Report on the FCC and IC Testing of: Apple Inc. Model: A1932

In accordance with FCC 47 CFR Part 15C and Industry Canada RSS-GEN

Prepared for: Apple Inc.
One Apple Park Way
Cupertino
California 95014
USA

FCC ID: BCGA1932 IC: 579C-A1932

Product Service

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Document Number: 75942371-14 | Issue: 01

SIGNATURE			
AJ Lawson.			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Andy Lawson	Senior EMC Engineer	Authorised Signatory	16 October 2018

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

ENGINEERING STATEMENT
The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C and Industry Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Colin Mckean	Senior EMC Engineer	Testing	16 October 2018

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY
A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C: 2017 and Industry Canada RSS-GEN: Issue 4 (2014-11).

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Product Service

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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	16 October 2018

Table 1

1.2 Introduction

Applicant	Apple Inc.
Manufacturer	Apple Inc.
Model Number(s)	A1932
Serial Number(s)	C02X500GL3FY
Hardware Version(s)	EVT2
Software Version(s)	18B2034
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2017 Industry Canada RSS-GEN: Issue 4 (2014-11)
Test Plan/Issue/Date	Not Applicable
Order Number Date	0540166213 28-August-2018
Date of Receipt of EUT	23-August 2018
Start of Test	25-September-2018
Finish of Test	25-September-2018
Name of Engineer(s)	Colin McKean
Related Document(s)	ANSI C63.10: 2013

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1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C and Industry Canada RSS-GEN is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 15C	RSS-GEN			
Configuration and Mode: 2.4GHz WLAN					
2.1	15.207	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10: 2013
Configuration and Mode: 5GHz WLAN					
2.1	15.207	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10: 2013
Configuration and Mode: Bluetooth					
2.1	15.207	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10: 2013

Table 2

Product Service

1.4 Product Information

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Laptop computer, with Bluetooth, Bluetooth Low Energy and 802.11 b/g/n/ac capabilities in the 2.4 GHz and 5.0 GHz bands.

1.5 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.6 EUT Modification Record

The table below details modifications made to the EUT during the test programme.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Serial Number: C02X500GL3FY			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.7 Test Location

TÜV SÜD Product Service conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: 2.4GHz WLAN		
AC Power Line Conducted Emissions	Colin McKean	UKAS
Configuration and Mode: 5GHz WLAN		
AC Power Line Conducted Emissions	Colin McKean	UKAS
Configuration and Mode: Bluetooth		
AC Power Line Conducted Emissions	Colin McKean	UKAS

Table 4

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom

Product Service

2 Test Details

2.1 AC Power Line Conducted Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.207
Industry Canada RSS-GEN, Clause 8.8

2.1.2 Equipment Under Test and Modification State

A1932, S/N: C02X500GL3FY - Modification State 0

2.1.3 Date of Test

25-September-2018

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.2.

The EUT was placed on a non-conductive table 0.8m above a reference ground plane and 0.4m away from a vertical coupling plane

All power was connected to the EUT through an Artificial Mains Network (AMN). Conducted disturbance voltage measurements on mains lines were made at the output of the AMN. The AMN was placed 0.8m from the boundary of the EUT and bonded to the reference ground plane.

2.1.5 Environmental Conditions

Ambient Temperature	22.0 °C
Relative Humidity	54.0 %

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2.1.6 Test Results

2.4GHz WLAN

Applied supply voltage: 120 Vac
Applied supply frequency: 60 Hz

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dB)
0.225	36.8	62.6	-25.9	20.8	52.6	-31.8
0.240	35.4	62.1	-26.7	16.4	52.1	-35.7
0.251	34.2	61.7	-27.5	17.3	51.7	-34.4
0.260	34.1	61.4	-27.3	18.9	51.4	-32.5
0.281	31.8	60.8	-29.0	14.6	50.8	-36.2

