



FCC Part 1 Subpart I
FCC Part 2 Subpart J

CERTIFICATION TEST REPORT

FOR

MAGNETIC CHARGING CABLE

MODEL NO: A2056

FCC ID: BCGA2056

REPORT NUMBER: 12486403-E2V3

ISSUE DATE: SEPTEMBER 07, 2018

Prepared for
APPLE INC.
1 APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A

Prepared by
UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888



Revision History

Rev.	Issue Date	Revisions	Revised By
V1	09/05/2018	Initial Issue	Chin Pang
V2	09/06/2018	Address TCB Questions	Francisco Guarnero
V3	09/07/2018	Correction on page7 and 12	Chin Pang

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE INC.
1 APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: MAGNETIC CHARGING CABLE

MODEL NUMBER: A2056

SERIAL NUMBER: DLC824401JRJLW04R

DATE TESTED: AUGUST 17–22, 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 1 SUBPART I & PART 2 SUBPART J	Complies

UL Verification Services Inc. calculated the RF Exposure of the above equipment in accordance with the requirements set forth in the above standards, using test results reported in the test report documents referenced below and/or documentation furnished by the applicant. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations of these calculations. The results show that the equipment is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Reviewed By:



Chin Pang
Senior Engineer
UL Verification Service Inc.

Prepared By:



Tony Wang
Test Engineer
UL Verification Services Inc.

2. TEST METHODOLOGY

All calculations were made in accordance with FCC OET Bulletin 65 Edition 97-01..

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
<input type="checkbox"/> Chamber A (IC:2324B-1)	<input type="checkbox"/> Chamber D (IC:22541-1)
<input type="checkbox"/> Chamber B (IC:2324B-2)	<input type="checkbox"/> Chamber E (IC:22541-2)
<input type="checkbox"/> Chamber C (IC:2324B-3)	<input type="checkbox"/> Chamber F (IC:22541-3)
<input type="checkbox"/> Immunity Area	<input type="checkbox"/> Chamber G (IC:22541-4)
	<input type="checkbox"/> Chamber H (IC:22541-5)
	<input checked="" type="checkbox"/> Temperature B Room

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at [NVLAP Lab Search](#).

4. EQUIPMENT UNDER TEST

4.1. DESCRIPTION OF EUT

The EUT is a magnetic charging device which has a single inductive charging coil to charge Apple Watch. The charging frequency is 326.5 kHz, and the maximum power consumption is 5W in charging status.

4.2. WORST-CASE CONFIGURATION AND MODE

The EUT is a single frequency magnetic charger enclosed in a plastic case with different cable lengths, 1m and 0.3m. For operation mode, EUT was tested with small and big watch to find the worst case. For EUT with 1m cable, both small and big watches were set for final test; and for EUT with 0.3m cable, the big watch was chosen for final test since there has no significant difference found between the small and big watches.

Config	Mode	Descriptions
1	Standby	EUT Alone powered by AC/DC adapter
2	Operating	EUT and Watch (big) powered by AC/DC adapter

Note that the EUT was tested as standby and operation modes.

4.3. KDB 680106 D01 SECTION 5b EQUIPMENT APPROVAL CONSIDERATIONS

Requirement	Device
(1) Power transfer frequency is less than 1 MHz.	Yes. Operating Frequency is 326.5KHz
(2) Output power from each primary coil is less than or equal to 15 watts.	Yes. The maximum power is 5Watts
(3) The transfer system includes only single primary and secondary coils. This includes charging systems that may have multiple primary coils and clients that are able to detect and allow coupling only between individual pairs of coils.	Yes. The system includes one single primary and secondary coil and the device is designed to charge a single client
(4) Client device is placed directly in contact with the transmitter.	Yes. The client device is placed directly in contact with the transmitter.
(5) Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion).	Yes. Mobile exposure condition apply.
(6) The aggregate H-field strengths at 15 cm surrounding the device and 20 cm above the top surface from all simultaneous transmitting coils are demonstrated to be less than 50% of the MPE limit.	Yes. The aggregate fields at 15cm from the device are 1.10% of the FCC H field limit.

