

RF EXPOSURE TEST REPORT

Report Number: 104034906MPK-002

Project Number: G104034906

Report Issue Date: August 8, 2019

Equipment Tested: Wireless Charger

Model Tested: SOURCE

FCC ID: 2ASP901EH1

Standards: ISED SPR-002 Issue 1 September 2016
Supplementary Procedure for Assessing Compliance with RSS-102 Nerve
Stimulation Exposure Limits

Tested by:
Intertek Testing Services NA, Inc.
1365 Adams Court
Menlo Park, CA 92630
USA

Client:
Pi Inc.
1111 Bayhill Dr., Suite 235
SAN BRUNO, CA 94066
USA

Report prepared by



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EMC Project Engineer

Report reviewed by



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Engineering Team Lead

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1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	-
4	Description of Equipment Under Test and Variant Models	-
5	System Setup and Method	-
6	Electric Field IEEE C95.1-2005 ISED SPR-002	Compliant
7	Magnetic Field IEEE C95.1-2005 ISED SPR-002	Compliant
8	Revision History	-

3 Client Information

This EUT was tested at the request of:

Client: Pi Inc.
1111 Bayhill Dr., Suite 235
SAN BRUNO, CA 94066
USA

Contact: Viswajit Natarajan
Email: Vish@spansive.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Pi Inc.
1111 Bayhill Dr., Suite 235
SAN BRUNO, CA 94066
USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Wireless Charger	Pi Inc.	SOURCE	01011907040019

Receive Date:	07/31/2019	Test Started:	08/06/2019
Received Condition:	Good	Test Completed:	08/06/2019
Type:	Production		

Description of Equipment Under Test (provided by client)
The EUT is a Qi compatible wireless charger for cellphone. Up to 4 devices can be charged through wireless charging + 2 High Power USB charging ports. Total 8 coils (4 pairs of Tx/Rx). Operating Frequency range = 113kHz – 230kHz.

Operating modes of the EUT:

No.	Description of EUT Exercising
1	The EUT was configured to continuously transmit.

Variant Models:

None

5 System Setup and Method

5.1 Method:

Configuration as required by Annex E, para E1.1 Passively used Table top device of SPR-002
Supplementary Procedure for Assessing Compliance with RSS-102 Nerve Stimulation Exposure Limits

and

Radio Standards Specification RSS-102, Radio Frequency (RF) Exposure Compliance of
Radiocommunication Apparatus

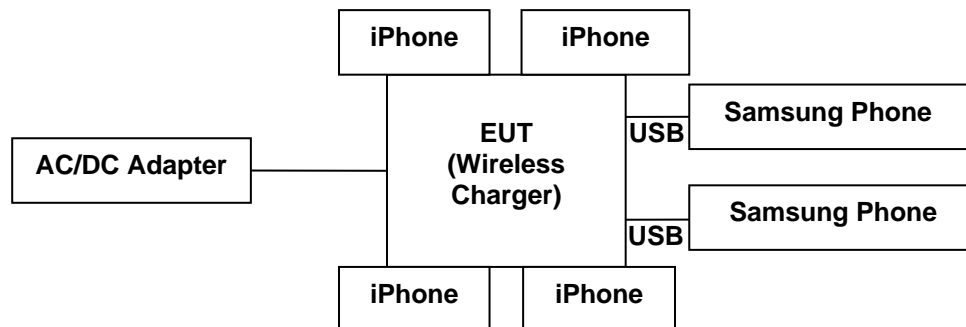
Radiofrequency radiation exposure evaluation:

Measurements were performed on all sides of the device and the worst result is recorded.

Measurement Uncertainty:

Measurement uncertainty is estimated 2.0 dB for the coverage factor of 2.

5.2 EUT Block Diagram:



6 Electric Field

6.1 Performance Requirement(s)

IEEE std C95.1 -2005

**Table 9—Action level (MPE for the general public when an RF safety program is unavailable)
(see Figure 4 for graphical representation)**

