



**Underwriters  
Laboratories UL Japan, Inc.**

Test report No. : 28EE0230-HO-02-A-R1  
Page : 1 of 71  
Issued date : February 29, 2008  
Revised date : April 1, 2008  
FCC ID : A6RYBA10A

## **RADIO TEST REPORT**

**Test Report No. : 28EE0230-HO-02-A-R1**

**Applicant** : YAMAHA Corporation  
**Type of Equipment** : Bluetooth WIRELESS AUDIO RECEIVER  
**Model No.** : YBA-10  
**FCC ID** : A6RYBA10A  
**Test regulation** : FCC Part 15 Subpart C 2008  
Section 15.207, Section 15.247  
**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.
5. This test 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.
6. Original test report number of this report is 28EE0230-HO-02-A.

**Date of test:** February 12 to 18, 2008

**Tested by:**

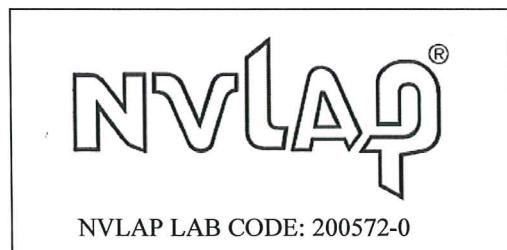
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## **SECTION 1: Customer information**

Company Name : YAMAHA Corporation  
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Facsimile Number : +81-53-460-3310  
Contact Person : Hiromi Imura

## **SECTION 2: Equipment under test (E.U.T.)**

### **2.1 Identification of E.U.T.**

Type of Equipment : Bluetooth WIRELESS AUDIO RECEIVER  
Model No. : YBA-10  
Serial No. : E10687XZ used for Radiated Emission Test  
E10697XZ used for Conducted Emission Test  
E10717XZ used for Antenna Terminal Conducted Test  
Rating : DC 5.0V  
Country of Mass-production : China  
Receipt Date of Sample : February 2, 2008  
Condition of EUT : Production 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: YBA-10(referred to as the EUT in this report) is the Bluetooth WIRELESS AUDIO RECEIVER.

Clock frequency(ies) in the system : 12MHz  
Equipment Type : Transceiver  
Frequency of Operation : 2402-2480MHz  
Bandwidth & Channel Spacing : 1MHz & 1MHz  
Modulation : FHSS  
Power Supply (inner) : DC 3.3V  
Antenna Type : Chip Multi-layer Antenna(LDA922G5520F-273)  
Antenna Connector Type : WM8430-2610RA1  
Antenna Gain : -1.1 dBi

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part15 Subpart C: 2008, final revised on March 24, 2008

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

\*The revision on March 24, 2008 does not influence the test specification applied to the EUT.

#### **FCC 15.31 (e)**

This EUT provides stable voltage(DC 3.3V) constantly to RF Module 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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### 3.2 Procedures and results

[FHSS]

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
1	Conducted emission	FCC: ANSI C63.4:2003 7. AC powerline conducted emission measurements  IC: RSS-Gen 7.2.2	FCC: Section 15.207  IC: RSS-Gen 7.2.2	-	N/A	[QP] 20.9dB 0.19210MHz, L [AV] 13.2dB 24.02840MHz, N 24.02822MHz, N	Complied
2	Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705  IC: -	FCC: Section15.247(a)(1)  IC: RSS-210 A8.1 (b)	Conducted	N/A		Complied
3	20dB Bandwidth	FCC: FCC Public Notice DA 00-705  IC: -	FCC: Section15.247(a)(1)  IC: RSS-210 A8.1 (a)	Conducted	N/A		Complied
4	Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705  IC: -	FCC: Section15.247(a)(1)(iii)  IC: RSS-210 A8.1 (d)	Conducted	N/A		Complied
5	Dwell time	FCC: FCC Public Notice DA 00-705  IC: -	FCC: Section15.247(a)(1)(iii)  IC: RSS-210 A8.1 (d)	Conducted	N/A	See data.	Complied
6	Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705  IC: RSS-Gen 4.8	FCC: Section15.247(b)(1)  IC: RSS-210 A8.4 (2)	Conducted	N/A		Complied
7	Band Edge Compliance	FCC: FCC Public Notice DA 00-705  IC: -	FCC: Section15.247(d)  IC: RSS-210 A8.5	Conducted	N/A		Complied
8	Spurious Emission	FCC: FCC Public Notice DA 00-705  IC: RSS-Gen 4.9 RSS-Gen 4.10	FCC: Section15.247(d)  IC: RSS-210 A8.5 RSS-Gen 7.2.1 and 7.2.3	Conducted/ Radiated	N/A	[Tx] 9.4dB 24800.0MHz, Hol,Ver, AV  [Rx] 13.3dB 9764.0MHz, Ver, AV	Complied

Note: UL Japan, Inc.'s EMI Work Procedures No.QPM05 and QPM15.

\*These tests were performed without any deviations from test procedure except for additions or exclusions.