4.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

SUPPORT EQUIPMENT & PERIPHERALS LIST				
Description	Housing/Watch Band	Manufacturer	Model	Serial Number
Watch (Big)	Aluminum/Sport band	Apple	A1978	D92X3007KNVP
Watch (Small),	Aluminum/Sport band	Apple	A1977	D92X102TKK8G
Watch(Big)	Aluminum/Sport band	Apple	A1976	D92X301BKK8D
Watch (Small)	Aluminum/Sport band	Apple	A1975	D92X2043KW4X
AC/DC Adapter	N/A	Apple	A1385	N/A

I/O CABLES

N/A

TEST SETUP

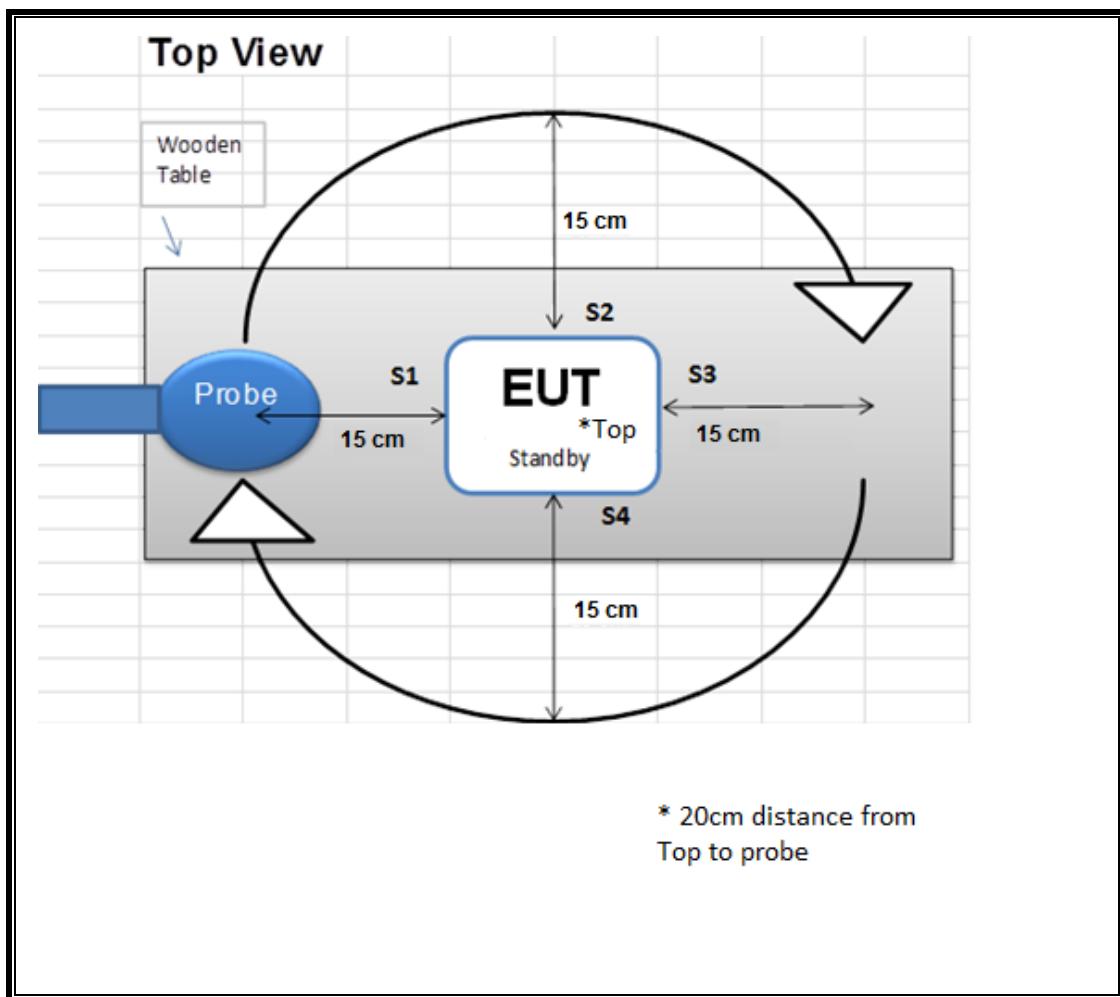
The following three configurations are tested:

