-RFUSP42V01
Report Version	V1.0

The test results relate only to the samples tested.

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# Test Report Certification

Issue Date: Dec. 15, 2009 Report No.: 09C120R-RFUSP42V01



Accredited by NIST (NVLAP) NVLAP Lab Code: 200533-0

Product Name	Aperion Home Audio Link		
Applicant	TATUNG CO.		
Address	22, Chungshan N. Rd., 3rd Sec. Taipei, Taiwan, 104, R.O.C.		
Manufacturer	TATUNG CO.		
Model No.	HAL-1T		
EUT Rated Voltage	DC 5V (Power by USB)		
EUT Test Voltage	AC 120V/60Hz		
Trade Name	Aperion		
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2008	G	
	ANSI C63.4: 2003	٧Ļ	
Test Result	Complied	ч Ч	

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Documented By :

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Approved By



(Manager / Vincent Lin)

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- Attachment 1: EUT Test Photographs
- Attachment 2: EUT Detailed Photographs

# 1. GENERAL INFORMATION

# 1.1. EUT Description

Product Name	Aperion Home Audio Link	
Trade Name	Aperion	
Model No.	HAL-1T	
FCC ID.	BJM-HAL1T	
Frequency Range	2405 – 2479MHz	
Type of Modulation	$\pi/4$ DQPSK (Differential Quadrature Phase Shift Keying)	
Number of Channels	38	
Channel Control	Auto	
Antenna Type	Printer on PCB	
Antenna Gain	Refer to the table "Antenna List"	
Audio Cable	Non-Shielded, 0.3m	
Power Adapter	MFR: Ktec, M/N: KSUFB0500050W1US	
Input: 100-240V, 50-60Hz, 0.15A		
	Output: 5.0V – 0.5A	
	Cable in: Non-Shielded, 0.09m	

### Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	TATUNG	N/A	Printer on PCB	1.88 dBi for 2.4 GHz

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Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 2:	2405 MHz	Channel 3:	2407 MHz	Channel 4:	2409 MHz
Channel 5:	2411 MHz	Channel 6:	2413 MHz	Channel 7:	2415 MHz
Channel 8:	2417 MHz	Channel 9:	2419 MHz	Channel 10:	2421 MHz
Channel 11:	2423 MHz	Channel 12:	2425 MHz	Channel 13:	2427 MHz
Channel 14:	2429 MHz	Channel 15:	2431 MHz	Channel 16:	2433 MHz
Channel 17:	2435 MHz	Channel 18:	2437 MHz	Channel 19:	2439 MHz
Channel 20:	2441 MHz	Channel 21:	2443 MHz	Channel 22:	2445 MHz
Channel 23:	2447 MHz	Channel 24:	2449 MHz	Channel 25:	2451 MHz
Channel 26:	2453 MHz	Channel 27:	2455 MHz	Channel 28:	2457 MHz
Channel 29:	2459 MHz	Channel 30:	2461 MHz	Channel 31:	2463 MHz
Channel 32:	2465 MHz	Channel 33:	2467 MHz	Channel 34:	2469 MHz
Channel 35:	2471 MHz	Channel 36:	2473 MHz	Channel 37:	2475 MHz
Channel 38:	2477 MHz	Channel 39:	2479 MHz		

Center Frequency of Each Channel:

- 1. The EUT is an Aperion Home Audio Link with a built-in 2.4GHz transceiver.
- 2. These tests are conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.247.
- 3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
- 4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

# **1.2.** Operational Description

The EUT is a Aperion Home Audio Link with a built-in 2.4GHz transceiver. The EUT operation frequency is 2.405GHz-2.479GHz. The signals modulated by  $\pi/4$  DQPSK (Differential Quadrature Phase Shift Keying) are transmitted from the Printer on PCB Antenna of the EUT.

Test Mode:	Mode 1: Transmitter
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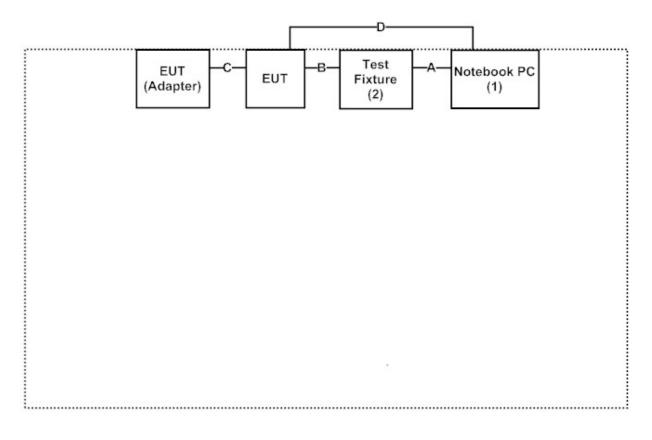
### **1.3.** Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

	Product	Manufacturer	Model No.	Serial No.	Power Cord
(1)	Notebook PC	DELL	РРТ	N/A	Non-Shielded, 0.8m
(2)	Test Fixture	TATUNG	N/A	N/A	N/A

