



TEST REPORT

Test Report No. : UL-RPT-RP11161473JD08B V2.0

Manufacturer : Apple Inc.
Model No. : A1706
FCC ID : BCGA1706
Test Standard(s) : FCC Part 15.207

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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: 27 September 2016

Checked by:

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This laboratory is accredited by UKAS.
The tests reported herein have been
performed in accordance with its terms
of accreditation.

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1. Customer Information

Company Name:	Apple
Address:	1 Infinite Loop Cupertino, CA 95014 U.S.A

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.207
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.207
Site Registration:	FCC: 209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Date:	13 September 2016

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.207	Transmitter AC Conducted Emissions	Complied

2.3. Methods and Procedures

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

2.4. 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.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Apple
Model Name or Number:	A1706
Test Sample Serial Number:	C02S200EHH5Q (<i>Radiated sample</i>)
Hardware Version:	EVT
Software Version:	OS: 16B2272a BB: v234 c4096
FCC ID:	BCGA1706

3.2. Description of EUT

The equipment under test was a Notebook PC with 2.4 GHz and 5 GHz wireless LAN and Bluetooth capabilities.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Technology Tested:	WLAN (IEEE 802.11b,g,n) / Digital Transmission System	
Type of Unit:	Transceiver	
Modulation Type:	BPSK	
Mode:	802.11n HT20	MCS0
Power Supply Requirement(s):	Nominal	3.8 VDC via 120 VAC 60 Hz adaptor
Channel Spacing:	20 MHz	
Transmit Frequency Range:	2412 MHz to 2462 MHz	
Transmit Channels Tested:	Channel Number	Channel Frequency (MHz)
	6	2437

3.5. Support Equipment

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

Description:	AC to DC Power adaptor
Brand Name:	Apple
Model Name or Number:	A1718
Serial Number:	Not marked or stated

Description:	USB-C Charge Cable (2 m)
Brand Name:	Apple
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Personal Hands Free (PHF)
Brand Name:	Apple
Model Name or Number:	Apple Ear Plugs
Serial Number:	Not marked or stated

Description:	USB-C Digital AV Multiport adaptor (x1)
Brand Name:	Apple
Model Name or Number:	A1621
Serial Number:	Not marked or stated

Description:	USB-C Digital VGA Multiport adaptor (x2)
Brand Name:	Apple
Model Name or Number:	A1620
Serial Number:	Not marked or stated

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Pre-scans were performed with the EUT transmitting on the centre channel of *Bluetooth* BR, *Bluetooth* LE and WLAN modes. The worst case mode was found to be 2.4 GHz WLAN and final measurements were performed in this mode only.

4.2. Configuration and Peripherals

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

- The EUT was powered via an AC power adaptor, which was in turn connected to a single line LISN. The LISN was connected to a 120/240 V power supply as required for testing purposes.
- Controlled using a bespoke application supplied by the customer on the EUT. The application was used to enable continuous transmission and to select the test channels / modes as required.
- Transmitter AC conducted spurious emissions tests were performed with the AC Charger, PHF and 3 USB adaptors connected to the EUT.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6. Measurement Uncertainty* for details.

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.

5.2. Test Results

5.2.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Matthew Galbraith	Test Date:	13 September 2016
Test Sample Serial Number:	C02S200EHH5Q		

FCC Reference:	Part 15.207
Test Method Used:	ANSI C63.10 Section 6.2 / FCC KDB 174176 and notes below

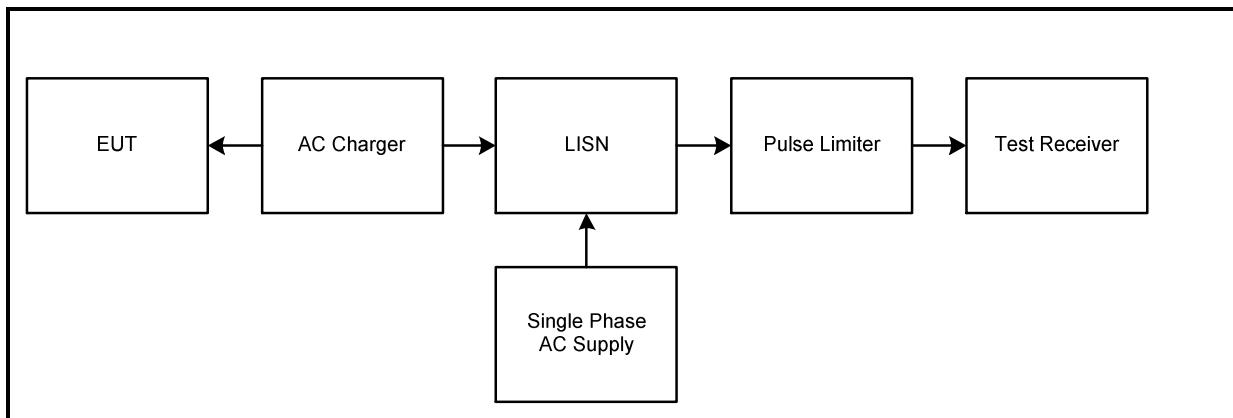
Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	50