Configuration	Mode	Descriptions
1	Standby	EUT Alone powered by AC/DC adapter
2	Operating (Watch, ~10% Power Charging)	EUT and Watch powered by AC/DC adapter
	Operating (Watch, ~50% Power Charging) <u>Note:</u> For the configuration 2 operating with Watch, battery level of the Watch was at a state of 20 – 50%.	EUT and Watch powered by AC/DC adapter
	Operating (Watch, >90% Power Charging)	EUT and Watch powered by AC/DC adapter

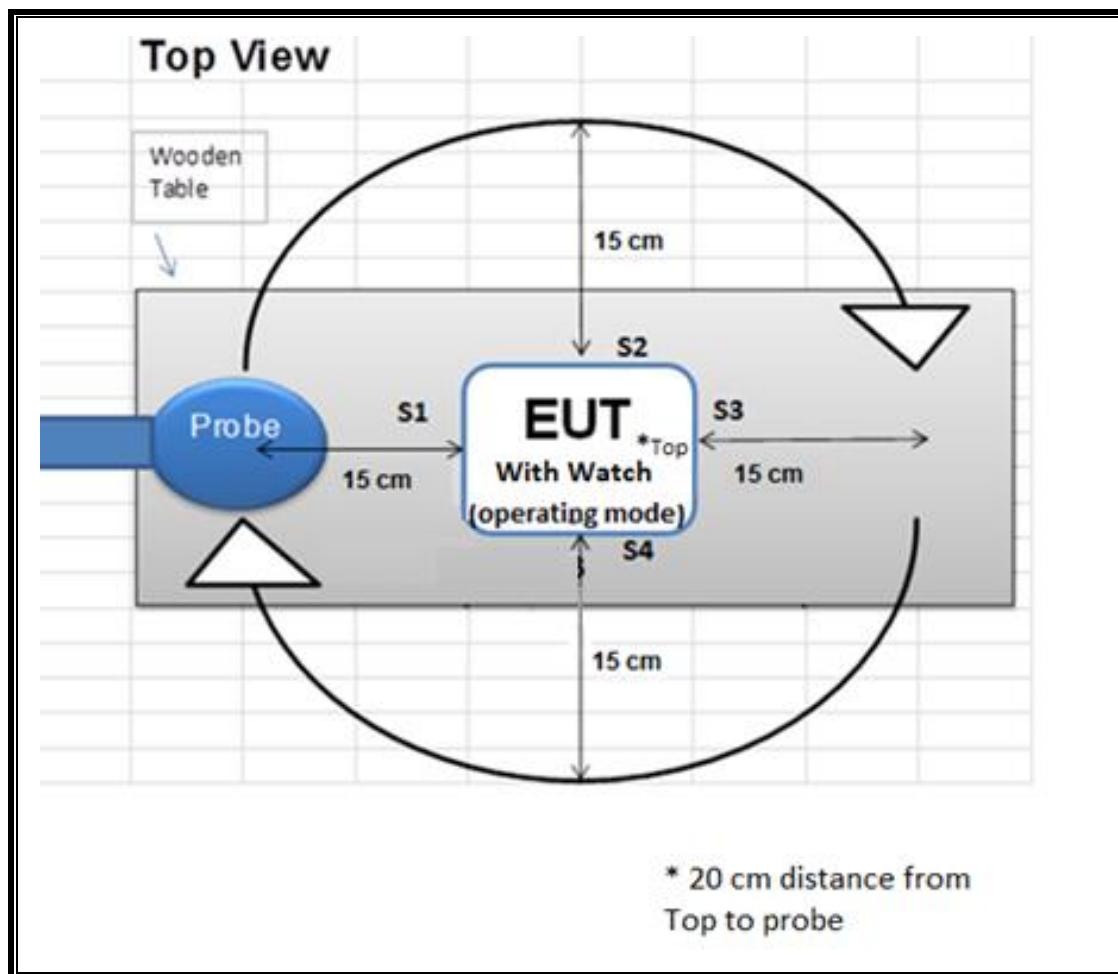
MEASUREMENT SETUP

The measurement was taken using a probe placed 15 cm surrounding the device and 20 cm above the top surface of the EUT. Measurements were taken from the top and all sides of the EUT per KDB680106 D01 v03.