Table 5 - Neutral Line Emissions Results

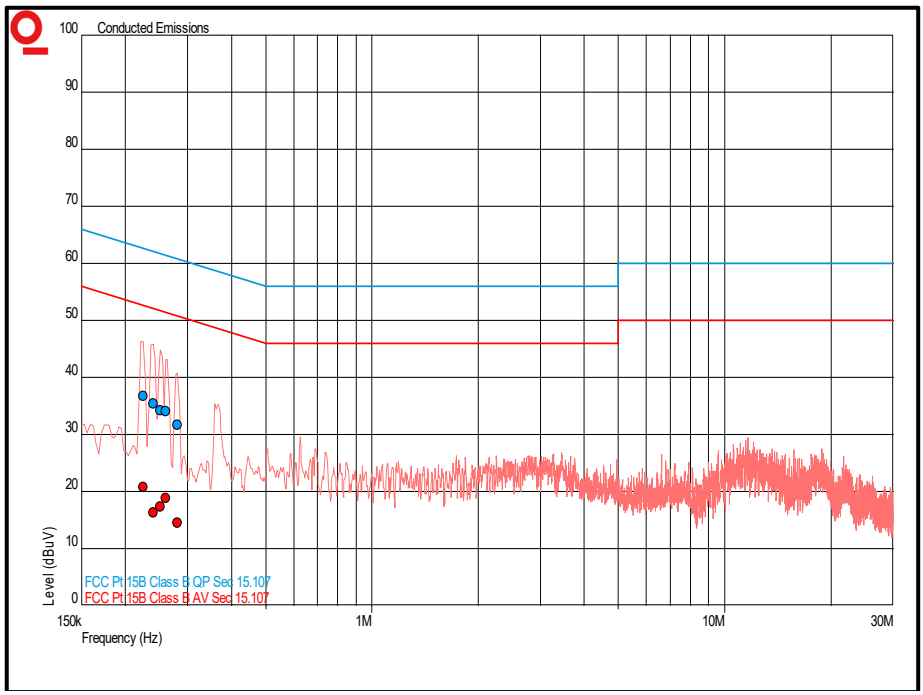

Figure 1 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dB)
0.174	42.6	64.8	-22.1	21.5	54.8	-33.2
0.249	34.7	61.8	-27.1	16.9	51.8	-34.9