Signa	l Cable Type	Signal cable Description
А	USB Cable	Shielded, 1.5m
в	Control Cable	Non-Shielded, 0.1m
С	USB Cable	Shielded, 1.0m
D	Audio Cable	Non-Shielded, 0.3m

# **1.4.** Configuration of Tested System



### **1.5.** EUT Exercise Software

- (1) Setup the EUT as shown in section 1.4.
- (2) Connect the EUT to a notebook via a test fixture.
- (3) Execute "AMD2 Debug.exe (V1.37.001)" on the notebook.
- (4) Setup the test channel.
- (5) Press "Apply" to start the continuous transmit.
- (6) Verify that the EUT works correctly.

### **1.6.** Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

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http://tw.quietek.com/tw/emc/accreditations/accreditations.htm

The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : <u>http://www.quietek.com/</u>

Site Description: File on

Federal Communications Commission FCC Engineering Laboratory 7435 Oakland Mills Road Columbia, MD 21046 Registration Number: 92195

Accreditation on NVLAP NVLAP Lab Code: 200533-0





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FCC Accreditation Number: TW1014



# 2. Conducted Emission

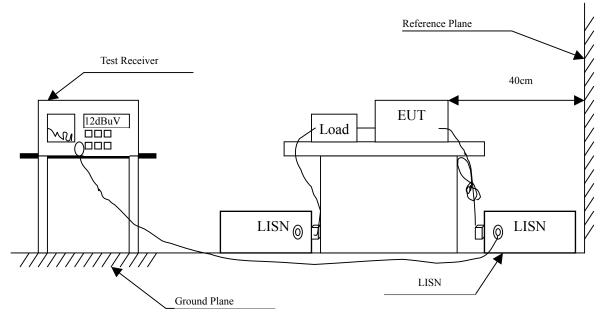
### 2.1. Test Equipment

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 2009	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2009	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2009	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2009	
5	No.1 Shielded Roo	m		N/A	

Note: All instruments are calibrated every one year.

# 2.2. Test Setup



### 2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit				
Frequency	I	limits		
MHz	QP	AVG		
0.15 - 0.50	66-56	56-46		
0.50-5.0	56	46		
5.0 - 30	60	50		

### 2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

# 2.5. Uncertainty

± 2.26 dB

### 2.6. Test Result of Conducted Emission

:	Aperion Home Audio Link
:	Conducted Emission Test
:	Line 1
:	Mode 1: Transmitter (2441MHz)
	:

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV	dB	dBuV
Line 1					
Quasi-Peak					
0.181	9.724	40.960	50.684	-14.430	65.114
0.240	9.680	35.010	44.690	-18.739	63.429
0.302	9.650	28.510	38.160	-23.497	61.657
0.361	9.650	22.000	31.650	-28.321	59.971
1.880	9.680	19.230	28.910	-27.090	56.000
3.888	9.700	22.940	32.640	-23.360	56.000
Average					
0.181	9.724	31.760	41.484	-13.630	55.114
0.240	9.680	27.740	37.420	-16.009	53.429
0.302	9.650	10.270	19.920	-31.737	51.657
0.361	9.650	15.190	24.840	-25.131	49.971
1.880	9.680	16.240	25.920	-20.080	46.000
3.888	9.700	17.180	26.880	-19.120	46.000

Note:

1. All Reading Levels are Quasi-Peak and average value.

2. "means the worst emission level.

3. Measurement Level = Reading Level + Correct Factor

Product	: Aperion Home Audio Link					
Test Item	: Conducted Emission Test					
Power Line	: Line 2					
Test Mode	: Mode 1:	Transmitter (244	1MHz)			
Frequency	Correct	Reading	Measurement	Margin	Limit	
	Factor	Level	Level			
MHz	dB	dBuV	dBuV	dB	dBuV	
Line 2						
Quasi-Peak						
0.181	9.732	40.920	50.652	-14.462	65.114	
0.244	9.689	35.340	45.029	-18.285	63.314	
0.298	9.660	24.020	33.680	-28.091	61.771	
0.353	9.655	10.950	20.605	-39.595	60.200	
3.822	9.700	26.010	35.710	-20.290	56.000	
15.466	10.000	8.840	18.840	-41.160	60.000	
Average						
0.181	9.732	32.030	41.762	-13.352	55.114	
0.244	9.689	26.810	36.499	-16.815	53.314	
0.298	9.660	19.500	29.160	-22.611	51.771	
0.353	9.655	3.310	12.965	-37.235	50.200	
3.822	9.700	19.630	29.330	-16.670	46.000	
15.466	10.000	3.060	13.060	-36.940	50.000	

- 1. All Reading Levels are Quasi-Peak and average value.
- 2. "means the worst emission level.
- 3. Measurement Level = Reading Level + Correct Factor

# **3.** Peak Power Output

### **3.1.** Test Equipment

The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Х	Power Meter	Anritsu	ML2495A/6K00003357	May, 2009
Х	Power Sensor	Anritsu	MA2491A/034457	May, 2009

Note: 1. All instruments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

### 3.2. Test Setup

Conducted Measurement



### 3.3. Limits

The maximum peak power shall be less 1 Watt.