CONFIGURATION 1



CONFIGURATION 2



5. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was used for the tests documented in this report:

Test Equipment List					
Description	Manufacturer	Model	S/N	Cal Date	Cal Due
Electric and Magnetic Field Probe	Narda	EHP-200A	170WX80318	04/06/2018	04/06/19

6. DUTY CYCLE

LIMITS

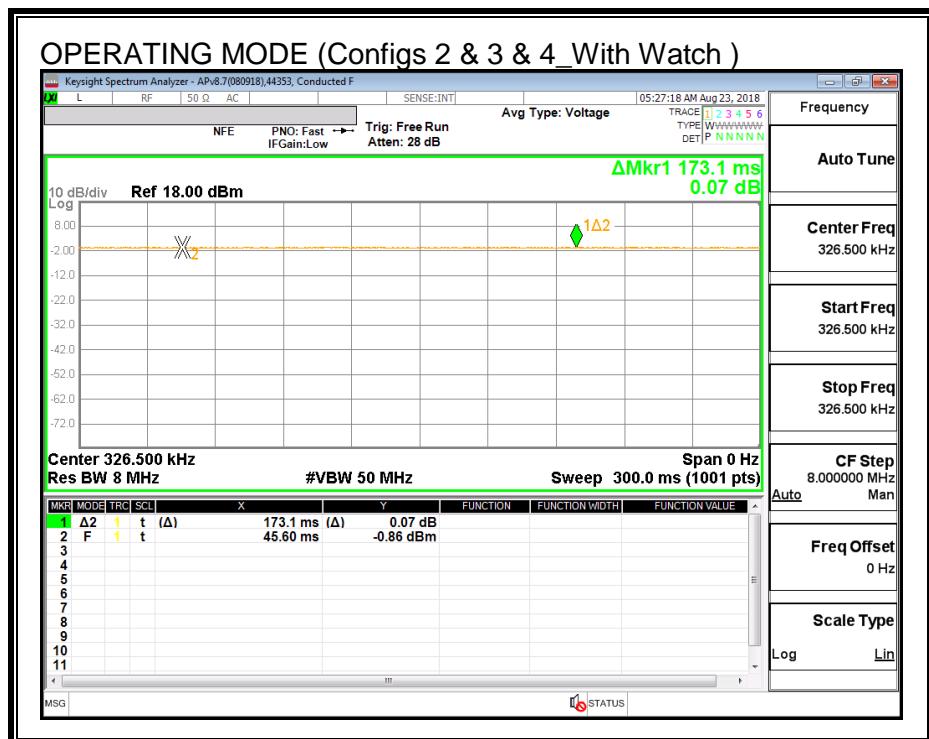
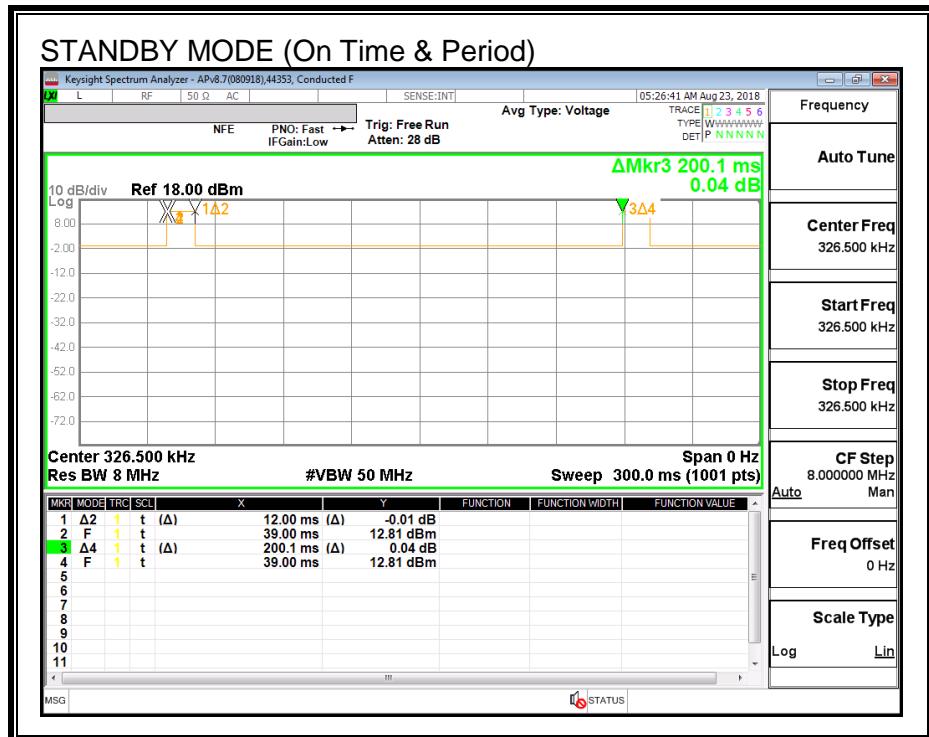
None; for reporting purposes only.