Table 6 - Live Line Emissions Results

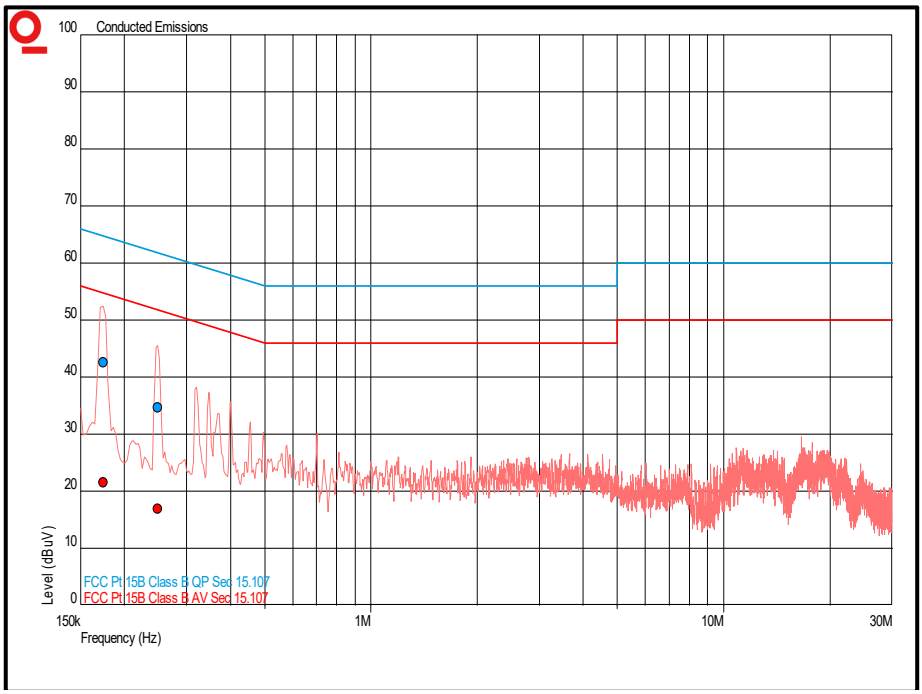

Figure 2 - Live Line - 150 kHz to 30 MHz

FCC 47 CFR Part 15, Limit Clause 15.207 and Industry Canada RSS-GEN, Limit Clause 8.8

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50
*Decreases with the logarithm of the frequency.		

Table 7

Product Service

5GHz WLAN

Applied supply voltage: 120 Vac
Applied supply frequency: 60 Hz

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dB)
0.177	42.3	64.6	-22.4	22.3	54.6	-32.3
0.204	39.1	63.5	-24.4	18.7	53.5	-34.7
0.246	35.0	61.9	-26.9	16.7	51.9	-35.3
0.314	29.6	59.9	-30.3	13.4	49.9	-36.4

Table 8 - Neutral Line Emissions Results

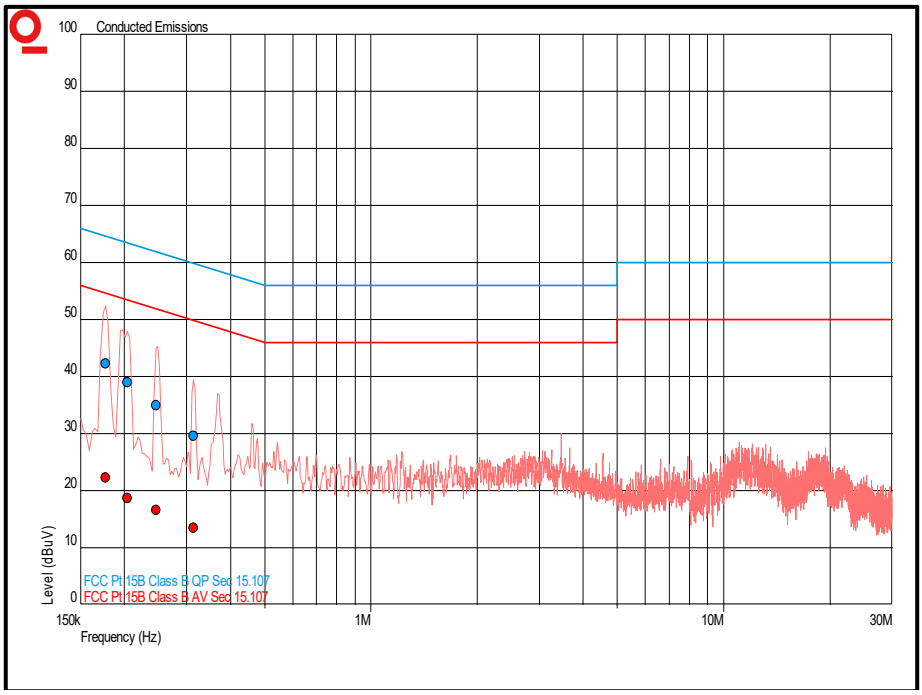

Figure 3 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dB)
0.150	46.3	66.0	-19.7	26.6	56.0	-29.4
0.183	41.4	64.3	-22.9	24.5	54.3	-29.8
0.195	40.1	63.8	-23.7	20.6	53.8	-33.3
0.200	39.5	63.6	-24.1	19.1	53.6	-34.5
0.266	33.8	61.2	-27.5	15.7	51.2	-35.6
0.368	32.4	58.6	-26.2	29.4	48.6	-19.1