Frequency range (MHz)	RMS electric field strength (E) ^a (V/m)	RMS magnetic field strength (H) ^a (A/m)	RMS power density (S) E-field, H-field (W/m ²)	Averaging time ^b E ² , H ² or S (min)	
0.1–1.34	614	16.3/f _M	(1000, 100 000/f _M ²) ^c	6	6
1.34–3	823.8/f _M	16.3/f _M	(1800/f _M ² , 100 000/f _M ²)	f _M ² /0.3	6
3–30	823.8/f _M	16.3/f _M	(1800/f _M ² , 100 000/f _M ²)	30	6
30–100	27.5	158.3/f _M ^{1.668}	(2, 9 400 000/f _M ^{3.336})	30	0.0636 f _M ^{1.337}
100–400	27.5	0.0729	2	30	30
400–2000	–	–	f _M /200	30	
2000–5000	–	–	10	30	
5000–30 000	–	–	10	150/f _G	
30 000–100 000	–	–	10	25.24/f _G ^{0.476}	
100 000–300 000	–	–	(90f _G –7000)/200	5048/[(9f _G –700)f _G ^{0.476}]	
NOTE—f _M is the frequency in MHz, f _G is the frequency in GHz.					
^a For exposures that are uniform over the dimensions of the body, such as certain far-field plane-wave exposures, the exposure field strengths and power densities are compared with the MPEs in the Table. For non-uniform exposures, the mean values of the exposure fields, as obtained by spatially averaging the squares of the field strengths or averaging the power densities over an area equivalent to the vertical cross section of the human body (projected area) or a smaller area depending on the frequency (see NOTES to Table 8 and Table 9 below), are compared with the MPEs in the Table.					
^b The left column is the averaging time for E ² , the right column is the averaging time for H ² . For frequencies greater than 400 MHz, the averaging time is for power density S					
^c These plane-wave equivalent power density values are commonly used as a convenient comparison with MPEs at higher frequencies and are displayed on some instruments in use.					

The field strength limits are established in Health Canada's RF exposure guideline, Safety Code 6.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10	83	90	-	Instantaneous

More stringent of the above two standards was used.

6.2 Method

Tests are performed in accordance with IEEE C95.1-2005 and ISED SPR-002.

The EMC-20 three-axis electric field probe with X, Y, Z field sensors was used.

Direct measurement was used. Measurements were performed on all sides of the device and the worst result is recorded. Fully charged battery was used for testing.

Test Site:

The test facility is located at 1365 Adams Court, Menlo Park CA 94025 USA. This test laboratory has been accredited by A2LA and registered with ISED, company number: 2042L.

6.3 Test Equipment Used:

Description	Manufacturer	Model	Serial	Cal Date	Cal Due
Probe Interface	Wandel & Golterman	Type 8.2	None	02/23/218	03/05/20
Electric Field Probe	Wandel & Goltermann	EMC-20	BN2244/29	02/23/218	03/05/20

6.4 Results:

The sample tested at 0mm and 10cm from EUT was found to Comply.

6.5 Data:

EUT + 4 WPT Phones + 2 USB Phones

EUT Location (worst-case)	Measured Value (V/m rms)	Limit (V/m rms)
Top	4.11	83
Left Side	2.95	83
Right Side	4.32	83
Front Side	5.35	83
Bottom	2.24	83
Back side	4.2	83

EUT + 3 WPT Phones + 2 USB Phones

EUT Location (worst-case)	Measured Value (V/m rms)	Limit (V/m rms)
Top	5.14	83
Left Side	5.37	83
Right Side	4.1	83
Front Side	7.58	83
Bottom	4.68	83
Back side	19.28	83

EUT + 2 WPT Phones + 2 USB Phones

EUT Location (worst-case)	Measured Value (V/m rms)	Limit (V/m rms)
Top	5.18	83
Left Side	11.16	83
Right Side	13.45	83
Front Side	12.48	83
Bottom	3.98	83
Back side	16.29	83

EUT + 1 WPT Phone + 2 USB Phones

EUT Location (worst-case)	Measured Value (V/m rms)	Limit (V/m rms)
Top	8.74	83
Left Side	14.43	83
Right Side	11.33	83
Front Side	9.14	83
Bottom	3.91	83
Back side	13.82	83

EUT + 2 USB Phones

EUT Location (worst-case)	Measured Value (V/m rms)	Limit (V/m rms)
Top	7.42	83
Left Side	11.21	83
Right Side	9.81	83
Front Side	12.84	83
Bottom	5.93	83
Back side	18.41	83

1) Test was performed with probe touching the EUT i.e. 0mm from EUT and 10cm from EUT, worst case results are reported here. The values indicated above are highest instantaneous values observed on the meter used for measurement.