PROCEDURE

Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
Standby (Config 1)	12.00	200.10	0.06	6.00%	12.22
Operating(Config 2)	100.00	100.00	1.00	100.00%	0.00



7. MAXIMUM PERMISSIBLE RF EXPOSURE

7.1. FCC LIMITS AND SUMMARY

7.1.1. FCC LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

7.1.2. FCC SUMMARY OF RESULTS

RESULTS

ID:	38602	Date:	8/14/18
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FCC RF EXPOSURE SUMMARY OF RESULTS

A1385/0.3m/USB-A/A1976

Electric Field Limit			Magnetic Field Limit		
FCC RF Exposure Limit	Maximum Average (V/m)	Percentage (%)	FCC RF Exposure	Maximum Average (A/m)	Percentage (%)
614	0.397	0.06%	1.63	0.018	1.10%

A1385/1.0m/USB-A/A1978

Electric Field Limit			Magnetic Field Limit		
FCC RF Exposure Limit	Maximum Average (V/m)	Percentage (%)	FCC RF Exposure	Maximum Average (A/m)	Percentage (%)
614	0.401	0.07%	1.63	0.018	1.10%

A1385/1.0m/USB-A/A1977

Electric Field Limit			Magnetic Field Limit		
FCC RF Exposure Limit	Maximum Average (V/m)	Percentage (%)	FCC RF Exposure	Maximum Average (A/m)	Percentage (%)
614	0.397	0.06%	1.63	0.018	1.10%

A1385/1.0m/USB-A/A1976

Electric Field Limit			Magnetic Field Limit		
FCC RF Exposure Limit	Maximum Average (V/m)	Percentage (%)	FCC RF Exposure	Maximum Average (A/m)	Percentage (%)
614	0.397	0.06%	1.63	0.018	1.10%

A1385/1.0m/USB-A/A1975

Electric Field Limit			Magnetic Field Limit		
FCC RF Exposure Limit	Maximum Average (V/m)	Percentage (%)	FCC RF Exposure	Maximum Average (A/m)	Percentage (%)
614	0.398	0.06%	1.63	0.018	1.10%

7.2. TEST RESULTS

7.2.1. FCC RF EXPOSURE

E- FIELD AND H- FIELD MEASUREMENTS

Note: Peak measurements were performed. RMS values were calculated from the peak measurement. Please refer to the formula for calculating the RMS values: [Field Strength x $\sqrt{\text{Duty Cycle}}$].

EUT WITH A1385 0.3m CABLE, USB-A AND MODEL A1976 WATCH

Configuration	Test Mode	Measuring Distance (cm)	Electric Field Limit (V/m)	Electric Field Reading (V/m)				Magnetic Field Limit (A/m)	Magnetic Field Reading (A/m)						
				FCC	Location	Peak	Duty Cycle %		FCC	Location	Peak	Duty Cycle %	FCC Average		
1	Standby	15 cm surrounding the device (S1-S4) and 20 cm above the top surface of the EUT	614	FCC	S1	0.380	6.00	0.023	FCC	S1	0.021	6	0.001		
					S2	0.371		0.022		S2	0.017		0.001		
					S3	0.380		0.023		S3	0.018		0.001		
					S4	0.371		0.022		S4	0.016		0.001		
					Top	0.388		0.023		Top	0.022		0.001		
	Operating Real Product (Power <10% Charging)			100.00	Max	0.397		0.024	FCC	Max	0.024	1.63	0.001		
					S1	0.291		0.291		S1	0.015		0.015		
					S2	0.263		0.263		S2	0.014		0.014		
					S3	0.258		0.258		S3	0.012		0.012		
					S4	0.261		0.261		S4	0.016		0.016		
2	Operating Real Product (Power ~ 20% - 50% Charging)			100.00	Top	0.266		0.266	FCC	Top	0.015	100	0.015		
					Max	0.317		0.317		Max	0.017		0.017		
					S1	0.371		0.371		S1	0.017		0.017		
					S2	0.381		0.381		S2	0.017		0.017		
					S3	0.388		0.388		S3	0.017		0.017		
	Operating Real Product (Power >90% Charging)			100.00	S4	0.372		0.372	FCC	S4	0.018	100	0.018		
					Top	0.371		0.371		Top	0.017		0.017		
					Max	0.397		0.397		Max	0.018		0.018		
					S1	0.373		0.373		S1	0.017		0.017		
					S2	0.364		0.364		S2	0.015		0.015		