### **3.4.** Test Procedure

The EUT was tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

### 3.5. Uncertainty

 $\pm$  1.27 dB

# **3.6.** Test Result of Peak Power Output

Product	:	Aperion Home Audio Link
Test Item	:	Peak Power Output Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmitter

Channel No.	Frequency (MHz)	Measurement	Required Limit	Result
Channel 02	2405.00	-7.80dBm	1Watt= 30 dBm	Pass
Channel 20	2441.00	-8.39dBm	1Watt= 30 dBm	Pass
Channel 39	2479.00	-9.20dBm	1Watt= 30 dBm	Pass

### 4. Radiated Emission

### 4.1. Test Equipment

The following test equipment are used during the radiated emission test:

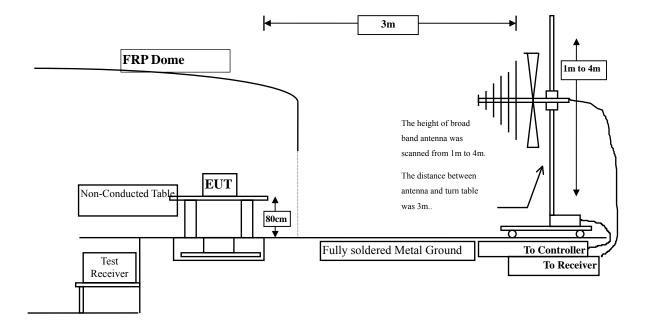
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 3	Х	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2009
	Х	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2009
	Х	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2009
	Х	Pre-Amplifier	AGILENT	8447D/2944A09549	Sep., 2009
	Х	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2009
	Х	Spectrum Analyzer	Advantest	R3162/91700283	Oct., 2009
	Х	Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2009
	Х	Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	Х	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

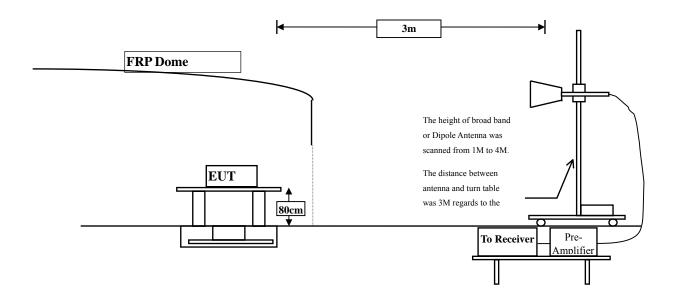
2. The test instruments marked with "X" are used to measure the final test results.

### 4.2. Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



### 4.3. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits				
Frequency MHz	uV/m @3m	dBuV/m@3m		
30-88	100	40		
88-216	150	43.5		
216-960	200	46		
Above 960	500	54		

Remarks: E field strength  $(dBuV/m) = 20 \log E$  field strength (uV/m)

### 4.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003 and tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2003 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement. The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna. The worst radiated emission is measured in the Open Area Test Site on the Final Measurement. The measurement frequency range form 30MHz - 10th Harmonic of fundamental was investigated.

### 4.5. Uncertainty

- ± 3.9 dB above 1GHz
- ± 3.8 dB below 1GHz

### 4.6. Test Result of Radiated Emission

Product	:	Aperion Home Audio Link
Test Item	:	Harmonic Radiated Emission Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmitter (2405MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4810.000	9.607	45.950	55.556	-18.444	74.000
7215.000	14.334	43.700	58.035	-15.965	74.000
9620.000	19.708	33.840	53.549	-20.451	74.000
Average					
<b>Detector:</b>					
4810.000	9.607	38.710	48.316	-5.684	54.000
7215.000	14.334	29.750	44.085	-9.915	54.000
Vertical					
Peak Detector:					
4810.000	8.347	45.980	54.326	-19.674	74.000
7215.000	15.419	44.050	59.469	-14.531	74.000
9620.000	18.918	36.120	55.039	-18.961	74.000
Average					
<b>Detector:</b>					
4810.000	8.347	38.350	46.696	-7.304	54.000
7215.000	15.419	37.030	52.449	-1.551	54.000
9620.000	18.918	22.640	41.559	-12.441	54.000

