Report on the FCC and IC Testing of: Apple Inc. Model: A1993

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: BCGA1993 IC: 579C-A1993

Product Service

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Document Number: 75942779-15 | Issue: 02

SIGNATURE			
			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Andy Lawson	Senior EMC Engineer	Authorised Signatory	10 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**
Graeme Lawler	Test Engineer	Testing	10 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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Product Service

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	26 September 2018
2	FCC and IC ID updated	10 October 2018

Table 1

1.2 Introduction

Applicant	Apple Inc.
Manufacturer	Apple Inc.
Model Number(s)	A1993
Serial Number(s)	C07WT00HK2V0
Hardware Version(s)	EVT
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	0540058293 18-May-2018
Date of Receipt of EUT	20-June-2018
Start of Test	06-August-2018
Finish of Test	06-August-2018
Name of Engineer(s)	Graeme Lawler
Related Document(s)	ANSI C63.10 (2013)

Product Service

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: CoTX - 2.4GHz Main, 5GHz Aux & BDR					
2.1	15.207	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2013)
Configuration and Mode: CoTX - 5GHz main, 2.4GHz Aux & BDR					
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 desktop computer with Bluetooth, Bluetooth Low Energy and 802.11 b/g/n/ac capabilities in the 2.4GHz and 5GHz 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: C07WT00HK2V0			
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: CoTX - 2.4GHz Main, 5GHz Aux & BDR		
AC Power Line Conducted Emissions	Graeme Lawler	UKAS
Configuration and Mode: CoTX - 5GHz main, 2.4GHz Aux & BDR		
AC Power Line Conducted Emissions	Graeme Lawler	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

A1993, S/N: C07WT00HK2V0 - Modification State 0

2.1.3 Date of Test

06-August-2018

2.1.4 Test Method

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

2.1.5 Environmental Conditions

Ambient Temperature	19.7 °C
Relative Humidity	53.8 %

Product Service

2.1.6 Test Results

CoTX - 2.4GHz WLAN (Main), 5GHz (Aux) + BDR

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

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.250	41.1	61.8	-20.6	40.0	51.8	-11.8
0.502	39.0	56.0	-17.0	36.5	46.0	-9.5
0.670	38.8	56.0	-17.2	34.8	46.0	-11.2
0.754	38.1	56.0	-17.9	33.6	46.0	-12.4
0.796	37.6	56.0	-18.4	32.6	46.0	-13.4
0.878	36.7	56.0	-19.3	31.6	46.0	-14.4

Table 5 - Neutral Line Emissions Results

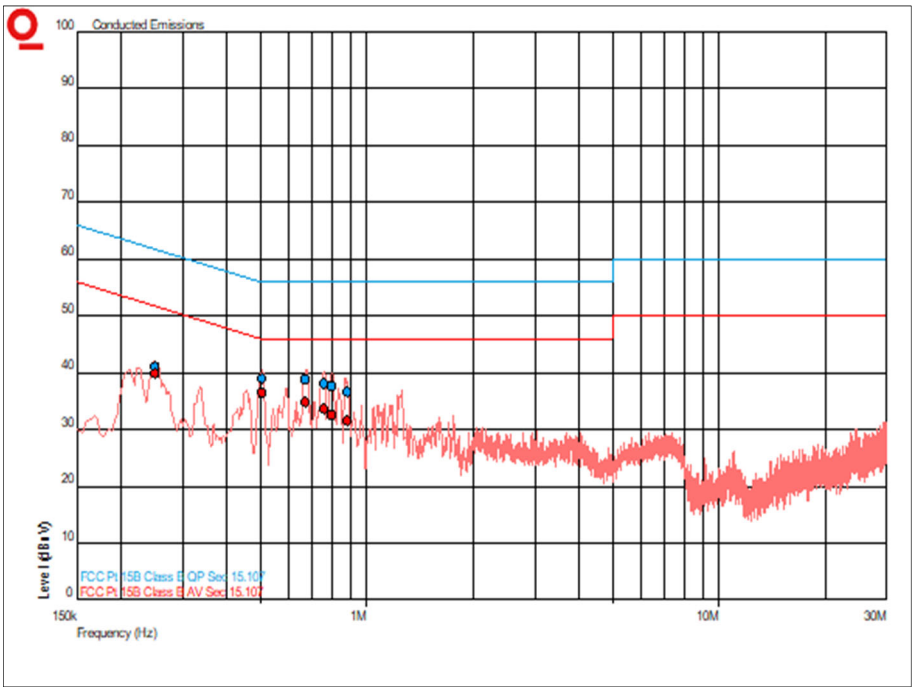

Figure 1 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.249	41.7	61.8	-20.1	39.9	51.8	-11.9
0.504	39.6	56.0	-16.4	36.5	46.0	-9.5
0.668	38.8	56.0	-17.2	34.6	46.0	-11.4
0.757	38.5	56.0	-17.5	33.2	46.0	-12.8
0.795	37.4	56.0	-18.6	32.5	46.0	-13.5
0.876	37.0	56.0	-19.0	31.3	46.0	-14.7