Test Result:	The EUT PASSED at 0mm Complies for Annex E, para E1.1 Passively used Table top device of SPR-002
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Test Personnel:	Aaron Chang	Test Date:	August 6, 2019
Product Standard:	ISED SPR-002	Limit Applied:	ISED RSS-102 Table 4
Input Voltage:	120VAC 60Hz	Ambient Temperature:	23.1°C
Pretest Verification w/ Ambient Signals or		Relative Humidity:	45.9 %
BB Source:	Yes	Atmospheric Pressure:	989 mBar

Deviations, Additions, or Exclusions: None

6.6 Setup Photographs:





7 Magnetic Field

7.1 Performance Requirement(s)

IEEE std C95.1 -2005

**Table 9—Action level (MPE for the general public when an RF safety program is unavailable)
(see Figure 4 for graphical representation)**

Frequency range (MHz)	RMS electric field strength (E) ^a (V/m)	RMS magnetic field strength (H) ^a (A/m)	RMS power density (S) E-field, H-field (W/m ²)	Averaging time ^b E ² , H ² or S (min)	
0.1–1.34	614	16.3/f _M	(1000, 100 000/f _M ²) ^c	6	6
1.34–3	823.8/f _M	16.3/f _M	(1800/f _M ² , 100 000/f _M ²)	f _M ² /0.3	6
3–30	823.8/f _M	16.3/f _M	(1800/f _M ² , 100 000/f _M ²)	30	6
30–100	27.5	158.3/f _M ^{1.668}	(2, 9 400 000/f _M ^{3.336})	30	0.0636 f _M ^{1.337}
100–400	27.5	0.0729	2	30	30
400–2000	–	–	f _M /200	30	
2000–5000	–	–	10	30	
5000–30 000	–	–	10	150/f _G	
30 000–100 000	–	–	10	25.24/f _G ^{0.476}	
100 000–300 000	–	–	(90f _G –7000)/200	5048/[(9f _G –700)f _G ^{0.476}]	
NOTE—f _M is the frequency in MHz, f _G is the frequency in GHz.					
^a For exposures that are uniform over the dimensions of the body, such as certain far-field plane-wave exposures, the exposure field strengths and power densities are compared with the MPEs in the Table. For non-uniform exposures, the mean values of the exposure fields, as obtained by spatially averaging the squares of the field strengths or averaging the power densities over an area equivalent to the vertical cross section of the human body (projected area) or a smaller area depending on the frequency (see NOTES to Table 8 and Table 9 below), are compared with the MPEs in the Table.					
^b The left column is the averaging time for E ² , the right column is the averaging time for H ² . For frequencies greater than 400 MHz, the averaging time is for power density S					
^c These plane-wave equivalent power density values are commonly used as a convenient comparison with MPEs at higher frequencies and are displayed on some instruments in use.					

The field strength limits are established in Health Canada's RF exposure guideline, Safety Code 6.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10	83	90	-	Instantaneous

More stringent of the above two limits was used.

7.2 Method

Tests are performed in accordance with ISED SPR-002.

The Narda ELT-400 Exposure Level Tester measures magnetic field in the frequency range 1 Hz to 400 kHz. Its display takes all frequency components into account automatically. It uses a standard-compliant three-axis 100 cm² probe.

Direct measurement was used. The edge of magnetic field probe is at 5cm from the equipment under test (EUT) during the test, i.e., 10 cm to the center of the probe. Measurements were performed on all sides of the device and the worst result is recorded.

Test Site:

The test facility is located at 1365 Adams Court, Menlo Park USA. This test laboratory has been accredited by A2LA and registered with ISED, company number: 2042L.

