



FCC Part 1 Subpart I
FCC Part 2 Subpart J

CERTIFICATION TEST REPORT

FOR

MAGNETIC CHARGING CABLE

MODEL NO: A2257

FCC ID: BCGA2257

REPORT NUMBER: 12938058-E2V2

ISSUE DATE: AUGUST 29, 2019

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

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	08/16/2019	Initial Issue	Chin Pang
V2	08/29/2019	Correction on EUT serial number	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: A2257

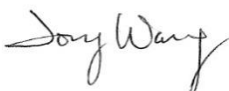
SERIAL NUMBER: DLC9247012GMFR02R, DLC92470030MFQY2A

DATE TESTED: AUGUST 17–22, 2019

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:		Prepared By:
		

Chin Pang
Senior Engineer
UL Verification Service Inc.

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	47658 Kato Rd.
☐ Chamber A (IC:2324B-1)	☐ Chamber D (IC:22541-1)	☐ Chamber I (IC: 2324A-5)
☐ Chamber B (IC:2324B-2)	☐ Chamber E (IC:22541-2)	☐ Chamber J (IC: 2324A-6)
☐ Chamber C (IC:2324B-3)	☐ Chamber F (IC:22541-3)	☐ Chamber K (IC: 2324A-1)
☒ Temperature B Room	☐ Chamber G (IC:22541-4)	☐ Chamber L (IC: 2324A-3)
	☐ Chamber H (IC:22541-5)	

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

4. 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 5 Watts
(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 worst case aggregate fields at 15cm from the device is 1.90% of the FCC H field limit.

4.1. DESCRIPTION OF EUT

The EUT is a magnetic charging cable 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 stainless steel case with 0.3m and 1 meter cable length USB -C type. For operation mode, it was tested with model A2095, a big watch. A2095 was chosen to test as the worst case condition since it has max load overall.

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. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

SUPPORT EQUIPMENT & PERIPHERALS LIST				
Description	Housing/Watch Band	Manufacturer	Model	Serial Number
Watch (big)	Stainless Steel	Apple	A2095	D92YT00GMW95
AC/DC Adapter	N/A	Apple	A1540	N/A