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. "\*", means this data is the worst emission level.
- 5. Measurement Level = Reading Level + Correct Factor.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product	: Aperion Home Audio Link						
Test Item	: Harmonic Radiated Emission Data						
Test Site	: No.3 OATS						
Test Mode	: Mode 1:	Transmitter (244	1 MHz)				
Frequency	Correct	Reading	Measurement	Margin	Limit		
	Factor	Level	Level				
MHz	dB	dBuV	dBuV/m	dB	dBuV/m		
Horizontal							
<b>Peak Detector:</b>							
4882.000	9.489	45.910	55.399	-18.601	74.000		
7323.000	14.568	35.830	50.398	-23.602	74.000		
9764.000	20.055	36.050	56.105	-17.895	74.000		
Average							
<b>Detector:</b>							
4882.000	9.489	40.880	50.369	-3.631	54.000		
7323.000	14.568	25.440	40.008	-13.992	54.000		
9764.000	20.055	22.570	42.625	-11.375	54.000		
Vertical							
<b>Peak Detector:</b>							
4882.000	8.979	42.860	51.839	-22.161	74.000		
7323.000	15.262	39.850	55.112	-18.888	74.000		
9764.000	19.255	35.750	55.005	-18.995	74.000		
Average							
Detector:							
7323.000	15.262	31.600	46.862	-7.138	54.000		
9764.000	19.255	22.490	41.745	-12.255	54.000		

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. "\*", means this data is the worst emission level.
- 5. Measurement Level = Reading Level + Correct Factor.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product Test Item	<ul> <li>Aperion Home Audio Link</li> <li>Harmonic Radiated Emission Data</li> </ul>							
Test Site	: No.3 OA	: No.3 OATS						
Test Mode	: Mode 1:	Transmitter (247	9 MHz)					
Frequency	Correct	Reading	Measurement	Margin	Limit			
	Factor	Level	Level					
MHz	dB	dBuV	dBuV/m	dB	dBuV/m			
Horizontal								
Peak Detector:								
4958.000	9.421	46.080	55.501	-18.499	74.000			
7437.000	15.001	37.060	52.061	-21.939	74.000			
9916.000	19.756	37.250	57.006	-16.994	74.000			
Average								
<b>Detector:</b>								
4958.000	9.421	41.020	50.441	-3.559	54.000			
9916.000	19.756	22.750	42.506	-11.494	54.000			
Vertical								
Peak Detector:								
4958.000	9.699	42.300	51.999	-22.001	74.000			
7437.000	15.378	39.180	54.558	-19.442	74.000			
9916.000	18.901	34.980	53.881	-20.119	74.000			
Average								
<b>Detector:</b>								
7437.000	15.378	31.230	46.608	-7.392	54.000			

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. "\*", means this data is the worst emission level.
- 5. Measurement Level = Reading Level + Correct Factor.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product	:	Aperion Home Audio Link
Test Item	:	General Radiated Emission Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmitter (2441 MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
111.480	-8.317	37.327	29.010	-14.510	43.520
258.920	-5.458	34.309	28.851	-17.169	46.020
365.620	-1.817	27.328	25.511	-20.509	46.020
563.500	1.040	26.659	27.700	-18.320	46.020
720.640	3.021	23.772	26.793	-19.227	46.020
912.700	5.660	20.509	26.169	-19.851	46.020
Vertical					
55.220	-5.133	38.197	33.064	-6.936	40.000
109.540	-0.829	34.224	33.395	-10.125	43.520
208.480	-8.201	33.322	25.121	-18.399	43.520
499.480	-1.342	25.582	24.239	-21.781	46.020
699.300	0.242	26.345	26.587	-19.433	46.020
965.080	7.397	20.521	27.918	-26.082	54.000

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. "\*", means this data is the worst emission level.
- 5. Measurement Level = Reading Level + Correct Factor.

6. The average measurement was not performed when the peak measured data under the limit of average detection.

### 5. **RF** antenna conducted test

### 5.1. Test Equipment

The following test equipments are used during the radiated emission tests:

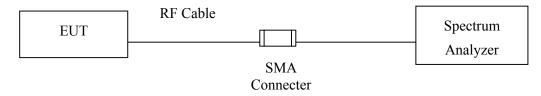
	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Nov, 2009
	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2009
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

2. The test instruments marked with "X" are used to measure the final test results.

### 5.2. Test Setup

### **RF** antenna Conducted Measurement:



### 5.3. Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

### 5.4. Test Procedure

The EUT was tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Set VBW> RBW, scan up through 10th harmonic.

# 5.5. Uncertainty

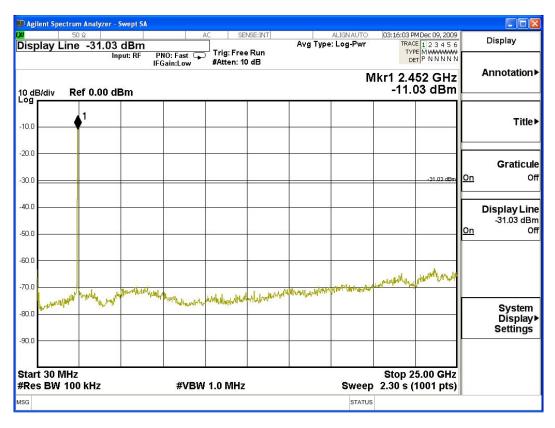
The measurement uncertainty Conducted is defined as  $\pm$  1.27dB