Table 6 - Live Line Emissions Results

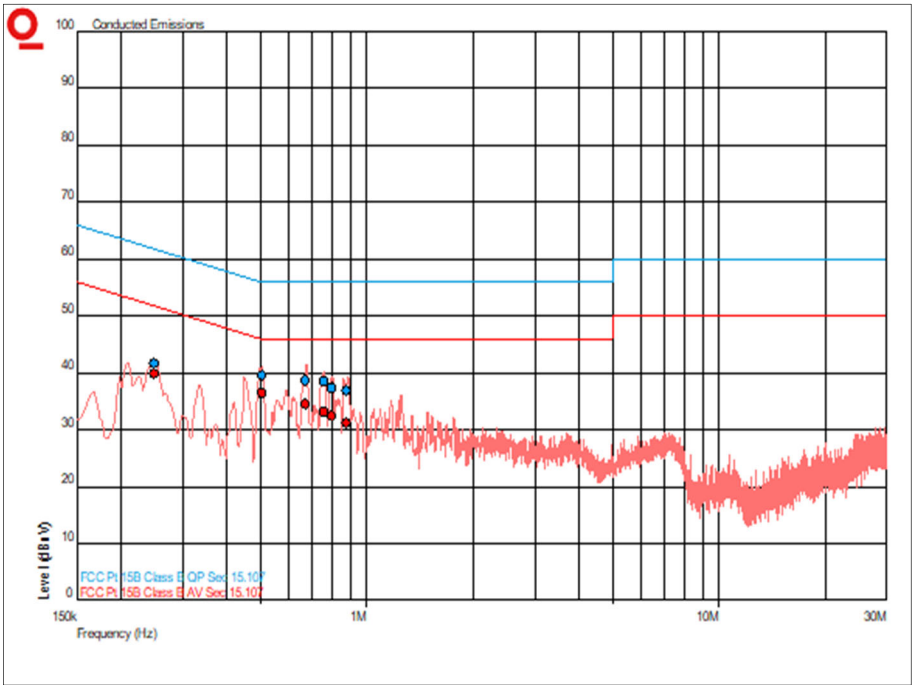

Figure 2 - Live Line - 150 kHz to 30 MHz

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

CoTX - 5GHz WLAN (main), 2.4GHz (Aux) + BDR

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

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.249	41.2	61.8	-20.6	39.1	51.8	-12.7
0.503	39.0	56.0	-17.0	36.6	46.0	-9.4
0.673	39.3	56.0	-16.7	34.8	46.0	-11.2
0.753	38.0	56.0	-18.0	33.4	46.0	-12.6
0.795	37.1	56.0	-18.9	32.0	46.0	-14.0
0.880	36.7	56.0	-19.3	31.7	46.0	-14.3