EUT WITH A1385 1m CABLE, USB-A AND MODEL A1978 WATCH

Configuration	Test Mode	Measuring Distance (cm)	Electric Field Limit (V/m)	Electric Field Reading (V/m)				Magnetic Field Limit (A/m)	Magnetic Field Reading (A/m)						
				FCC	Location	Peak	Duty Cycle %		FCC	Location	Peak	Duty Cycle %	FCC Average		
1	Standby	15 cm surrounding the device (S1-S4) and 20 cm above the top surface of the EUT	614	FCC	S1	0.343	6.00	0.021	FCC	S1	0.017	6	0.001		
					S2	0.332		0.020		S2	0.017		0.001		
					S3	0.343		0.021		S3	0.017		0.001		
					S4	0.343		0.021		S4	0.017		0.001		
					Top	0.332		0.020		Top	0.034		0.002		
	Operating Real Product (Power <10% Charging)			100.00	Max	0.343		0.021	FCC	Max	0.037		0.002		
					S1	0.383		0.383		S1	0.017		0.017		
					S2	0.388		0.388		S2	0.018		0.018		
					S3	0.392		0.392		S3	0.017		0.017		
					S4	0.397		0.397		S4	0.017		0.017		
2	Operating Real Product (Power ~ 20% - 50% Charging)			100.00	Top	0.390		0.390	FCC	Top	0.017	100	0.017		
					Max	0.395		0.395		Max	0.018		0.018		
					S1	0.387		0.387		S1	0.018		0.018		
					S2	0.391		0.391		S2	0.018		0.018		
					S3	0.378		0.378		S3	0.017		0.017		
	Operating Real Product (Power >90% Charging)			100.00	S4	0.388		0.388	FCC	S4	0.017	100	0.017		
					Top	0.397		0.397		Top	0.017		0.017		
					Max	0.401		0.401		Max	0.018		0.018		
					S1	0.291		0.291		S1	0.014		0.014		
					S2	0.315		0.315		S2	0.013		0.013		

EUT WITH A1385, 1m CABLE USB-A AND MODEL A1977 WATCH

Configuration	Test Mode	Measuring Distance (cm)	Electric Field Limit (V/m)	Electric Field Reading (V/m)				Magnetic Field Limit (A/m)	Magnetic Field Reading (A/m)						
				FCC	Location	Peak	Duty Cycle %		FCC	Location	Peak	Duty Cycle %			
1	Standby	15 cm surrounding the device (S1 - S4) and 20 cm above the top surface of the EUT	614	S1	0.343		6.00	0.021	1.63	S1	0.017	6	0.001		
				S2	0.332			0.020		S2	0.017		0.001		
				S3	0.343			0.021		S3	0.017		0.001		
				S4	0.343			0.021		S4	0.017		0.001		
				Top	0.332			0.020		Top	0.034		0.002		
	Operating Real Product (Power <10% Charging)			Max	0.343			0.021		Max	0.037		0.002		
				S1	0.371		100.00	0.371		S1	0.017	100	0.017		
				S2	0.353			0.353		S2	0.017		0.017		
				S3	0.345			0.345		S3	0.017		0.017		
				S4	0.362			0.362		S4	0.017		0.017		
2	Operating Real Product (Power ~ 20% - 50% Charging)			Top	0.354			0.354		Top	0.017		0.017		
				Max	0.388			0.388		Max	0.017		0.017		
				S1	0.371		100.00	0.371		S1	0.017	100	0.017		
				S2	0.377			0.377		S2	0.017		0.017		
				S3	0.377			0.377		S3	0.017		0.017		
				S4	0.382			0.382		S4	0.017		0.017		
	Operating Real Product (Power >90% Charging)			Top	0.388			0.388		Top	0.017		0.017		
				Max	0.397			0.397		Max	0.018		0.018		
				S1	0.371		100.00	0.371		S1	0.017	100	0.017		
				S2	0.379			0.379		S2	0.017		0.017		
				S3	0.380			0.380		S3	0.017		0.017		
				S4	0.380			0.380		S4	0.017		0.017		
				Top	0.380			0.380		Top	0.017		0.017		
				Max	0.388			0.388		Max	0.018		0.018		

