



RADIO TEST REPORT

Test Report No. : 31EE0033-HO-01-B

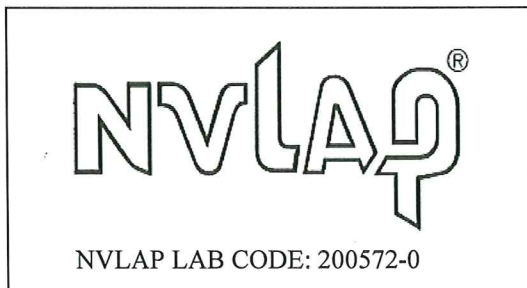
Applicant : ONKYO SOUND & VISION Corporation
Type of Equipment : UNIVERSAL PORT MODULE FOR AIRPLAY
Model No. : UP-AR1
FCC ID : ATMUPAR1
Test regulation : FCC Part 15 Subpart C: 2010
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
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Date of test: April 19 to June 21, 2011

Representative test engineer: T. Shimada
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SECTION 1: Customer information

Company Name : ONKYO SOUND & VISION Corporation
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SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : UNIVERSAL PORT MODULE FOR AIRPLAY
Model No. : UP-AR1
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 12V
Receipt Date of Sample : April 17, 2011
Country of Mass-production : Malaysia
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product description

Model No: UP-AR1 (referred to as the EUT in this report) is the UNIVERSAL PORT MODULE FOR AIRPLAY.

General Specification

Clock frequency(ies) in the system : 6MHz, 24MHz, 50MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2412-2462MHz
Modulation : DSSS/OFDM
Power Supply (radio part input) : DC 1.2V, DC 1.9V, DC 3.3V, DC 5.0V
Antenna type : PIFA Antenna
Antenna Gain : 3.0488dBi max

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2010, final revised on December 6, 2010 and effective January 5, 2011

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz,
2400-2483.5MHz, and 5725-5850MHz

3.2 Procedures and results

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|---|--|---|---|----------|------------------------|
| Conducted Emission | FCC: ANSI C63.4:2003 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 7.2.4 | FCC: Section 15.207 ----- IC: RSS-Gen 7.2.4 | [QP] 21.4dB 0.22149MHz, N 0.22049MHz, L [AV] 21.2dB, 0.22049MHz, L | Complied | - |
| 6dB Bandwidth | FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.6.2 | FCC: Section 15.247(a)(2) ----- IC: RSS-210 A8.2(a) | See data. | Complied | Conducted |
| Maximum Peak Output Power | FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.8 | FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4) | | Complied | Conducted |
| Power Density | FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: - | FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b) | | Complied | Conducted |
| Spurious Emission Restricted Band Edges | FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.9 | FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.3 | 1.6dB 9748MHz, AV, Vert. | Complied | Conducted/ Radiated |

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

FCC 15.31 (e)

This EUT provides stable voltage(DC 1.2V, DC 1.9V, DC 3.3V, DC 5.0V) constantly to RF part regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|------------------------|-------------------|-------------------|--------------|---------|-----------|
| 99% Occupied Bandwidth | IC: RSS-Gen 4.6.1 | IC: RSS-Gen 4.6.1 | N/A | - | Conducted |

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

| Test room (semi-anechoic chamber) | Conducted emission (+dB) |
|--------------------------------------|-----------------------------|
| | 150kHz-30MHz |
| No.1 | 3.1dB |
| No.2 | 3.3dB |
| No.3 | 3.7dB |
| No.4 | 3.2dB |

| Test room (semi-anechoic chamber) | Radiated emission | | | | | | |
|--------------------------------------|-------------------|------------------|-----------------|----------------|-----------------|-------------------|-------------------|
| | (3m*)(+dB) | | | | (1m*)(+dB) | | (0.5m*)(+dB) |
| | 9kHz -30MHz | 30MHz -300MHz | 300MHz -1GHz | 1GHz -10GHz | 10GHz -18GHz | 18GHz -26.5GHz | 26.5GHz -40GHz |
| No.1 | 3.5dB | 5.1dB | 5.2dB | 4.8dB | 5.1dB | 4.4dB | 4.3dB |
| No.2 | 4.0dB | 5.1dB | 5.2dB | 4.8dB | 5.0dB | 4.3dB | 4.2dB |
| No.3 | 4.2dB | 4.7dB | 5.2dB | 4.8dB | 5.0dB | 4.5dB | 4.2dB |
| No.4 | 4.0dB | 5.0dB | 5.1dB | 4.8dB | 5.0dB | 5.1dB | 4.2dB |