Note(s):

1. The EUT was plugged into a USB cable which is connected to an AC charger. The AC charger was connected to 120 VAC 60 Hz single phase supply via a LISN.
2. In accordance with FCC KDB 174176 Q4, tests were performed with a 240 VAC 60 Hz single phase supply as this was within the voltage range marked on the AC to DC power adaptor.
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.
5. Pre-scans were performed with the EUT transmitting on the centre channel of *Bluetooth BR*, *Bluetooth LE* and *WLAN* modes. The worst case mode was found to be 2.4GHz WLAN and final measurements were performed in this mode only.

Test setup:



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

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.155	Live	51.9	65.8	13.8	Complied
0.164	Live	51.0	65.3	14.3	Complied
0.272	Live	36.1	61.1	25.0	Complied
0.438	Live	29.9	57.1	27.2	Complied
0.731	Live	29.1	56.0	26.9	Complied
27.060	Live	28.4	60.0	31.6	Complied

Results: Live / Average / 120 VAC 60 Hz

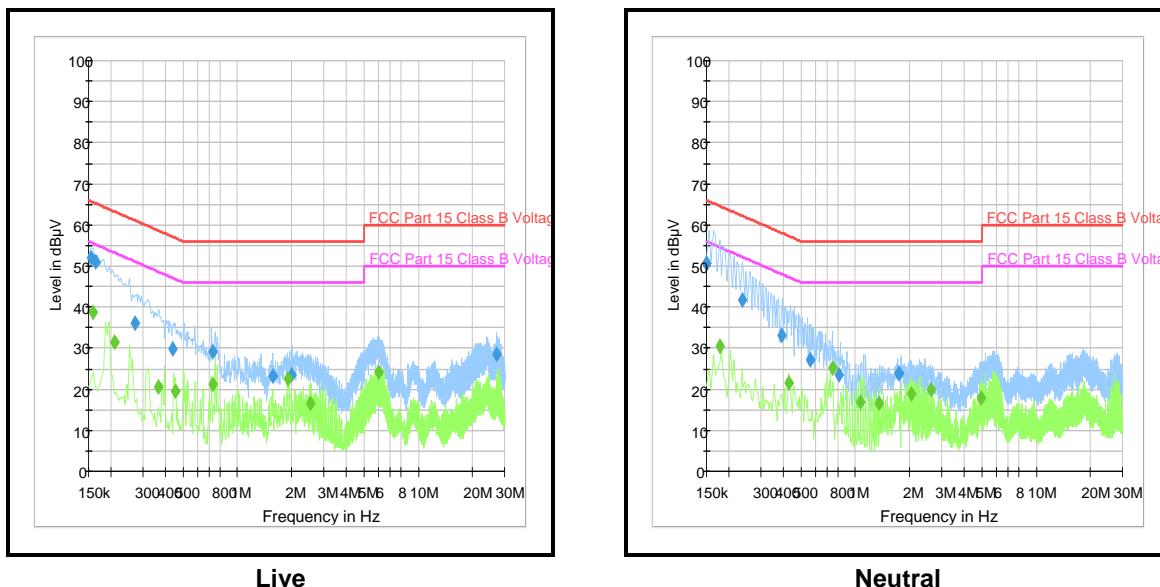
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.159	Live	38.7	55.5	16.8	Complied
0.209	Live	31.4	53.3	21.9	Complied
0.452	Live	19.5	46.8	27.4	Complied
0.731	Live	21.3	46.0	24.7	Complied
1.896	Live	22.6	46.0	23.4	Complied
6.032	Live	24.1	50.0	25.9	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150	Neutral	50.7	66.0	15.3	Complied
0.236	Neutral	41.6	62.3	20.6	Complied
0.389	Neutral	33.0	58.1	25.1	Complied
0.564	Neutral	27.2	56.0	28.8	Complied
0.812	Neutral	23.6	56.0	32.4	Complied
1.743	Neutral	24.0	56.0	32.0	Complied

Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.177	Neutral	30.5	54.6	24.1	Complied
0.429	Neutral	21.4	47.3	25.9	Complied
0.744	Neutral	25.1	46.0	20.9	Complied
2.036	Neutral	18.8	46.0	27.2	Complied
2.616	Neutral	19.8	46.0	26.2	Complied
4.943	Neutral	17.8	46.0	28.2	Complied

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

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 (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.155	Live	52.3	65.8	13.4	Complied
0.159	Live	52.0	65.5	13.5	Complied
0.362	Live	48.6	58.7	10.1	Complied
0.438	Live	35.1	57.1	22.0	Complied
0.713	Live	32.6	56.0	23.4	Complied
0.870	Live	31.4	56.0	24.6	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.182	Live	34.7	54.4	19.7	Complied
0.204	Live	31.2	53.4	22.3	Complied
0.366	Live	46.7	48.6	1.9	Complied
0.501	Live	27.6	46.0	18.4	Complied
0.803	Live	27.3	46.0	18.7	Complied
0.834	Live	25.2	46.0	20.8	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

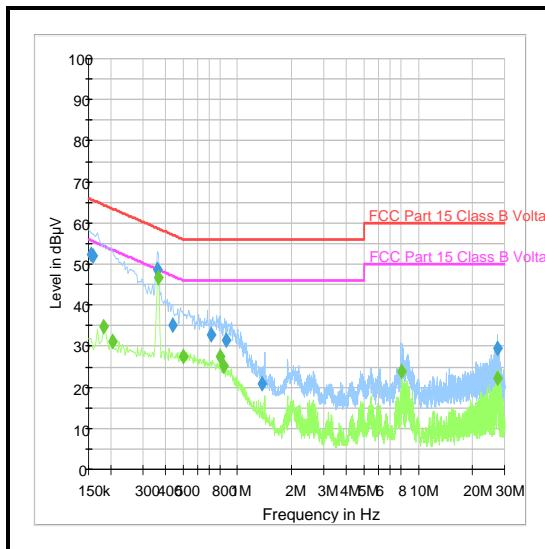
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150	Neutral	53.2	66.0	12.8	Complied
0.155	Neutral	52.6	65.8	13.2	Complied
0.366	Neutral	46.5	58.6	12.1	Complied
0.411	Neutral	35.7	57.6	21.9	Complied
0.807	Neutral	32.1	56.0	23.9	Complied
0.870	Neutral	32.6	56.0	23.4	Complied

Results: Neutral / Average / 240 VAC 60 Hz

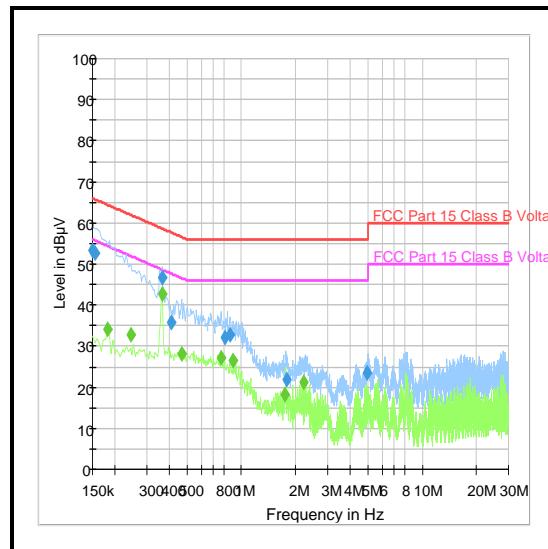
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.182	Neutral	34.1	54.4	20.4	Complied
0.245	Neutral	32.6	51.9	19.3	Complied
0.366	Neutral	42.7	48.6	5.9	Complied
0.470	Neutral	28.1	46.5	18.5	Complied
0.776	Neutral	27.3	46.0	18.7	Complied
0.902	Neutral	26.6	46.0	19.4	Complied

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.

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2014	Thermohygrometer	Testo	608-H1	45046246	10 Jun 2017	12
A004	LISN	Rohde & Schwarz	ESH3-Z5	890604/027	08 Feb 2017	12
A1829	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100671	05 May 2017	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	11 Apr 2017	12
S0539	Variable AC Power Supply	Kikusui	PCR 1000L	13010170	Calibration not required	N/A
M1818	Multimeter	Fluke	79 Series II	71811580	27 Apr 2017	12

6. 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 of the measurand (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".

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
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.

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	-	-	Sections 3.1 & 3.5 updated

--- END OF REPORT ---