# 5.6. Test Result of RF antenna conducted test

Product	:	Aperion Home Audio Link
Test Item	:	RF antenna conducted test
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmitter

### Channel 02 (2405MHz) 30-25GHz

💴 Agilent Spectrum Analyzer - Sw	rept SA	122				500 100			
<mark>ιχί</mark> 50 Ω	A	C SENS	E:INT	Avg Type	ALIGN AUTO		MDec 09, 2009		Display
Display Line -30.49 d	I <b>BM</b> t: RF PNO: Fast ⊊⊃ IFGain:Low	Trig: Free F #Atten: 10 c		Avg Type	: Log-Pwr	TYP	E 1 2 3 4 5 6 E MWWWWW T P N N N N N		
10 dB/div Ref 0.00 dB	m				М		02 GHz 19 dBm		Annotation►
-10.0									Title►
-20.0							-30.49 dBm	<u>On</u>	Graticule Off
-40.0								<u>On</u>	Display Line -30.49 dBm Off
-60.0	televenture .		. al. ab	in the second states of the	and the state of the	La Lader Marsha	bruner bielym		
-80.0	tater-activestry-Matthedralam	while when the second des	land low and a second	and Articles 2					System Display Settings
Start 30 MHz #Res BW 100 kHz	#VBW	1.0 MHz			Sweep		5.00 GHz 1001 pts)		
MSG					STATUS				



### Channel 20 (2441MHz) 30-25GHz

### Channel 39 (2479MHz) 30-25GHz



#### 6. **Band Edge**

#### 6.1. **Test Equipment**

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
		Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2009
	Х	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2009
	Х	Pre-Amplifier	AGILENT	8447D/2944A09549	Sep., 2009
Site # 3	Х	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2009
	Х	Spectrum Analyzer	Advantest	R3162/91700283	Oct., 2009
	Х	Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2009
	Х	Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	Х	Coaxial Switch	Anritsu	MP59B/6200265729	N/A
	Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

The following test equipments are used during the band edge tests:

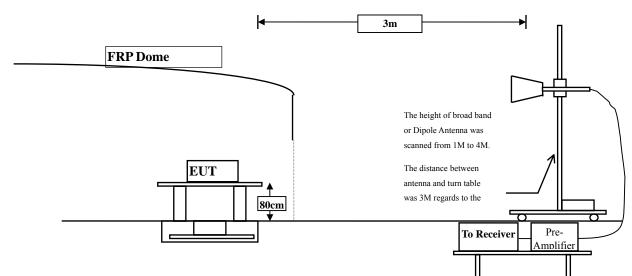
### Note:

1. All instruments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

#### 6.2. **Test Setup**

### **RF Radiated Measurement:**



#### 6.3. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

### 6.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003 and tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2003 on radiated measurement.

### 6.5. Uncertainty

- ± 3.9 dB above 1GHz
- ± 3.8 dB below 1GHz

### 6.6. Test Result of Band Edge

Product	:	Aperion Home Audio Link
Test Item	:	Band Edge Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmitter-Channel 02

# Fundamental Filed Strength

Antenna	Frequency	Correction Factor	Reading Level	Emission Level	Detector
Pole	[MHz]	[dB/m]	[dBuV]	[dBuV/m]	
Horizontal	2405	36.603	63.35	99.953	Peak
Horizontal	2405	36.603	60.51	97.113	Average
Vertical	2405	35.599	67.19	102.789	Peak
Vertical	2405	35.599	64.64	100.239	Average

Note: 1:Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

Average detector: RBW=1MHz, VBW=30Hz

# Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	$\Delta$ (dB)	Band Edge Field Strength (dBuV/m)	Detector
Horizontal	2342.1	99.953	53.47	46.483	Peak
Horizontal	2380.8	97.113	63.01	34.103	Average
Vertical	2342.1	102.789	53.47	49.319	Peak
Vertical	2380.8	100.239	63.01	37.229	Average

Note:

The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

Band Edge field Strength = F -  $\Delta$ 

F = Fundamental field Strength (Peak or Average)

 $\Delta$  = Conducted Band Edge Delta (Peak or Average)

Agilent Spectrum Analyzer	- Swept SA				
50 Ω larker 4 2.400000	Input: RF PNO: Fast		ALIGN AUTO Avg Type: Log-Pwr	10:17:48 AM Dec 08, 2009 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N	Marker
0 dB/div Ref 0.00	IFGain:Low	, #Atten: 10 dB	Mk	r4 2.400 0 GHz -47.01 dBm	Select Marke
					Norm
0.0 0.0 30.0 30.0		2	4	and when the second second second	De
0.0 0.0 0.0					Fixe
enter 2.39000 GHz Res BW 1.0 MHz R MODE TRC SCL		BW 1.0 MHz	#Sweep	Span 100.0 MHz 500 ms (1001 pts)	į
1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5	2.404 8 GHz 2.390 0 GHz 2.342 1 GHz 2.400 0 GHz	-7.06 dBm -62.96 dBm -60.53 dBm -47.01 dBm			Propertie
8 9 0 1					<b>M</b> c 1 c
2					