*3m/1m/0.5m = Measurement distance

| Power meter (+dB) | |
|-------------------|------------|
| Below 1GHz | Above 1GHz |
| 1.0dB | 1.0dB |

| Antenna terminal conducted emission and Power density (+dB) | | | Antenna terminal conducted emission (+dB) | | Channel power (+dB) |
|---|-----------|------------|---|---------------|---------------------|
| Below 1GHz | 1GHz-3GHz | 3GHz-18GHz | 18GHz-26.5GHz | 26.5GHz-40GHz | |
| 1.0dB | 1.1dB | 2.7dB | 3.2dB | 3.3dB | 1.5dB |

Conducted Emission test

The data listed in this test report has enough margin, more than the site margin.

Radiated emission test (3m / 1m)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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3.5 Test Location

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| | FCC Registration Number | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms |
|----------------------------|-------------------------|------------------------|----------------------------|--|------------------------|
| No.1 semi-anechoic chamber | 313583 | 2973C-1 | 19.2 x 11.2 x 7.7m | 7.0 x 6.0m | No.1 Power source room |
| No.2 semi-anechoic chamber | 655103 | 2973C-2 | 7.5 x 5.8 x 5.2m | 4.0 x 4.0m | - |
| No.3 semi-anechoic chamber | 148738 | 2973C-3 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.3 Preparation room |
| No.3 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.4 semi-anechoic chamber | 134570 | 2973C-4 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.4 Preparation room |
| No.4 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.5 semi-anechoic chamber | - | - | 6.0 x 6.0 x 3.9m | 6.0 x 6.0m | - |
| No.6 shielded room | - | - | 4.0 x 4.5 x 2.7m | 4.75 x 5.4 m | - |
| No.6 measurement room | - | - | 4.75 x 5.4 x 3.0m | 4.75 x 4.15 m | - |
| No.7 shielded room | - | - | 4.7 x 7.5 x 2.7m | 4.7 x 7.5m | - |
| No.8 measurement room | - | - | 3.1 x 5.0 x 2.7m | N/A | - |
| No.9 measurement room | - | - | 8.0 x 4.5 x 2.8m | 2.0 x 2.0m | - |
| No.10 measurement room | - | - | 2.6 x 2.8 x 2.5m | 2.4 x 2.4m | - |
| No.11 measurement room | - | - | 3.1 x 3.4 x 3.0m | 2.4 x 3.4m | - |

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test set up, Data of EMI, and Test instruments

Refer to APPENDIX.

SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

| Mode | Remarks* |
|---|-----------------|
| IEEE 802.11b (11b) | 11Mbps, PN9 |
| IEEE 802.11g (11g) | 36Mbps, PN9 |
| *The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel) | |
| *Power of the EUT was set by the software as follows; Power settings: 11b: 13.88dBm, 11g: 13.12dBm Software: 0.16/11610B Ver. 0.16/11610B *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product. | |

*The details of Operating mode(s)

| Test Item | Operating Mode | Tested frequency |
|---------------------------------------|-----------------------|-------------------------|
| Conducted Emission | 11b Tx | 2412MHz |
| Spurious Emission(Conducted/Radiated) | 11g Tx | 2437MHz |
| 6dB Bandwidth | | 2462MHz |
| Maximum Peak Output Power | | |
| Power Density | | |
| 99% Occupied Bandwidth | | |

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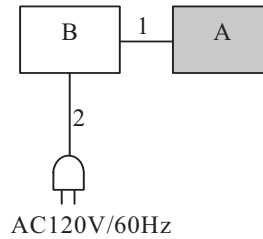
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4.2 Configuration and peripherals



