



# **TEST REPORT**

**Test Report No. : UL-RPT-RP11624992JD09A V2.0**

**Customer** : Apple Inc.

**Model No.** : A1842

**FCC ID** : BCGA1842

**Test Standard(s)** : FCC Part 15.207(a)

**Test Laboratory** : UL VS LTD, Basingstoke, Hampshire, RG24 8AH, United Kingdom

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2. The results in this report apply only to the sample(s) tested.
3. This sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions.

**Date of Issue:** 22 August 2017

**Checked by:**

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Senior Test Engineer, Radio Laboratory

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**Report Revision History**

<b>Version Number</b>	<b>Issue Date</b>	<b>Revision Details</b>	<b>Revised By</b>
1.0	31/07/2017	Initial Version	Ian Watch
2.0	22/08/2017	Changed Model No. to A1842 Changed description of EUT in Section 1.1	Ian Watch

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## **1. Attestation of Test Results**

### **1.1. Description of EUT**

The device is an interactive digital media player which plays content onto a screen through an HDMI port. It incorporates Wi-Fi and Bluetooth radios.

### **1.2. General Information**

<b>Specification Reference:</b>	47CFR15.207
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.207
<b>Location of Testing:</b>	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
<b>Test Dates:</b>	20 July 2017 to 24 July 2017

### **1.3. Summary of Test Results**

<b>FCC Reference (47CFR)</b>	<b>Measurement</b>	<b>Result</b>
Part 15.207(a)	Transmitter AC Conducted Emissions	Complied

#### **Note(s):**

1. There are two vendors of the WiFi/*Bluetooth* radio modules, Vendor 1 and Vendor 2.
2. The WiFi/*Bluetooth* radio modules have the same mechanical outline (i.e. the same packaging dimension and pin layout), use the same on-board antenna matching circuit, have an identical antenna structure and are built and tested to conform to the same specification and to operate within the same tolerances.

Baseline testing was performed on the two vendors to determine the worst case.

### **1.4. Deviations from the Test Specification**

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

## **2. Summary of Testing**

### **2.1. Facilities and Accreditation**

The test site and measurement facilities used to collect data are located at Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom.

UL VS LTD is accredited by UKAS. The tests reported herein have been performed in accordance with its terms of accreditation.

### **2.2. Methods and Procedures**

<b>Reference:</b>	ANSI C63.10-2013
<b>Title:</b>	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
<b>Reference:</b>	KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
<b>Title:</b>	AC Power-Line Conducted Emissions Frequently Asked Questions

## **2.3. Calibration and Uncertainty**

### **Measuring Instrument Calibration**

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

### **Measurement Uncertainty**

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value measured (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

<b>Measurement Type</b>	<b>Range</b>	<b>Confidence Level (%)</b>	<b>Calculated Uncertainty</b>
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±4.69 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

**2.4. Test and Measurement Equipment****Test Equipment Used for AC Conducted Emissions Tests:**

<b>Asset No.</b>	<b>Instrument</b>	<b>Manufacturer</b>	<b>Type No.</b>	<b>Serial No.</b>	<b>Date Calibration Due</b>	<b>Cal. Interval (Months)</b>
M2013	Thermohygrometer	Testo	608-H1	45046419	20 Jun 2018	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	07 Nov 2017	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	09 Aug 2017	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	09 May 2018	12
M1269	Multimeter	Fluke	179	90250210	02 May 2018	12

### **3. Equipment Under Test (EUT)**

#### **3.1. Identification of Equipment Under Test (EUT)**

Brand Name:	Apple Inc.
Model Name or Number:	A1842
Test Sample Serial Number:	C02TK026J4C7 ( <i>Radiated sample</i> )
Hardware Version:	EVT
Software Version:	15J42500h
FCC ID:	BCGA1842

#### **3.2. Modifications Incorporated in the EUT**

No modifications were applied to the EUT during testing.

**3.3. Additional Information Related to Testing**

<b>Technology Tested:</b>	WLAN (IEEE 802.11b,g,n) / Digital Transmission System	
<b>Type of Unit:</b>	Transceiver	
<b>Modulation Type:</b>	BPSK	
<b>Data rate:</b>	802.11n HT20	MCS0 (MIMO with CDD)
<b>Power Supply Requirement(s):</b>	Nominal	120 VAC 60 Hz
<b>Channel Spacing:</b>	20 MHz	
<b>Transmit Frequency Range:</b>	2412 MHz to 2462 MHz	
<b>Transmit Channels Tested:</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	6	2437