I/O CABLES

N/A

TEST SETUP

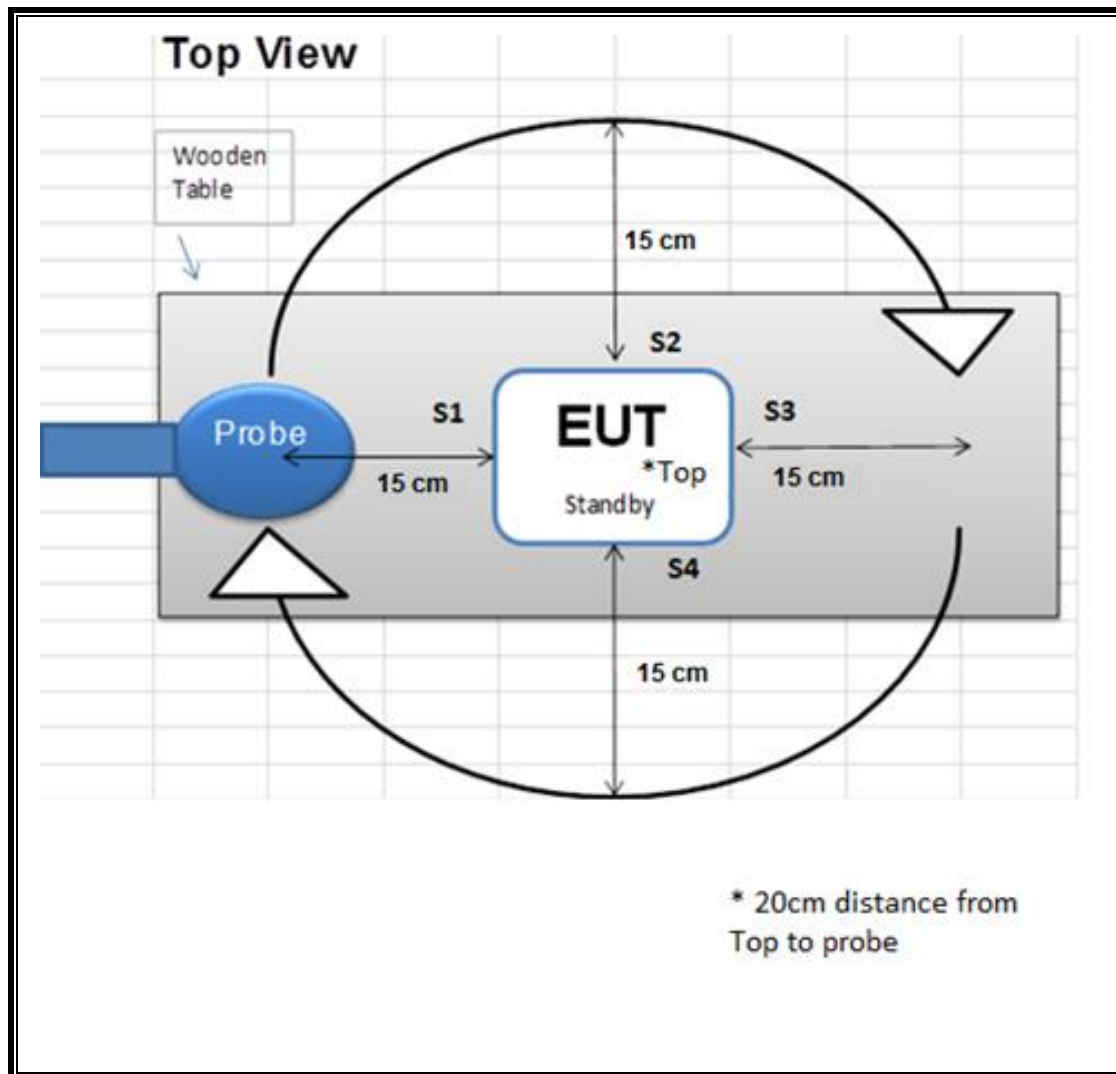
The following two configurations are tested:

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

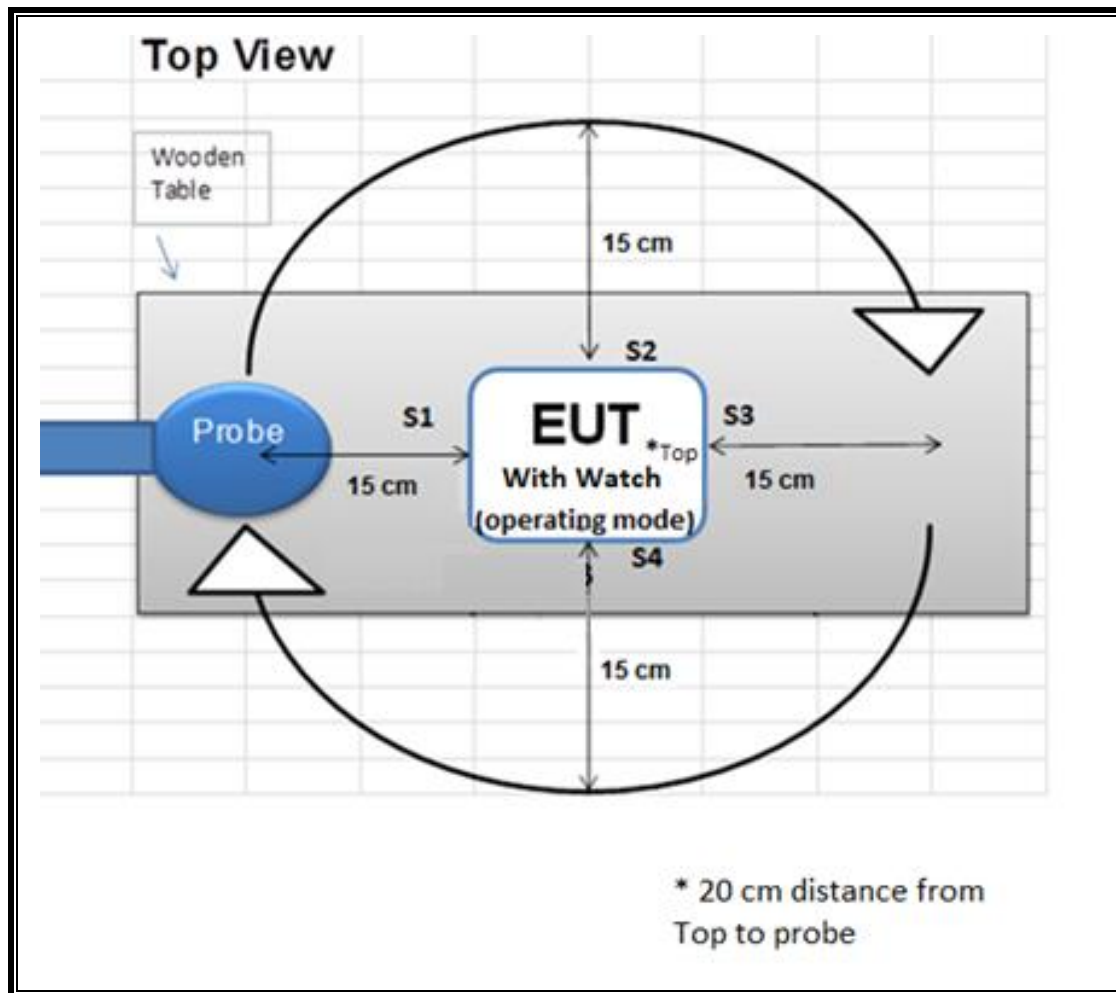
MEASUREMENT SETUP

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	Label ID	Cal Date	Cal Due
Electric and Magnetic Field Probe	Narda	EHP-200A	160WX41008	T1085	10/24/2018	10/24/2019