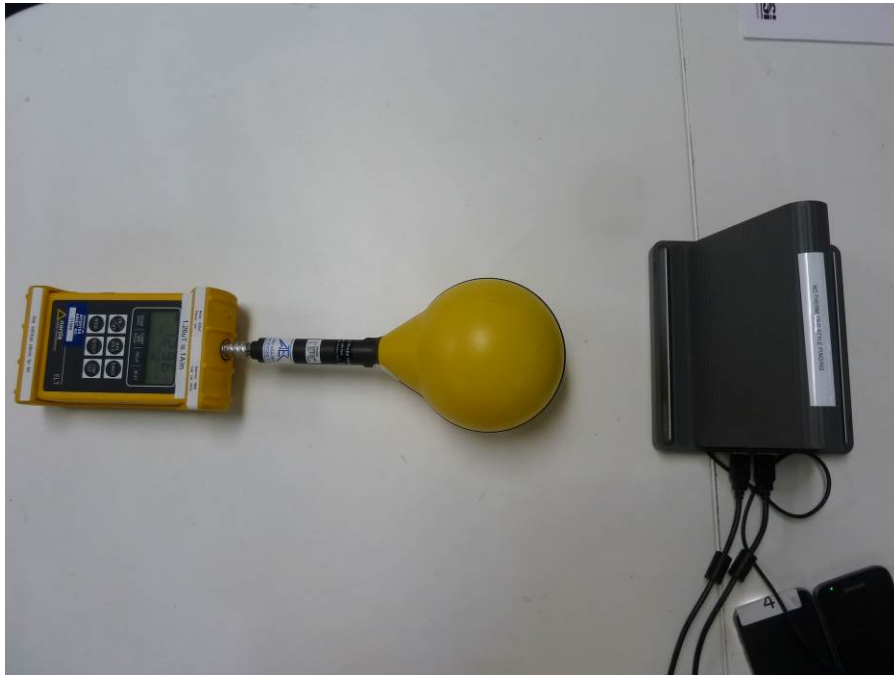
7.3 Test Equipment Used:

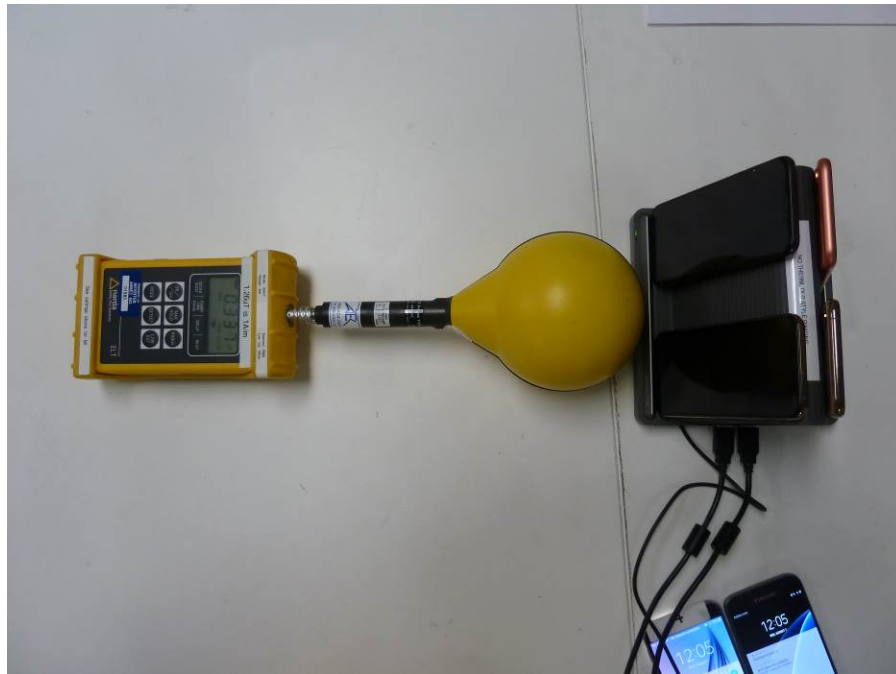
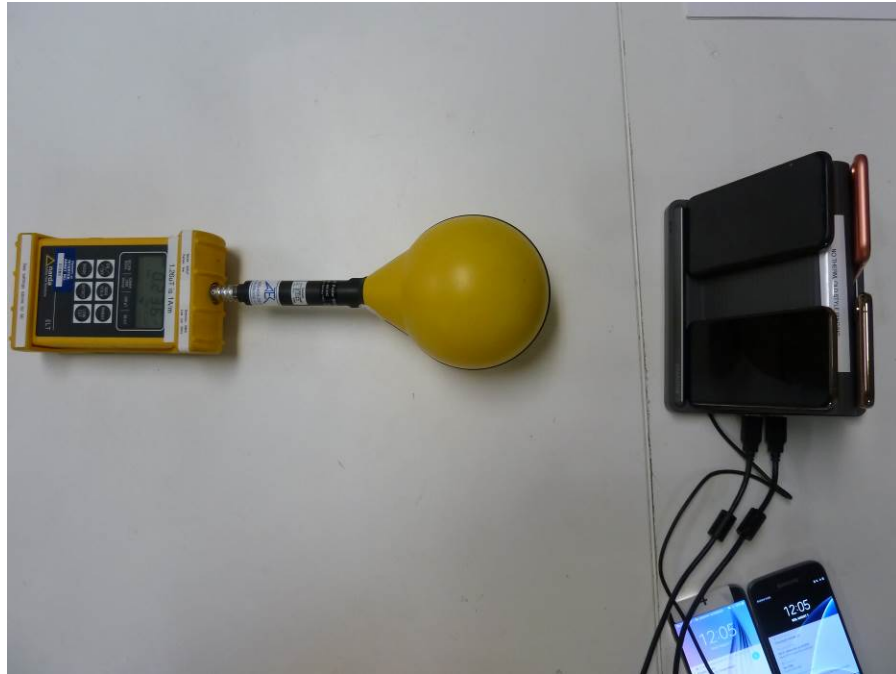
Description	Manufacturer	Model	Serial	Cal Date	Cal Due
Exposure Level Tester	Narda	ELT-400	N-0044	09/19/2018	09/19/2019
B-Field Probe	Narda	2300/90.10	M-0487	09/19/2018	09/19/2019