Table 9 - Live Line Emissions Results

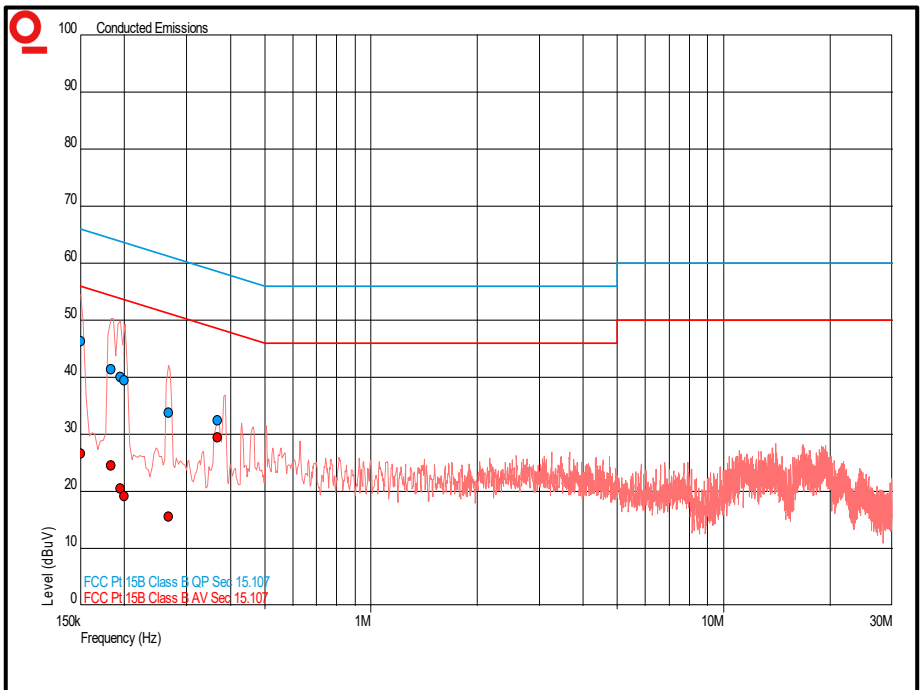

Figure 4 - Live Line - 150 kHz to 30 MHz

FCC 47 CFR Part 15, Limit Clause 15.207 and Industry Canada RSS-GEN, Limit Clause 8.8

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50
*Decreases with the logarithm of the frequency.		

Table 10

Bluetooth

Applied supply voltage: 120 Vac
Applied supply frequency: 60 Hz

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dB)
0.192	40.5	63.9	-23.5	21.8	53.9	-32.2
0.219	37.4	62.9	-25.5	21.0	52.9	-31.9