6. DUTY CYCLE

LIMITS

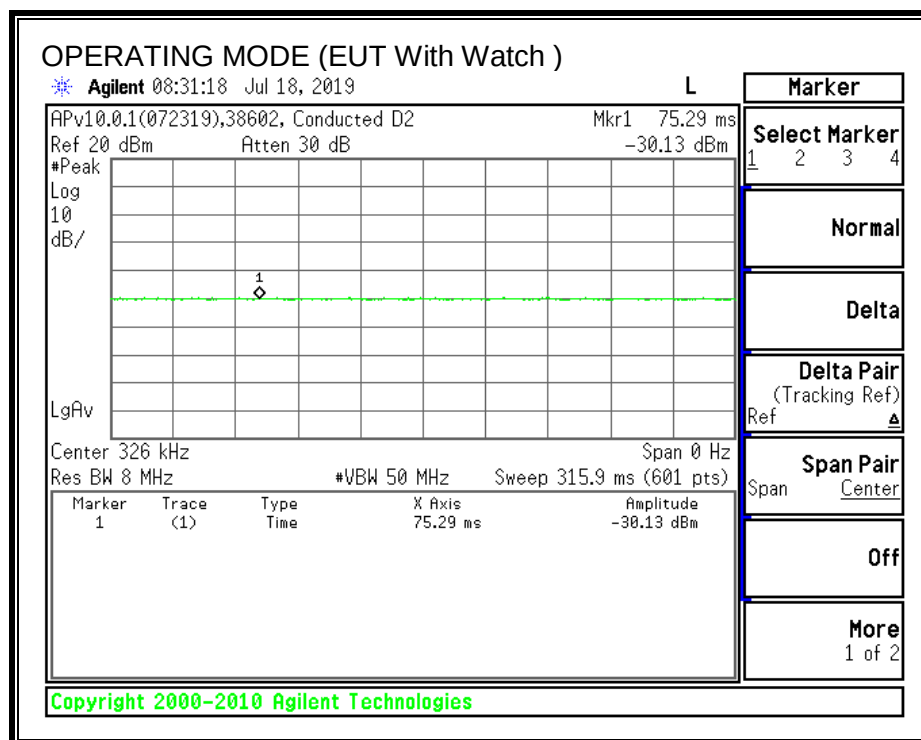
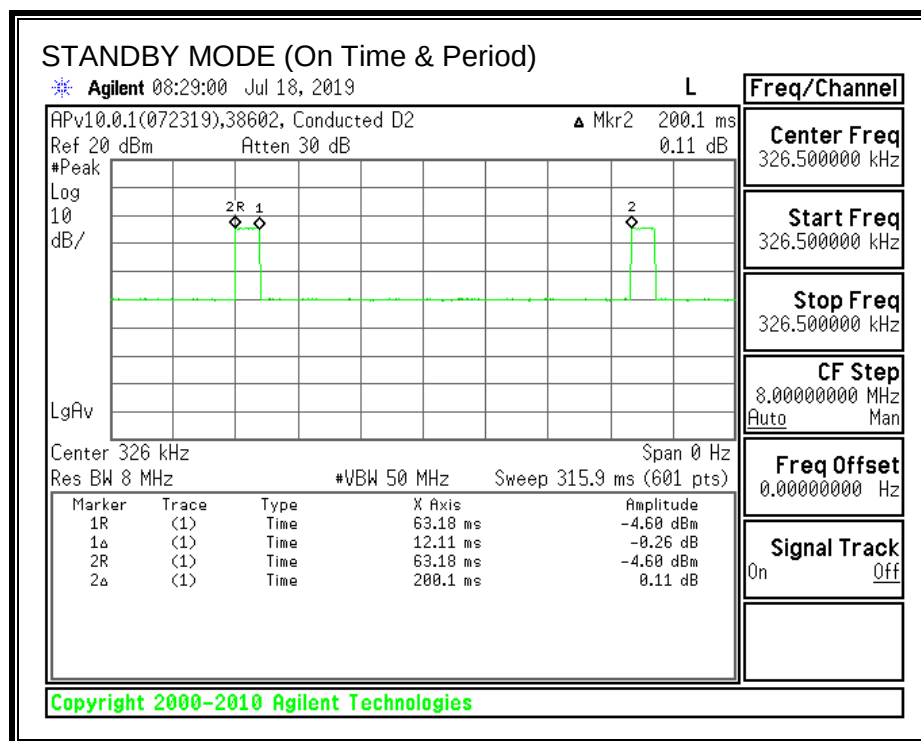
None; for reporting purposes only.

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)	12.11	200.10	0.06	6.05%	12.18
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:	7/19/19
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FCC RF Exposure Summary of Results

A2257/A1540/0.3M/USB-C/A2095

Electric Field Limit			Magnetic Field Limit		
FCC RF Exposure Limit	Maximum Average (V/m)	Percentage (%)	FCC RF Exposure	Maximum Average (A/m)	Percentage (%)
614	0.127	0.02%	1.63	0.026	1.60%

A2257/A1540/1.0M/USB-C/A2095

Electric Field Limit			Magnetic Field Limit		
FCC RF Exposure Limit	Maximum Average (V/m)	Percentage (%)	FCC RF Exposure	Maximum Average (A/m)	Percentage (%)
614	0.155	0.03%	1.63	0.031	1.90%

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: $[\text{Field Strength} \times \sqrt{\text{Duty Cycle}}]$.