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

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### 3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	IC: RSS-Gen 4.6.1	IC: RSS-Gen 4.6.1	Conducted	N/A	N/A	N/A

### 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	Conducted emission	Radiated emission (10m*)			Radiated emission (3m*)			Radiated emission (3m*)	
		150kHz-30MHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	1GHz-18GHz
No.1 semi-anechoic Chamber (±)	3.7dB	3.1dB	4.7dB	4.4dB	3.2dB	3.7dB	4.4dB	5.9dB	6.1dB
No.2 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	4.3dB	3.9dB	5.9dB	6.1dB
No.3 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	4.2dB	4.4dB	5.9dB	6.1dB
No.4 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	4.2dB	4.4dB	5.9dB	6.1dB

\*10m/3m = Measurement distance

#### Conducted emission test

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

#### Radiated emission test(3m)

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

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

#### Other test except Conducted Emission and Spurious Emission (Radiated)

The measurement uncertainty for this test is 3.0dB.

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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	IC4247	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	IC4247-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	IC4247-3	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	IC4247-4	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, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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

### 4.1 Operating Mode(s)

Test	Mode	Tested frequency
Conducted Emission	Bluetooth Transmitting (Tx), DH5/3DH5, Payload: PRBS9	2402MHz 2441MHz 2480MHz
	Bluetooth Transmitting (Rx)	2441MHz
Carrier Frequency Separation	Bluetooth Transmitting (Tx) (Hopping ON)/Inquiry, DH5/3DH5, Payload: PRBS9	2402MHz 2441MHz 2480MHz
20dB Bandwidth	Bluetooth Transmitting (Tx) (Hopping Off)/Inquiry, DH5/3DH5, Payload: PRBS9	2402MHz 2441MHz 2480MHz
Number of Hopping Frequency	Bluetooth Transmitting (Tx) (Hopping ON)/Inquiry, DH5/3DH5, Payload: PRBS9	-
Dwell time	Bluetooth Transmitting (Tx) (Hopping ON)/Inquiry, Payload: PRBS9 -DH1 -DH3 -DH5 -3DH1 -3DH3 -3DH5	-
Maximum Peak Output Power	Bluetooth Transmitting (Tx) (Hopping Off)/Inquiry, Payload: PRBS9 -DH5 -2DH5 -3DH5	2402MHz 2441MHz 2480MHz
Spurious Emission (Conducted/Radiated)	Bluetooth Transmitting (Tx), DH5/3DH5, Payload: PRBS9	2402MHz 2441MHz 2480MHz
	Bluetooth Receiving (Rx), DH5	2441MHz
Band Edge Compliance (Conducted)	Bluetooth Transmitting (Tx), DH5/3DH5, Payload: PRBS9 -Hopping ON -Hopping OFF	2402MHz 2480MHz
(Radiated)	Bluetooth Transmitting (Tx), DH5/3DH5, Payload: PRBS9	2402MHz 2480MHz
99% Occupied Bandwidth	Bluetooth Transmitting (Tx), DH5/3DH5, Payload: PRBS9 -Hopping ON -Hopping OFF	2402MHz 2441MHz 2480MHz

As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload (except Dwell time test)

**Remarks:** Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT. However, the limit level 125mW of AFH mode was used due to the overlap of the bandwidth.

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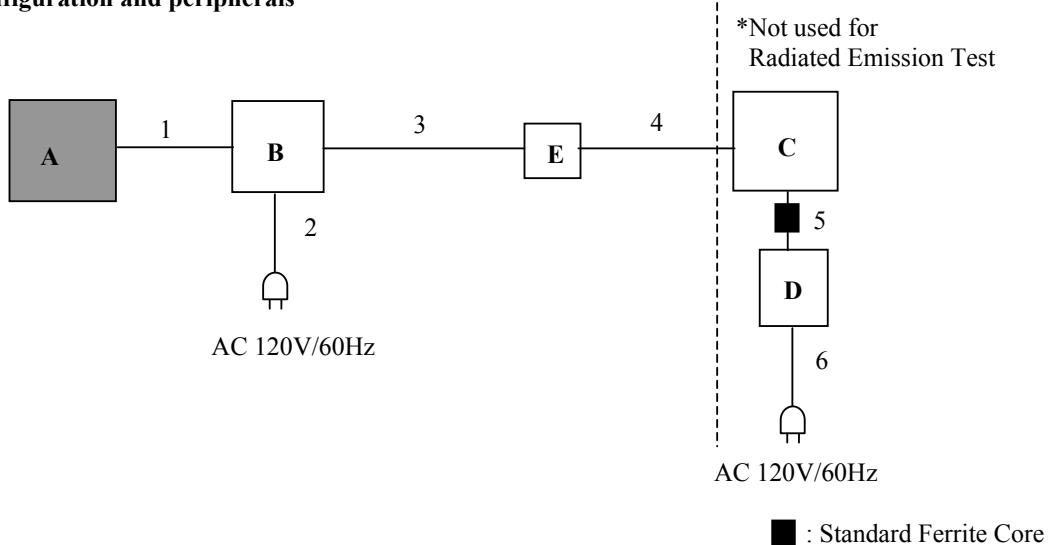
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#### 4.2 Configuration and peripherals