<b>Technology Tested:</b>	WLAN (IEEE 802.11a,n) / U-NII	
<b>Type of Unit:</b>	Transceiver	
<b>Modulation:</b>	BPSK	
<b>Data rate:</b>	802.11n HT40	MCS0 (MIMO with CDD)
<b>Power Supply Requirement(s):</b>	Nominal	120 VAC 60 Hz
<b>Channel Spacing:</b>	40 MHz	
<b>Transmit Frequency Band:</b>	5725 MHz to 5850 MHz	
<b>Transmit Channels Tested:</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	151	5755

### **3.4. Description of Available Antennas**

The radio utilizes two integrated antennas, with the following declared maximum gains at 2400 – 2483.5 MHz:

Antenna Port	Antenna Gain (dBi)
1	0.9
2	-0.1

The radio utilizes two integrated antennas, with the following maximum gains in the 5725 to 5850 MHz:

Antenna Port	Antenna Gain (dBi)
1	-0.1
2	1.6

### **3.5. Description of Test Setup**

#### **Support Equipment**

The following support equipment was used to exercise the EUT during testing:

<b>Description:</b>	Goldeneye Adaptor
<b>Brand Name:</b>	Goldeneye
<b>Model Name or Number:</b>	X892
<b>Serial Number:</b>	Not marked or stated

<b>Description:</b>	Laptop PC
<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	MacBook Pro
<b>Serial Number:</b>	C2QRC05BGQCT

<b>Brand Name:</b>	Ethernet Hub
<b>Description:</b>	Netgear
<b>Model Name or Number:</b>	GS605v3
<b>Serial Number:</b>	1YG19490218E

<b>Description:</b>	HDMI Cable. Length 1.8 metres
<b>Brand Name:</b>	Not marked or stated
<b>Model Name or Number:</b>	Not marked or stated
<b>Serial Number:</b>	Not marked or stated

<b>Description:</b>	Ethernet Cable. Length 0.5 metre
<b>Brand Name:</b>	Not marked or stated
<b>Model Name or Number:</b>	Not marked or stated
<b>Serial Number:</b>	Not marked or stated

<b>Description:</b>	USB to lightning cable
<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	Kanzi
<b>Serial Number:</b>	316D67

## **Operating Modes**

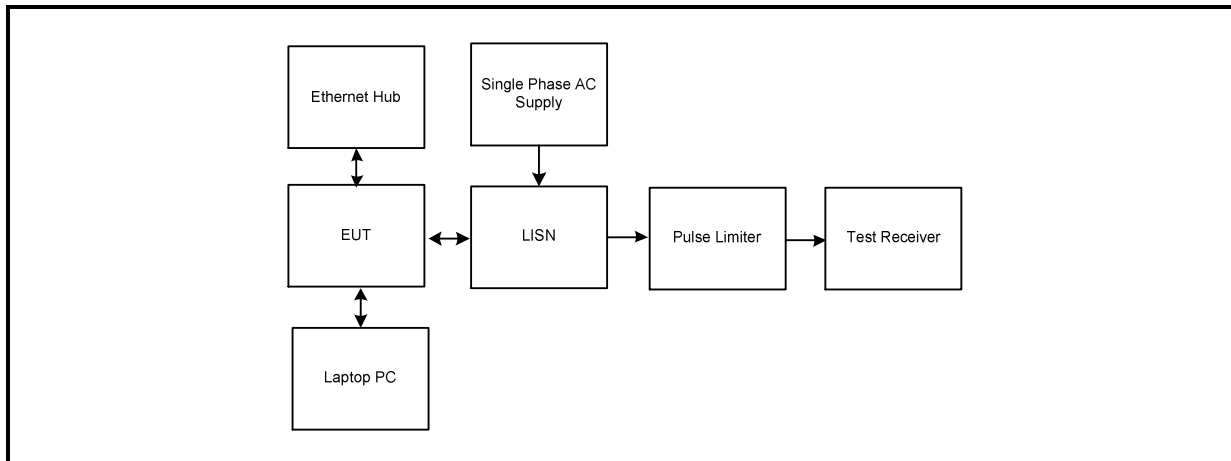
The EUT was tested in the following operating mode(s):

- The EUT was tested in the following operating mode(s): Pre-scans were performed with the EUT transmitting in *Bluetooth* BR, *Bluetooth* LE, 2.4 GHz WLAN and 5.0 GHz WLAN modes. The worst case mode was found to be 2.4 GHz WLAN and 5 GHz WLAN transmitting simultaneously. Final measurements were performed in this configuration.
- The EUT was transmitting at full power while charging.