*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

| No. | Item | Model number | Serial number | Manufacturer | Remarks |
|-----|-----------------------------------|--------------|---|----------------------------------|---------|
| A | UNIVERSAL PORT MODULE FOR AIRPLAY | UP-AR1 | 23 for CE, RE (Below 1GHz)* 19 for RE (Above 1GHz)* 4 for AT* | ONKYO SOUND & VISION Corporation | EUT |
| B | AV Receiver | HT-R390 | 0984DCP0X0600004 | ONKYO SOUND & VISION Corporation | - |

List of cables used

| No. | Name | Length (m) | Shield | | Remarks |
|-----|--------------------|------------|------------|------------|---------|
| | | | Cable | Connector | |
| 1 | 24P Shielded Cable | 1.4 | Shielded | Shielded | - |
| 2 | AC Cable | 1.7 | Unshielded | Unshielded | - |

*CE: Conducted emission test
RE: Radiated emission test (Below 1GHz / Above 1GHz)
AT: Antenna Terminal Conducted test

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

| | |
|--------------------------|---------------------|
| Detector | : QP and AV |
| Measurement range | : 0.15-30MHz |
| Test data | : APPENDIX |
| Test result | : Pass |

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SECTION 6: Radiated Spurious Emission

Test Procedure

It was measured based on "2. Radiated emission test" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

| | | | | |
|--------------|-------------|-----------------|----------------|------------|
| Frequency | Below 30MHz | 30MHz to 300MHz | 300MHz to 1GHz | Above 1GHz |
| Antenna Type | Loop | Biconical | Logperiodic | Horn |

In any 100kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5(IC) and outside the restricted band of FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).

| | | | | |
|-----------------|----------------|--|------------------------|--|
| Frequency | Below 1GHz | Above 1GHz | | 20dBc |
| Instrument used | Test Receiver | Spectrum Analyzer | | Spectrum Analyzer |
| Detector | QP | PK | AV | PK |
| IF Bandwidth | BW 120kHz(T/R) | RBW: 1MHz VBW: 3MHz | RBW: 1MHz VBW: 10Hz | RBW: 100kHz VBW: 300kHz (S/A) |
| Test Distance | 3m | 3m (below 10GHz), 1m*1) (above 10GHz) | | 3m (below 10GHz), 1m*1) (above 10GHz) |

*1) Distance Factor: $20 \times \log(3.0m/1.0m) = 9.5dB$

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 30M-26.5GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

| Test | Span | RBW | VBW | Sweep time | Detector | Trace | Instrument used |
|---------------------------------|--|-----------------|--------------------|------------|----------|----------|--------------------------------|
| 6dB Bandwidth | 20MHz | 100kHz | 300kHz | Auto | Peak | Max Hold | Spectrum Analyzer |
| 99% Occupied Bandwidth | Enough width to display 20dB Bandwidth | 1 to 3% of Span | Three times of RBW | Auto | Peak | Max Hold | Spectrum Analyzer |
| Maximum Peak Output Power | - | - | - | Auto | Peak | - | Power Meter (Sensor: 50MHz BW) |
| Peak Power Density | 18MHz | 30kHz | 100kHz | 600sec | Peak | Max Hold | Spectrum Analyzer *1) *2) |
| Conducted Spurious Emission *3) | Range: 9kHz-150kHz | 200Hz | 620Hz | Auto | Peak | Max Hold | Spectrum Analyzer |
| | Range: 150kHz-30MHz | 10kHz | 30kHz | | | | |
| | Range: 30MHz-25GHz (Less or equal to 5GHz) | 100kHz | 300kHz | | | | |

*1) PSD Option 1 of "Guidance on Measurement of Digital Transmission Systems Operating under Section 15.247".

*2) The test was not performed at RBW:3kHz however the measurement is to be performed with RBW:3kHz in the regulation, because, the measurement value with RBW:3kHz is less than the value of RBW:30kHz and the test data met the limit with RBW:30kHz.

*3) * In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=10kHz)

The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : APPENDIX

Test result : Pass

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