A2257 WITH A1540, 0.3M CABLE USB-C AND MODEL A2095 WATCH

FCC Limit												
Configuration	Test Mode	Measuring Distance (cm)	Electric Field Limit	Electric Field Reading				Magnetic Field Limit	Magnetic Field Reading			
			(V/m)	(V/m)				(A/m)	(A/m)			
			FCC	Location	Peak	Duty Cycle %	FCC Average	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	S1	0.111	6.05	0.027	1.63	S1	0.019	6.05	0.005
				S2	0.120		0.030		S2	0.017		0.004
				S3	0.111		0.027		S3	0.019		0.005
				S4	0.120		0.030		S4	0.019		0.005
				Top	0.118		0.029		Top	0.021		0.005
				Max	0.127		0.031		Max	0.021		0.005
2	Operating Real Product (Power <10% Charging)			S1	0.111	100	0.111		S1	0.021	100	0.021
				S2	0.119		0.119		S2	0.019		0.019
				S3	0.120		0.120		S3	0.025		0.025
				S4	0.120		0.120		S4	0.017		0.017
				Top	0.111		0.111		Top	0.017		0.017
				Max	0.120		0.120		Max	0.026		0.026
	Operating Real Product (Power ~ 20% - 50% Charging)			S1	0.120	100	0.120		S1	0.024	100	0.024
				S2	0.126		0.126		S2	0.019		0.019
				S3	0.120		0.120		S3	0.021		0.021
				S4	0.120		0.120		S4	0.019		0.019
				Top	0.120		0.120		Top	0.019		0.017
				Max	0.127		0.127		Max	0.025		0.025
	Operating Real Product (Power >90% Charging)			S1	0.111	100	0.111		S1	0.025	100	0.025
				S2	0.111		0.111		S2	0.018		0.018
				S3	0.120		0.120		S3	0.021		0.021
				S4	0.120		0.120		S4	0.019		0.019
				Top	0.116		0.116		Top	0.017		0.017
				Max	0.120		0.120		Max	0.025		0.025

A2257 WITH A1540, 1.0M CABLE USB-C AND MODEL A2095 WATCH

FCC Limit													
Configuration	Test Mode	Measuring Distance (cm)	Electric Field Limit	Electric Field Reading				Magnetic Field Limit	Magnetic Field Reading				
			(V/m)	(V/m)				(A/m)	(A/m)				
			FCC	Location	Peak	Duty Cycle %	FCC Average	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	S1	0.111	6.05	0.027	1.63	S1	0.019	6.05	0.005	
				S2	0.126		0.031		S2	0.017		0.004	
				S3	0.111		0.027		S3	0.019		0.005	
				S4	0.121		0.030		S4	0.017		0.004	
				Top	0.118		0.029		Top	0.007		0.002	
				Max	0.127		0.031		Max	0.024		0.006	
2	Operating Real Product (Power <10% Charging)			S1	0.120	100	0.120		S1	0.025	0.025		
				S2	0.111		0.111		S2	0.027	0.027		
				S3	0.120		0.120		S3	0.021	0.021		
				S4	0.126		0.126		S4	0.030	0.030		
				Top	0.111		0.111		Top	0.018	0.018		
				Max	0.127		0.127		Max	0.031	0.031		
	Operating Real Product (Power ~ 20% - 50% Charging)			S1	0.120	100	0.120		S1	0.017	0.017		
				S2	0.120		0.120		S2	0.019	0.019		
				S3	0.119		0.119		S3	0.019	0.019		
				S4	0.111		0.111		S4	0.018	0.018		
				Top	0.118		0.118		Top	0.017	0.017		
				Max	0.121		0.121		Max	0.020	0.020		
	Operating Real Product (Power >90% Charging)			S1	0.111	100	0.111		S1	0.017	0.017		
				S2	0.120		0.120		S2	0.019	0.019		
				S3	0.145		0.145		S3	0.021	0.021		
				S4	0.120		0.120		S4	0.022	0.022		
				Top	0.111		0.111		Top	0.018	0.018		
				Max	0.155		0.155		Max	0.024	0.024		