7.4 Results:

The sample tested at 0mm and 10cm from EUT was found to Comply.

7.5 Setup Photographs:





7.6 Data:

EUT + 4 WPT Phones + 2 USB Phones

EUT Location (worst-case)	Measured Value (uT)	Measured Value (A/m rms)	Limit (A/m rms)
Top	0.963	0.764	90
Left Side	1.065	0.845	90
Right Side	1.052	0.835	90
Front Side	3.599	2.856	90
Bottom	0.412	0.327	90
Back side	2.347	1.863	90

EUT + 3 WPT Phones + 2 USB Phones

EUT Location (worst-case)	Measured Value (uT)	Measured Value (A/m rms)	Limit (A/m rms)
Top	1.533	1.217	90
Left Side	1.342	1.065	90
Right Side	2.371	1.882	90
Front Side	3.966	3.148	90
Bottom	0.437	0.347	90
Back side	8.038	6.379	90

EUT + 2 WPT Phones + 2 USB Phones

EUT Location (worst-case)	Measured Value (uT)	Measured Value (A/m rms)	Limit (A/m rms)
Top	1.994	1.583	90
Left Side	1.716	1.362	90
Right Side	1.692	1.343	90
Front Side	4.268	3.387	90
Bottom	0.439	0.348	90
Back side	13.03	10.341	90

EUT + 1 WPT Phones + 2 USB Phones

EUT Location (worst-case)	Measured Value (uT)	Measured Value (A/m rms)	Limit (A/m rms)
Top	1.996	1.584	90
Left Side	1.821	1.445	90
Right Side	1.791	1.421	90
Front Side	10.84	8.603	90
Bottom	0.452	0.359	90
Back side	11.94	9.476	90

EUT + 2 USB Phones

EUT Location (worst-case)	Measured Value (uT)	Measured Value (A/m rms)	Limit (A/m rms)
Top	2.845	2.258	90
Left Side	2.269	1.801	90
Right Side	2.127	1.688	90
Front Side	14.82	11.762	90
Bottom	0.477	0.379	90
Back side	16.12	12.794	90

Calculated Value (A/m) = Measured Value (uT) /1.26

1) Test was performed with probe touching the EUT i.e. 0mm from EUT and 10cm from EUT. The values indicated above are highest instantaneous rms values observed on the meter used for measurement.

2) The above values show the device complies without applying duty cycle correction

3) Test tests were performed with and without Tag card. Only highest readings of both conditions are reported here.

Test Result:	The EUT PASSED with probe 0mm from the EUT. Complies for Annex E, para E1.1 Passively used Table top device of SPR-002
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Test Personnel:	Aaron Chang	Test Date:	August 6, 2019
Product Standard:	ISED SPR-002	Limit Applied:	ISED RSS-102 Table 4
Input Voltage:	120VAC 60Hz	Ambient Temperature:	23.1°C
Pretest Verification w/ Ambient Signals or		Relative Humidity:	45.9 %
BB Source:	Yes	Atmospheric Pressure:	989 mBar

Deviations, Additions, or Exclusions: None

8 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	August 08, 2019	104034906MPK-002	AC	KV	Initial Release