# Peak Detector of conducted Band Edge Delta

### Average Detector of conducted Band Edge Delta

💭 Agilent Spectrum Analyzer -	Swept SA				
Marker 4 2.400000		AC SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	10:18:20 AM Dec 08, 2009 TRACE 1 2 3 4 5 6	Marker
h	nput: RF PNO: Fast 🕞 IFGain:Low	Trig: Free Run #Atten: 10 dB	641.		Select Marker
10 dB/div Ref 0.00 d	IBm			r4 2.400 0 GHz -59.35 dBm	4
- <b>og</b> 10.0			1		
20.0			+		Norm
10.0					-
i0.0			4		De
60.0		∧ <sup>3</sup> ∧2			
70.0				^	
30.0					Fixe
enter 2.39000 GHz				Snop 100 0 MHz	
Res BW 1.0 MHz	#VBV	V 10 Hz	Sweep	Span 100.0 MHz 7.80 s (1001 pts)	c
ikr mode tro scl 1 N 1 f	× 2.405 0 GHz	-9.59 dBm	INCTION FUNCTION WIDTH	FUNCTION VALUE	12
2 N 1 f 3 N 1 f	2.390 0 GHz 2.380 8 GHz	-74.38 dBm -72.60 dBm			
4 N 1 f	2.400 0 GHz	-59.35 dBm			Propertie
6 7					
8 9					Мо
					1 0
12 12 SG			STATUS		
			STATUS		

Product	:	Aperion Home Audio Link
Test Item	:	Band Edge Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmitter -Channel

# Fundamental Filed Strength

Antenna	Frequency Correction Factor		Correction Factor Reading Level		Detector
Pole	[MHz]	[dB/m]	[dB(uV)]	[dB(uV/m)]	
Horizontal	2479	36.706	60.09	96.796	Peak
Horizontal	2479	36.706	57.05	93.756	Average
Vertical	2479	36.156	63.96	100.116	Peak
Vertical	2479	36.156	61.17	97.326	Average

39

Note: 1:Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

Average detector: RBW=1MHz, VBW=30Hz

# Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	$\Delta$ (dB)	Band Edge Field Strength (dBuV/m)	Detector
Horizontal	2483.5	96.796	40.53	56.266	Peak
Horizontal	2483.5	93.756	50.86	42.896	Average
Vertical	2483.5	100.116	40.53	59.586	Peak
Vertical	2483.5	97.326	50.86	46.466	Average

Note:

The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements

per the Marker-Delta Method with the following formula:

Band Edge field Strength = F -  $\Delta$ 

F = Fundamental field Strength (Peak or Average)

 $\Delta$  = Conducted Band Edge Delta (Peak or Average)

					vept SA	nalyzer - Swe		nt Spec	Agile
Marker	10:18:52 AM Dec 08, 2009 TRACE 1 2 3 4 5 6	ALIGNAUTO Type: Log-Pwr	A	AC SENS	00000 GHz	33500000	50 Ω 2.48	er 2	ark
Select Marke	DET P N N N N		n	Trig: Free F #Atten: 10		Input:			
	r2 2.483 5 GHz -48.83 dBm	Mk			m	0.00 dBm	Ref	div	dB
				<u>(</u> 1					
Norr				()					.0
									.0
De							_		.0
	halo and a local state of the second	waren agenterales	La mar		مرسحية للقيص بمحمد والمتحم معدار المقداميم	والار والمعالية والمعالمة		Lost Culle	.0
	an a	and address day			and the second	- Handler			.0
Fixe									.0
									.0
	Span 100.0 MHz			50. Vie	10	GHz	8350	er 2.4	L Int
ĵ	500 ms (1001 pts)	#Sweep		W 1.0 MHz	#VE	Hz	1.0 M	BW	es
	FUNCTION VALUE	FUNCTION WIDTH	FUNCTIO	Y	X			DDE TR	
				-8.30 dB	2.479 1 GHz 2.483 5 GHz		f	V 1 V 1	
Burnette				1992 - 1998 (1999 - 1999) - 1999					
Propertie									
M								-	
1.								_	
									2
		STATUS							i

### Peak Detector of conducted Band Edge Delta

# Average Detector of conducted Band Edge Delta

								- Swept SA			ent Spe	
Marker	E 1 2 3 4 5 6	TRAC	ALIGNAUTO : Log-Pwr	Avg Typ			GHz	000000	83500	50 s 2.4	ker 2	l Iarl
Select Marker						#Atten: 10	PNO: Fast C IFGain:Low					
2	35 GHz 35 dBm	r2 2.483 -61.5	Mk					dBm	f 0.00 c	Ref	div	0 dE
						1						. <b>og</b> 10.0
Norma				-		A				_		20.0
						+				-		30.0
D. H						$\uparrow$						40.0
Delta					2							50.0 60.0
				0	1mg	/				_		70.0
Fixed					~		~					80.0
						- 0						90.0
	00.0 MHz	Span 1			25				0 GHz			
01	1001 pts)					V 10 Hz	#VB				BW	
	IN VALUE	FUNCTIO	ICTION WIDTH	NCTION	3m	-10.99 di	90 GHz			f	IDDE TI N 1	1
				1	3m	-61.85 d	35GHz	2.48		f	N 1	3
Properties												4
												6 7
Mor												8 9
1 of 2				1			1					10 11
			OTATIO									12
			STATUS									SG