Table 8 - Neutral Line Emissions Results

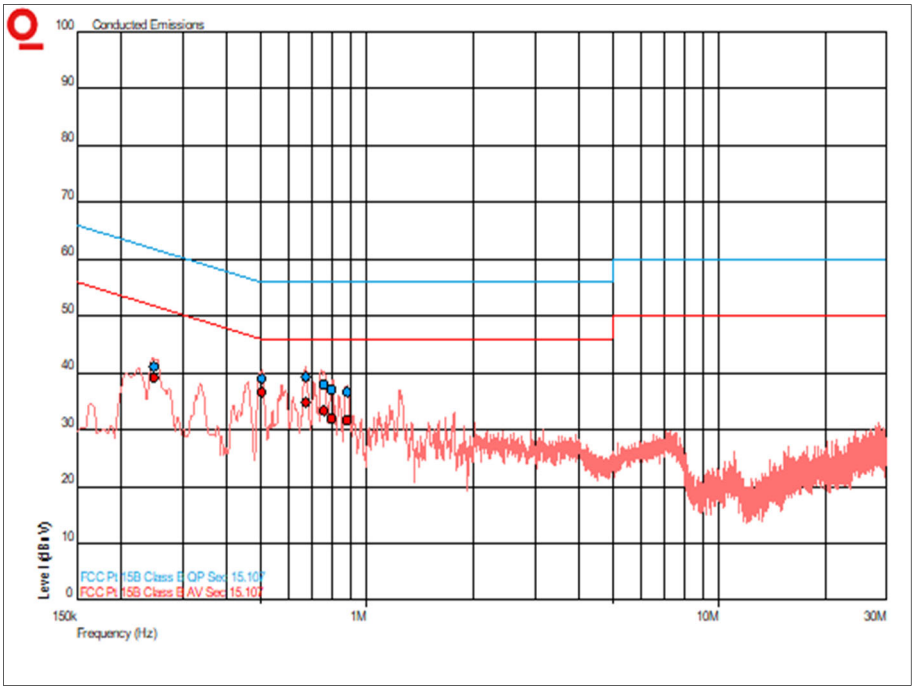

Figure 3 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.250	41.7	61.8	-20.0	40.2	51.8	-11.6
0.500	39.4	56.0	-16.6	35.5	46.0	-10.5
0.674	39.6	56.0	-16.4	34.6	46.0	-11.4
0.753	38.0	56.0	-18.0	33.3	46.0	-12.7
0.793	37.0	56.0	-19.0	31.3	46.0	-14.7
0.876	36.8	56.0	-19.2	30.1	46.0	-15.9

Table 9 - Live Line Emissions Results

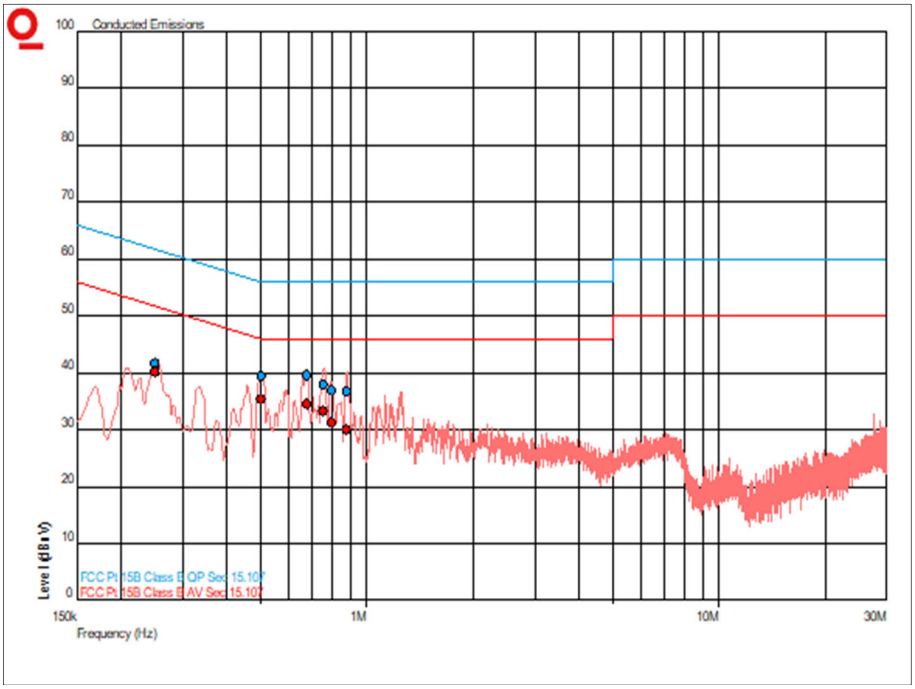

Figure 4 - Live Line - 150 kHz to 30 MHz

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

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
LISN (1 Phase)	Chase	MN 2050	336	12	10-Apr-2019
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Compliance 5	Teseq	C5e V5.26.51	3274	-	Software
Transient Limiter	Hewlett Packard	11947A	2377	12	23-Feb-2019
Multimeter	Iso-tech	IDM101	2419	12	23-Nov-2018
Variac Transformer	Zenith	Z-710-R	3169	-	O/P Mon
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Cable (Rx, Nm-Nm, 7m)	Scott Cables	SLU18-NMNM-07.00M	4498	-	O/P Mon
Hygrometer	Rotronic	HP21	4989	12	26-Apr-2019

Table 11

O/P Mon – Output Monitored using calibrated equipment

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 12