## **Configuration and Peripherals**

The EUT was tested in the following configuration(s):

- Final measurements were performed with the EUT configured to simultaneously transmit two signals at maximum output power (2.4 GHz WLAN: 802.11n HT20 (MIMO) / channel 6 / 2437 MHz and 802.11n HT40 (MIMO) and 5 GHz WLAN: U-NII Band 3 802.11n HT40 (MIMO) / channel 151 / 5755 MHz). Prescan plots for all other configurations are archived on the UL VS LTD IT server and available for inspection if required.
- Controlled in test mode using a software application on the laptop PC supplied by the customer. The application was used to enable a continuous transmission and to select the test channels as required. The customer supplied a document containing the setup instructions 'EUT\_setup\_v3.2.docx'. The laptop PC was connected to the EUT via a Goldeneye adaptor and USB to lightning cable.
- The EUT was powered from a 120 VAC 60 Hz single phase mains supply unless otherwise stated.
- The HDMI port was terminated into the laptop PC and the Ethernet port was terminated into an Ethernet hub.

**Test Setup Diagrams****Conducted Tests:****Test Setup for AC Conducted Spurious Emissions**

## **4. AC Power Line Conducted Emissions Test Results**

### **4.1. Transmitter AC Conducted Spurious Emissions**

#### **Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Dates:</b>	20 July 2017 to 24 July 2017
<b>Test Sample Serial Number:</b>	C02TK026J4C7		

<b>FCC Reference:</b>	Part 15.207(a)
<b>Test Method Used:</b>	ANSI C63.10 Section 6.2 / FCC KDB 174176 and notes below

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	22
<b>Relative Humidity (%):</b>	57

#### **Note(s):**

1. The EUT was connected to the power supply input which was connected to a 120 VAC 60 Hz single phase supply via a LISN.
2. In accordance with FCC KDB 174176 Q4, tests were also performed with a 240 VAC 60 Hz single phase supply.
3. A pulse limiter was fitted between the LISN and the test receiver.
4. Pre-scans were performed and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.

**Transmitter AC Conducted Spurious Emissions (continued)****Results: Live / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.164	Live	37.6	65.3	27.7	Complied
0.236	Live	35.3	62.3	27.0	Complied
0.254	Live	29.3	61.6	32.3	Complied
0.762	Live	26.6	56.0	29.4	Complied
16.161	Live	28.5	60.0	31.5	Complied
17.408	Live	27.6	60.0	32.4	Complied

**Results: Live / Average / 120 VAC 60 Hz**

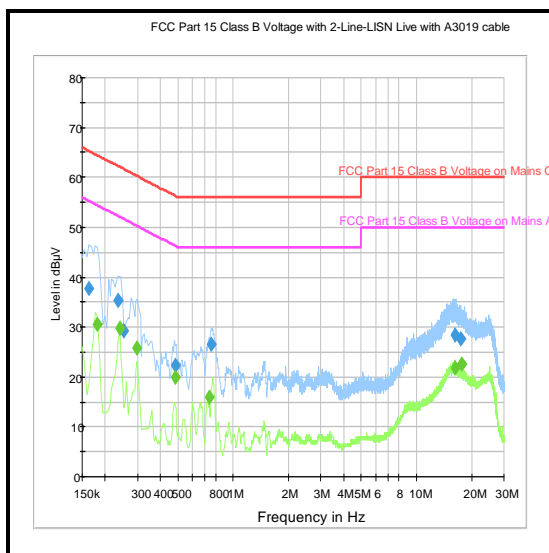
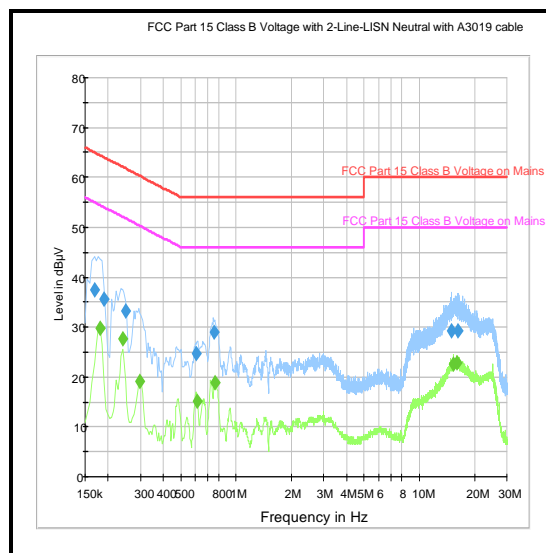
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.182	Live	30.7	54.4	23.7	Complied
0.240	Live	29.7	52.1	22.4	Complied
0.299	Live	25.9	50.3	24.4	Complied
0.483	Live	19.8	46.3	26.5	Complied
16.310	Live	21.7	50.0	28.3	Complied
17.691	Live	22.6	50.0	27.4	Complied