# 7. Occupied Bandwidth

### 7.1. Test Equipment

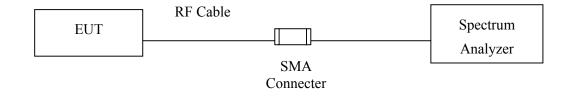
The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.	
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr, 2009	_

Note: 1. All instruments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

### 7.2. Test Setup



### 7.3. Limits

The minimum bandwidth shall be at least 500 kHz.

# 7.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003; tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements. Set RBW = 100 kHz, Span greater than RBW.

# 7.5. Uncertainty

 $\pm$  150Hz

# 7.6. Test Result of Occupied Bandwidth

Product	:	Aperion Home Audio Link
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmitter (2405MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
02	2405.00	1100	>500	Pass

# Figure Channel 02:

enter 2.40500 GHz Res BW 100 kHz	#	<b>#VBW</b> 100 kH	Iz	#Sweep	Span 20.00 MHz 500 ms (1001 pts)	
0.0						Mo
0.0						Mkr→RefL
0.0 0.0 0.0 0.0	1 <sup>2</sup> .			- WANN	harmond rahilian	Mkr→
0.0	a Warman Manuel a			- White		
0.0		un <sup>1</sup>		<u>\</u>		Marker De
0.0		mar wo	1	А.		
0.0						Next L
0.0			-6.00 dB 1.10 MH	z		
0.0						Next Rig
dB/div Ref 0.00 d	Bm		- 100	Mkı	1 2.404 86 GHz -8.584 dBm	
	put: RF PNO: F IFGain:1			g Hold:>100/100	DET P N N N N	NextPe
50 Ω arker 1 2.4048600	00000 GHz	AC	SENSE:INT	ALIGNAUTO g Type: Log-Pwr	04:02:11 PM Dec 07, 2009 TRACE 1 2 3 4 5 6	Peak Search

Product	:	Aperion Home Audio Link
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmitter (2441MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
20	2441.00	1080	>500	Pass

# Figure Channel 20:

Input: R			g Type: Log-Pwr g Hold: 32/100	TRACE 1 2 3 4 5 6 TYPE MWWWWWW DET P N N N N N	Peak Search
dB/div Ref 0.00 dBm	in connection		Mkr	1 2.441 32 GHz -9.332 dBm	NextPea
<b>g</b> 		-6.00 dB			Next Rig
.0		1.08 MHz	:		Next Le
).0		How with	<u>\</u>		Marker De
0.0 .0 .0	Manyard Maria		harden		Mkr→0
0.0 Ring bland			*~~1	Any no statistizione in a statistica and	
.0					Mkr→RefL
enter 2.44100 GHz Res BW 100 kHz	#VBW 100	(H7	#Sween	Span 20.00 MHz 500 ms (1001 pts)	<b>Мо</b> 1 о

Product	:	Aperion Home Audio Link
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmitter (2479MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2479.00	1100	>500	Pass

# Figure Channel 39:

50 Ω arker 1 2.47898000000		ENSE:INT Avg T	ALIGNAUTO	04:09:05 PM Dec 07, 2009 TRACE 1 2 3 4 5 6	Peak Search
Input: RF	PNO: Fast Trig: Fr IFGain:Low Atten: 1		ld: 77/100	DET P N N N N N	
dB/div Ref 0.00 dBm			Mkr	2.478 98 GHz -10.628 dBm	NextPea
		1			Next Rig
0.0		-6.00 dB			
					Next Le
2.0	work work	how my			
2.0					Marker De
2013 B	hope with		Why .		
0.0			Lan Verynaur	An Anna Anna Anna Anna Anna Anna Anna A	Mkr→
J.U Josho And				Wyought Wandelshi	
0.0					Mkr→RefL
0.0					Mo
enter 2.47900 GHz Res BW 100 kHz	#VBW 100 kH	7	#Sween	Span 20.00 MHz 500 ms (1001 pts)	1 0

### 8. Power Density

### 8.1. Test Equipment

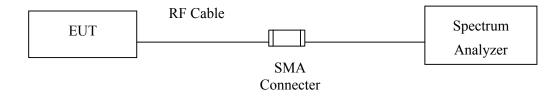
The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr, 2009
	4 4 11 4 4			

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

### 8.2. Test Setup



### 8.3. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

# 8.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003; tested according to DTS test procedure of Mar. 2005 KDB558074 for compliance to FCC 47CFR 15.247 requirements. Set RBW= 3 kHz, VBW=10KHz, Sweep time=(SPAN/3KHz), detector=Peak detector