\* Cabling and setup(s) 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	Remark
A	Bluetooth WIRELESS AUDIO RECEIVER	YBA-10	E10697XZ *1) E10687XZ *2) E10717XZ *3)	YAMAHA	EUT
B	UART-RS232C JIGU	-	-	YAMAHA	-
C	PC	CF-T5MW4AXS	7DKSA51909	Panasonic	*1), *3)
D	AC Adapter	CF-AA1625AM5	-	Panasonic	*1), *3)
E	USB-RS232C Converter	USB-CVRS9	-	SANWA SUPPLY	-

\*1) Used for Conducted Emission Test

\*2) Used for Radiated Emission Test

\*3) Used for Antenna Terminal Conducted Test

#### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	21pin Dock Cable	2.0	Shielded	Shielded	-
2	AC Cable	1.8	Unshielded	Unshielded	-
3	RS232C Cable	2.0	Shielded	Shielded	-
4	USB Cable	0.3	Shielded	Shielded	-
5	DC Cable	2.0	Unshielded	Unshielded	-
6	AC Cable	1.8	Unshielded	Unshielded	-

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## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a wooden table of nominal size, 1m by 1.5m, raised 80cm 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 cable and AC 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 or a Measurement Room.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

<b>Detector</b>	: quasi-peak and average detector (IF BW 9 kHz)
<b>Measurement range</b>	: 0.15-30MHz
<b>Test data</b>	: APPENDIX 2
<b>Test result</b>	: Pass

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## **SECTION 6: Spurious Emission**

### **[Conducted]**

#### **Test Procedure**

The Out of Band Emission was measured with a spectrum analyzer connected to the antenna port. It was measured based on "1. RF antenna conducted test" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

The following spectrum analyzer setting was used:

- RBW: 100kHz
- VBW: 300kHz
- Sweep: Auto
- Detector: Peak
- Trace: Max Hold

**Test data** : APPENDIX 2

**Test result** : Pass

### **[Radiated]**

#### **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 urethane platform of nominal size, 0.5m by 1.0m, raised 80cm above the conducting ground plane. The Radiated Electric Field Strength intensity has been measured in a Semi Anechoic Chamber with a ground plane and at a distance of 3m(Below 10GHz) and 1m(Upper 10GHz).

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

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

#### **\* Marker Delta Method (Measurement for Band-edge)**

STEP 1) Perform an in-band field strength measurement of the fundamental emission using the RBW table below.

STEP 2) Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 1% of the total span, and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission.

STEP 3) Subtract the delta measured in STEP 2) from the field strengths measured in STEP 1). The result is the field strength of band-edge.

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In any 100kHz 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 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 2 of RSS-210 2.7 (IC) and outside the restricted band of FCC15.205 / Table 1 of RSS-210 2.7 (IC).**

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

- 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.

**Test data** : APPENDIX 2  
**Test result** : Pass

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## **SECTION 7: Bandwidth**

### **Test Procedure**

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

It was measured based on "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247 ".  
The following spectrum analyzer setting was used:

- Span: 3MHz
- RBW: 30kHz
- VBW: 30kHz
- Sweep: Auto
- Detector: Peak
- Trace: Max Hold

**Test data** : APPENDIX 2

**Test result** : Pass

## **SECTION 8: Maximum Peak Output Power**

### **Test Procedure**

The Maximum Peak Output Power was measured with a power meter (tested bandwidth: 50MHz) connected to the antenna port.

**Test data** : APPENDIX 2

**Test result** : Pass

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## **SECTION 9: Carrier Frequency Separation**

### **Test Procedure**

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna port. The following spectrum analyzer setting was used:

- Span: 3MHz
- RBW: 100kHz
- VBW: 300kHz
- Sweep: Auto
- Detector: Peak
- Trace: Max Hold

**Test data** : APPENDIX 2  
**Test result** : Pass

## **SECTION 10: Number of Hopping Frequency**

### **Test Procedure**

The Number of Hopping Frequency was measured with a spectrum analyzer connected to the antenna port. The following spectrum analyzer setting was used:

- Span: 30MHz
- RBW: 300kHz
- VBW: 1MHz
- Sweep: Auto
- Detector: Peak
- Trace: Max Hold

**Test data** : APPENDIX 2  
**Test result** : Pass

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## **SECTION 11: Dwell time**

### **Test Procedure**

The Dwell time was measured with a spectrum analyzer connected to the antenna port.  
The following spectrum analyzer setting was used:

- Span: Zero Span
- RBW: 1MHz
- VBW: 1MHz
- Sweep: as necessary to capture the entire dwell time per hopping channel
- Detector: function peak
- Trace: Max Hold

**Test data** : APPENDIX 2  
**Test result** : Pass