**Results: Neutral / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.168	Neutral	37.6	65.1	27.5	Complied
0.191	Neutral	35.7	64.0	28.3	Complied
0.249	Neutral	33.1	61.8	28.7	Complied
0.762	Neutral	28.9	56.0	27.1	Complied
14.910	Neutral	29.3	60.0	30.7	Complied
16.256	Neutral	29.4	60.0	30.6	Complied

**Results: Neutral / Average / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.182	Neutral	29.7	54.4	24.7	Complied
0.240	Neutral	27.6	52.1	24.5	Complied
0.614	Neutral	15.2	46.0	30.8	Complied
0.771	Neutral	19.0	46.0	27.0	Complied
15.369	Neutral	22.6	50.0	27.4	Complied
15.963	Neutral	22.7	50.0	27.3	Complied

**Transmitter AC Conducted Spurious Emissions (continued)****Results: 120 VAC 60 Hz****Live****Neutral**

*Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

**Transmitter AC Conducted Spurious Emissions (continued)****Results: Live / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.186	Live	36.7	64.2	27.5	Complied
0.186	Live	36.7	64.2	27.5	Complied
0.231	Live	35.2	62.4	27.2	Complied
0.798	Live	24.8	56.0	31.2	Complied
15.221	Live	26.8	60.0	33.2	Complied
25.400	Live	26.5	60.0	33.5	Complied

**Results: Live / Average / 240 VAC 60 Hz**

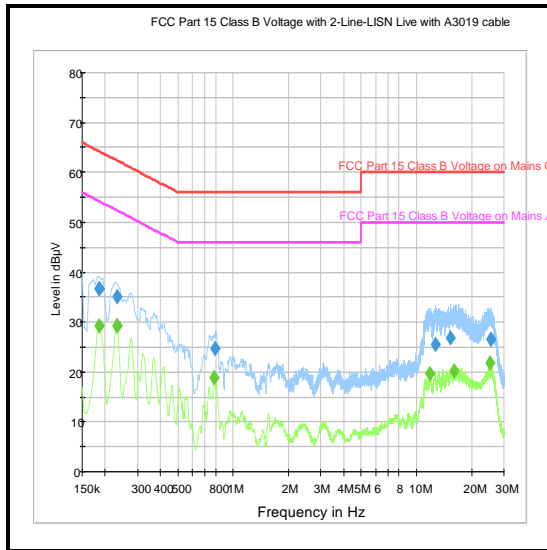
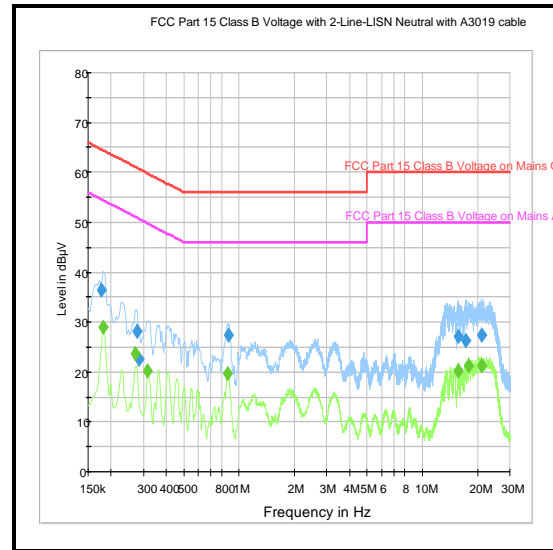
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.186	Live	29.3	54.2	24.9	Complied
0.231	Live	29.2	52.4	23.2	Complied
0.231	Live	29.3	52.4	23.1	Complied
0.789	Live	19.0	46.0	27.0	Complied
15.986	Live	20.2	50.0	29.8	Complied
25.058	Live	21.7	50.0	28.3	Complied

**Results: Neutral / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.177	Neutral	36.4	64.6	28.2	Complied
0.276	Neutral	28.1	60.9	32.8	Complied
0.870	Neutral	27.4	56.0	28.6	Complied
15.635	Neutral	27.2	60.0	32.8	Complied
17.304	Neutral	26.4	60.0	33.6	Complied
21.089	Neutral	27.4	60.0	32.6	Complied

**Results: Neutral / Average / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.182	Neutral	29.1	54.4	25.3	Complied
0.272	Neutral	23.6	51.1	27.5	Complied
0.866	Neutral	19.8	46.0	26.2	Complied
15.626	Neutral	20.1	50.0	29.9	Complied
17.772	Neutral	21.4	50.0	28.6	Complied
20.922	Neutral	21.3	50.0	28.7	Complied

**Transmitter AC Conducted Spurious Emissions (continued)****Results: 240 VAC 60 Hz****Live****Neutral**

*Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

**--- END OF REPORT ---**