EUT WITH A1385, 1m CABLE USB-A AND MODEL A1976 WATCH

Configuration	Test Mode	Measuring Distance (cm)	Electric Field Limit (V/m)	Electric Field Reading (V/m)				Magnetic Field Limit (A/m)	Magnetic Field Reading (A/m)						
				FCC	Location	Peak	Duty Cycle %		FCC	Location	Peak	Duty Cycle %			
1	Standby	15 cm surrounding the device (S1 - S4) and 20 cm above the top surface of the EUT	614	S1	0.343		6.00	0.021	1.63	S1	0.017	6	0.001		
				S2	0.332			0.020		S2	0.017		0.001		
				S3	0.343			0.021		S3	0.017		0.001		
				S4	0.343			0.021		S4	0.017		0.001		
				Top	0.332			0.020		Top	0.034		0.002		
	Operating Real Product (Power <10% Charging)			Max	0.343			0.021		Max	0.037		0.002		
				S1	0.251		100.00	0.251		S1	0.017	100	0.017		
				S2	0.258			0.258		S2	0.017		0.017		
				S3	0.264			0.264		S3	0.015		0.015		
				S4	0.253			0.253		S4	0.015		0.015		
2	Operating Real Product (Power ~ 20% - 50% Charging)			Top	0.266			0.266		Top	0.015		0.015		
				Max	0.273			0.273		Max	0.017		0.017		
				S1	0.380		100.00	0.380		S1	0.017	100	0.017		
				S2	0.379			0.379		S2	0.018		0.018		
				S3	0.380			0.380		S3	0.017		0.017		
				S4	0.383			0.383		S4	0.017		0.017		
	Operating Real Product (Power >90% Charging)			Top	0.388			0.388		Top	0.017		0.017		
				Max	0.397			0.397		Max	0.018		0.018		
				S1	0.388		100.00	0.388		S1	0.017	100	0.017		
				S2	0.371			0.371		S2	0.017		0.017		
				S3	0.380			0.380		S3	0.017		0.017		
				S4	0.380			0.380		S4	0.017		0.017		
				Top	0.380			0.380		Top	0.017		0.017		

EUT WITH A1385, 1m CABLE USB-A AND MODEL A1975 WATCH

Configuration	Test Mode	Measuring Distance (cm)	Electric Field Limit (V/m)	Electric Field Reading (V/m)			Magnetic Field Limit (A/m)	Magnetic Field Reading					
				FCC	Location	Peak		FCC Average	Location	Peak			
			FCC	Location	Peak	Duty Cycle %	FCC Average	Location	Peak	Duty Cycle %			
1	Standby	15 cm surrounding the device (S1 - S4) and 20 cm above the top surface of the EUT	614	S1	0.343	6.00	0.021	1.63	S1	0.017	6		
				S2	0.332		0.020		S2	0.017			
				S3	0.343		0.021		S3	0.017			
				S4	0.343		0.021		S4	0.017			
				Top	0.332		0.020		Top	0.034			
	Operating Real Product (Power ~20% - 50% Charging)			Max	0.343		0.021		Max	0.037			
				S1	0.371	100.00	0.371		S1	0.017	100		
				S2	0.388		0.388		S2	0.017			
				S3	0.381		0.381		S3	0.017			
				S4	0.388		0.388		S4	0.017			
2	Operating Real Product (Power >90% Charging)			Top	0.388		0.388		Top	0.017	100		
				Max	0.398		0.398		Max	0.018			
				S1	0.388	100.00	0.388		S1	0.017			
				S2	0.388		0.388		S2	0.018			
				S3	0.371		0.371		S3	0.017			
				S4	0.388		0.388		S4	0.018			
				Top	0.381		0.381		Top	0.018			
				Max	0.397		0.397		Max	0.018			