Table 11 - Neutral Line Emissions Results

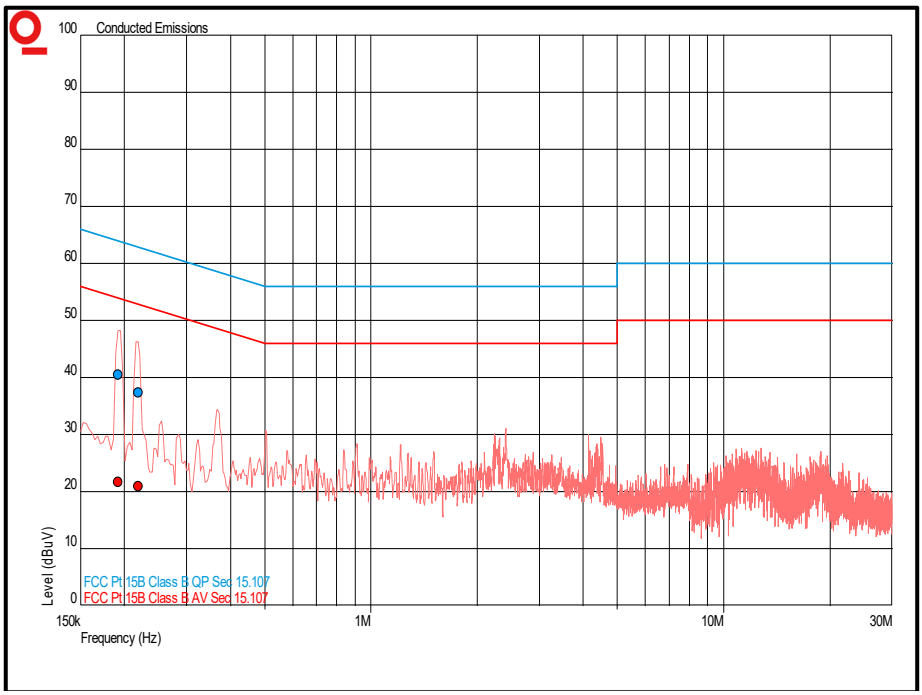

Figure 5 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dB)
0.165	43.7	65.2	-21.5	22.9	55.2	-32.3
0.210	38.2	63.2	-25.0	18.5	53.2	-34.8
0.258	33.7	61.5	-27.8	19.1	51.5	-32.4

Table 12 - Live Line Emissions Results

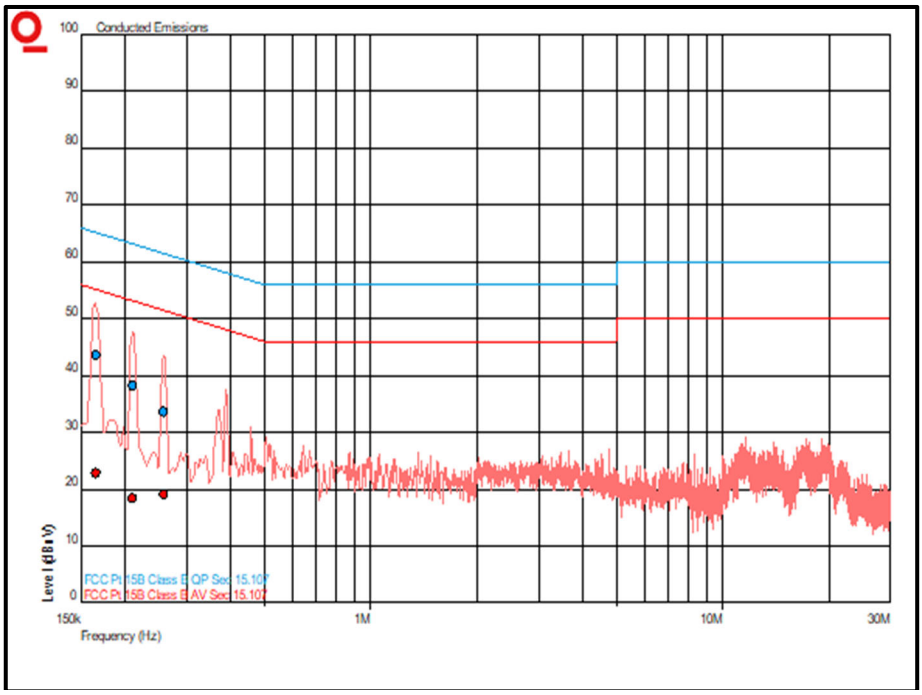

Figure 6 - Live Line - 150 kHz to 30 MHz

FCC 47 CFR Part 15, Limit Clause 15.207 and Industry Canada RSS-GEN, Limit Clause 8.8

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50
*Decreases with the logarithm of the frequency.		

Table 13

Product Service

2.1.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Transient Limiter	Hewlett Packard	11947A	15	12	26-Jul-2019
3 phase LISN	Rohde & Schwarz	ESH2-Z5	323	12	9-Apr-2019
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Compliance 5 Emissions	Teseq	V5.26.51	3275	-	Software
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018

Table 14

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3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
AC Power Line Conducted Emissions	150 kHz to 30 MHz, LISN, ±3.7 dB

Table 15