# 8.5. Uncertainty

 $\pm$  1.27 dB

# 8.6. Test Result of Power Density

Product	:	Aperion Home Audio Link
Test Item	:	Power Density Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmitter (2405MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
02	2405.00	-21.284	< 8dBm	Pass

# Figure Channel 02:

Marker 1         Z.405195000000 GHZ         Trig: Free Run         Avg type. Log-rwr         Trig: Trig: Free Run           Input: RF         PNO: Far         Trig: Free Run         Avg type. Log-rwr         N           10 dB/div         Ref 0.00 dBm         -21.284 dBm         -21.284 dBm         N           200         1         -1         -1         -21.284 dBm         N           300         -1         -1         -1         -21.284 dBm         N           300         -1         -1         -1         -21.284 dBm         N           300         -1	0	1Dec 07, 2009	04:04:51 PN	ALIGNAUTO		VSE:INT	C SE	A.		0Ω		KI 🛛
Mkr1 2.405 195 0 GHz         N           0 dB/div         Ref 0.00 dBm         -21.284 dBm         N           00         1         1         1         N           00         1         1         1         1         N           00         1         1         1         1         1         N           00         1	Search	MWWWWW	TYP					NO: Far 😱	put: RF P		ker 12	larl
10.0     1     1     1     1     1       20.0     1     1     1     1     1       30.0     1     1     1     1     1       40.0     1     1     1     1     1       50.0     1     1     1     1     1       60.0     1     1     1     1     1	lext Pea			Mkr1 2.4						ef 0.00 d	3/div F	0 dE
	ext Rigi						-					
	Next Le	twaysoft, but	ĸŀ?ŷĸ-ĂţĸĿĬſĬĬŎĬġĬ	Nalisian weeks	uhafhyriyyyynau	llaiset-ikilvinii	leithwighter	whenthe	mhurneridylite	₽₽ <b>₩₩₩₽₩₩₩₩₩₩₩₩₩₩</b>	Yadir.yaj dukulu	
	ker De											
	Mkr→(											
	→RefL											
0.0 enter 2.4052400 GHz Res BW 3.0 kHz #VBW 10 kHz #Sweep 100 s (1001 pts)	<b>Mo</b> 1 of			#Sweep			10 kHz	#VBW	Z			ent

Product	:	Aperion Home Audio Link
Test Item	:	Power Density Data
Test Site	:	No.3OATS
Test Mode	:	Mode 1: Transmitter (2441MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
20	2441.000	-22.397	< 8dBm	Pass

# Figure Channel 20:

50 Ω	- Swept SA AC	SENSE:INT		04:08:02 PM Dec 07, 2009	Dank Danak
		Avg Typ Free Run Avg Hold n: 10 dB	e: Log-Pwr : 1/100	TRACE 123456 TYPE MWWWWW DET PNNNNN	Peak Search
0 dB/div Ref 0.00 (	dBm		Mkr1 2.4	41 207 2 GHz -22.397 dBm	NextPea
og 0.0					Next Rig
20.0 /**/thm./*/in./*/in./*/in/**/in/**/in/**/in/**/in/**/in/**/in/**/in/**/in/**/in/**/in/**/in/**/in/**/in/**/in/*	and war and the stand of the st	r/ballacontrologicality.com	hutophotometer	4+1-4+hrille,atmy.uperpresed	Next Lo
0.0				F	Marker De
0.0					Mkr→
0.0				F	Mkr→Refl
0.0					Ма
enter 2.4413200 GI Res BW 3.0 kHz	lz #VBW 10 k	· · · ·	#Sween	Span 300.0 kHz 100 s (1001 pts)	1 o

:	Aperion Home Audio Link
:	Power Density Data
:	No.3 OATS
:	Mode 1: Transmitter (2479MHz)
	:

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
39	2479.00	-21.888	< 8dBm	Pass

### Figure Channel 39:

Peak Search	04:11:16 PM Dec 07, 2009 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N	ALIGNAUTO : Log-Pwr 1/100	Avg Ty: Avg Hol		Trig: Free Atten: 10		000000 G		ker 1	larl
NextPea	479 073 0 GHz -21.888 dBm	Mkr1 2.4						Ref 0.00 (	3/div	
Next Rig						2	~			<b>og</b> 0.0
	● <sup>1</sup> F	•		-						0.0
Next L	an water you wanter and the second	uyurahayulaya	1/4akahahayya	erlyenthereten	ntilleformaniskyllister		yladyirayylary	nlphiliphytywalwyty	nthouna	0.0
MarkerD										D.O
Marker De				·				4		0.0
Mkr→							-			D.O
94994417213994 - 613				2						0.0
Mkr→Refl	[									0.0
				£				-		0.0
Mc 1 c	Span 300.0 kHz							89800 GÎ	ter 2.47	en
		#Sweep			10 kHz	#VBW	-		s BW 3	

# 9. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs