RF Exposure Test Report

Report No.:	SA191111D05
FCC ID:	2AEIM-WC1
Test Model:	WC1
Received Date:	Nov. 11, 2019
Test Date:	Dec. 26, 2019
Issued Date:	Dec. 27, 2019
Applicant:	Tesla Motors, Inc
Address:	3500 Deer Creek Road Palo Alto California United States 94304
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
FCC Registration / Designation Number:	198487 / TW2021

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
SA191111D05	Original release.	Dec. 27, 2019

1 Certificate of Conformity

Product:	Wireless Phone Charger
Brand:	Tesla
Test Model:	WC1
Sample Status:	Engineering sample
Applicant:	Tesla Motors, Inc
Test Date:	Dec. 26, 2019
Standards:	FCC Part 2 (Section 2.1091) FCC Part 1 (Section 1.1307(c) and (d), Section 1.1310) KDB 680106 D01 RF Exposure Wireless Charging v03

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Annie Chang , **Date:** Dec. 27, 2019

Annie Chang / Senior Specialist

Approved by : Rex. Lai , **Date:** Dec. 27, 2019

Rex Lai / Associate Technical Manager

2 General Information

2.1 General Description of EUT

Product	Wireless Phone Charger
Brand	Tesla
Test Model	WC1
Sample Status	Engineering sample
Power Supply Rating	I/P rating: 5Vdc O/P rating: 7.5W
Modulation Type	FSK
Operating Frequency	127.7 kHz
Antenna Type	Coil antenna
Field Strength	91.53dBuV/m
Dimensions	43.45cm^2
Accessory Device	N/A
Data Cable Supplied	Shielded USB cable (0.3m) attached on EUT
Maximum Power Output from the Charging Coil	7.5W

Note: The EUT is a Wireless Phone Charger with Qi function.

3 RF Exposure

3.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

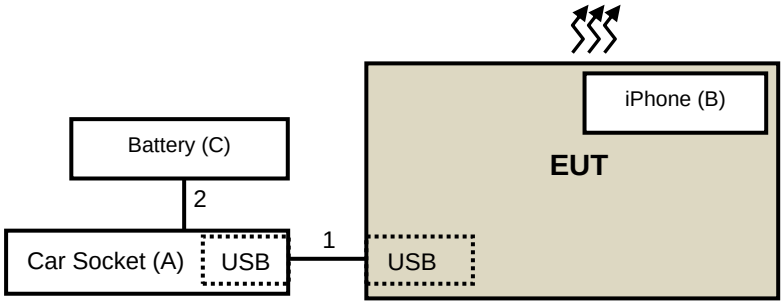
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Car Socket	SONY	CP-CADM2	N/A	N/A	Supplied by client
B.	iPhone	Apple	A1201	N/A	N/A	Provided by Lab
C.	Battery	RISING	SMF NX120-7L	N/A	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/ No)	Cores (Qty.)	Remarks
1.	USB cable	1	0.3	Y	0	Supplied by client
2.	DC cable	1	0.3	N	0	Supplied by client

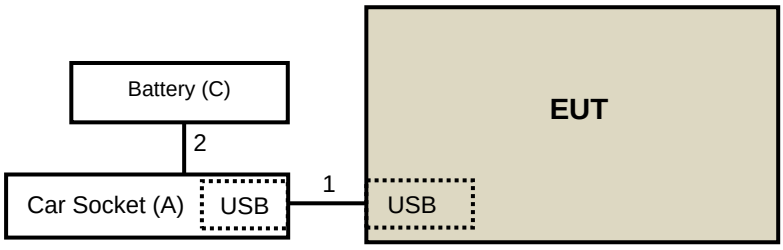
Note: The core(s) is(are) originally attached to the cable(s).

3.1.1 Configuration of System under Test

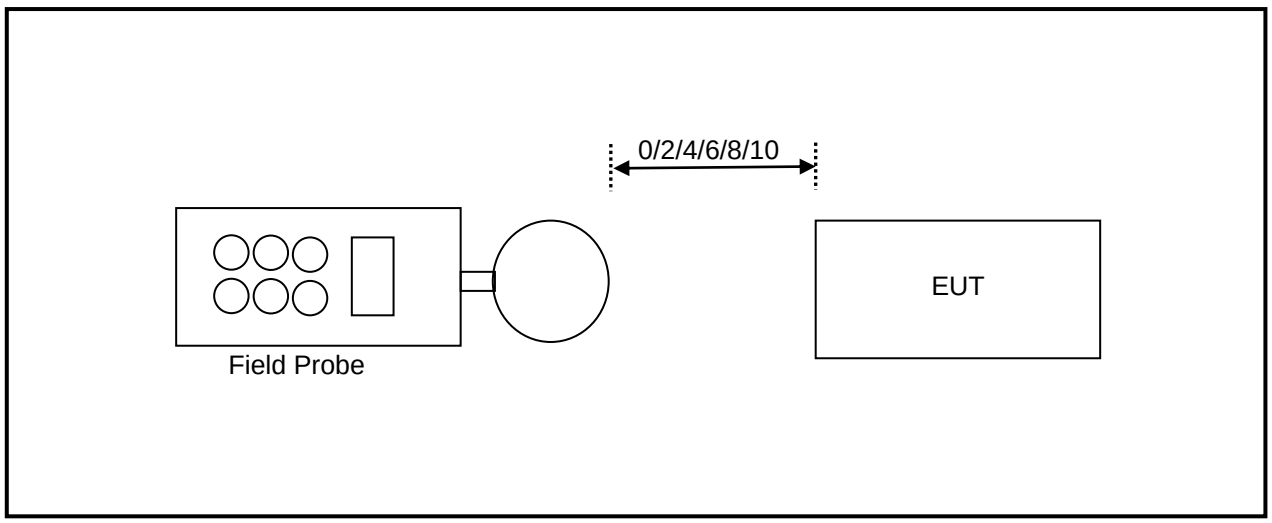
Charging Mode:



Standby Mode:



3.2 Test Setup



Note: Measurements should be made from all sides and the top of the primary/client pair, with the 0, 2, 4, 6, 8, 10 cm measured from the edge of the probe(s) to the edge of the device.

3.3 Test Instruments

Description	Brand	Model No.	Frequency Range	Calibrated Date	Calibrated Until
Broadband Field Meter	NARDA	NBM-550	-	Mar. 28, 2018	Mar. 27, 2020
Magnetic Field Meter	NARDA	ELT-400	1 – 400kHz	Apr. 12, 2018	Apr. 11, 2020
Magnetic Probe	NARDA	HF-3061	300kHz – 30MHz	Apr. 16, 2018	Apr. 15, 2020
Magnetic Probe	NARDA	HF-0191	27 – 1000MHz	Apr. 17, 2018	Apr. 16, 2020
Broadband Field Meter	NARDA	NBM-550	-	Mar. 28, 2018	Mar. 27, 2020
Electric Field Meter	COMBINOVA	EFM 200	5Hz – 400kHz	Dec. 6, 2017	Dec. 5, 2019
E-Field Probe	NARDA	EF-0391	100kHz – 3GHz	Mar. 28, 2018	Mar. 27, 2020
E-Field Probe	NARDA	EF-6091	100MHz – 60GHz	Mar. 29, 2018	Mar. 28, 2020

NOTE: 1. The calibration interval of the above test instruments is 12/24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Chia Pau RF Chamber
3. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

3.4 Limits for Maximum Permissible Exposure (MPE)

§ 1.1310 The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency(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
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.

Note : The aggregate H-field strengths as close as passable surrounding the device and above the top surface from all simultaneous transmitting coils .

3.5 EUT Configuration and Test Point Description

Charging Mode

EUT Side	Left	Right	Top	Bottom	Z-axis
Actual Distance install in the Vehicular (cm)	8	8	0	2.77	1.044
Measurement Distance (cm)	8	8	7	2	1
	Test result defined it as 0 cm, please see report page 11.	Test result defined it as 0 cm, please see report page 11.	When cell phone plug into the EUT, that have 7 cm gap between transmitter and human body. Test result defined it as 0 cm, please see report page 11.	Test result defined it as 0 cm, please see report page 11.	Test result defined it as 0 cm, please see report page 11.

Note: Due to STC request for EUT photos, please see Test Setup Photos exhibit for above table with supporting pictures.

Standby Mode

EUT Side	Left	Right	Top	Bottom	Z-axis
Actual Distance install in the Vehicular (cm)	8	8	Not perform. Since the EUT will not open the case during the standby mode.	2.77	1.044
Measurement Distance (cm)	8	8		2	1
	Test result defined it as 0 cm, please see report page 13.	Test result defined it as 0 cm, please see report page 13.		Test result defined it as 0 cm, please see report page 13.	Test result defined it as 0 cm, please see report page 13.

Note: Due to STC request for EUT photos, please see Test Setup Photos exhibit for above table with supporting pictures.

4 Calculation Result of Maximum Conducted Power

Charging Mode

Charging Mode with iPhone, battery 10% Charge

H-Field Measurement (Closest distance @ 0 cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.1250	0.1270	0.1790	0.0860	0.3220
Max H-field (A/m)	0.1000	0.1016	0.1432	0.0688	0.2576
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0630	-0.0614	-0.0198	-0.0942	0.0946

Charging Mode with iPhone, battery 50% Charge

H-Field Measurement (Closest distance @ 0 cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.1050	0.1060	0.1300	0.1230	0.2770
Max H-field (A/m)	0.0840	0.0848	0.1040	0.0984	0.2216
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0790	-0.0782	-0.0590	-0.0646	0.0586

Charging Mode with iPhone, battery 90% Charge

H-Field Measurement (Closest distance @ 0 cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.1040	0.1030	0.1210	0.0860	0.2770
Max H-field (A/m)	0.0832	0.0824	0.0968	0.0688	0.2216
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0798	-0.0806	-0.0662	-0.0942	0.0586

Charging Mode with iPhone, battery 10% Charge

H-Field Measurement (Closest distance @ 2cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.1150	0.1180	0.1330	0.1420	0.2440
Max H-field (A/m)	0.0920	0.0944	0.1064	0.1136	0.1952
10 % Limit (A/m)	0.1630	0.1630	0.1630	0.1630	0.1630
10 % Margin (A/m)	-0.0710	-0.0686	-0.0566	-0.0494	0.0322

Charging Mode with iPhone, battery 50% Charge

H-Field Measurement (Closest distance @ 2cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.0910	0.0930	0.1160	0.1040	0.1730
Max H-field (A/m)	0.0728	0.0744	0.0928	0.0832	0.1384
10 % Limit (A/m)	0.1630	0.1630	0.1630	0.1630	0.1630
10 % Margin (A/m)	-0.0902	-0.0886	-0.0702	-0.0798	-0.0246

Charging Mode with iPhone, battery 90% Charge

H-Field Measurement (Closest distance @ 2cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.0900	0.0920	0.1070	0.0970	0.1720
Max H-field (A/m)	0.0720	0.0736	0.0856	0.0776	0.1376
10 % Limit (A/m)	0.1630	0.1630	0.1630	0.1630	0.1630
10 % Margin (A/m)	-0.0910	-0.0894	-0.0774	-0.0854	-0.0254

Charging Mode with iPhone, battery 10% Charge

H-Field Measurement (Closest distance @ 4cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.1110	0.1140	0.1280	0.1270	0.2410
Max H-field (A/m)	0.0888	0.0912	0.1024	0.1016	0.1928
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0742	-0.0718	-0.0606	-0.0614	0.0298

Charging Mode with iPhone, battery 50% Charge

H-Field Measurement (Closest distance @ 4cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.0900	0.0910	0.1030	0.0860	0.1590
Max H-field (A/m)	0.0720	0.0728	0.0824	0.0688	0.1272
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0910	-0.0902	-0.0806	-0.0942	-0.0358

Charging Mode with iPhone, battery 90% Charge

H-Field Measurement (Closest distance @ 4cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.0880	0.0900	0.0960	0.0780	0.1560
Max H-field (A/m)	0.0704	0.0720	0.0768	0.0624	0.1248
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0926	-0.0910	-0.0862	-0.1006	-0.0382

Charging Mode with iPhone, battery 10% Charge

H-Field Measurement (Closest distance @ 6cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.1090	0.1120	0.1250	0.1190	0.2025
Max H-field (A/m)	0.0872	0.0896	0.1000	0.0952	0.1604
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0758	-0.0734	-0.0630	-0.0678	-0.0010

Charging Mode with iPhone, battery 50% Charge

H-Field Measurement (Closest distance @ 6cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.0870	0.0890	0.0960	0.0810	0.1480
Max H-field (A/m)	0.0696	0.0712	0.0768	0.0648	0.1184
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0934	-0.0918	-0.0862	-0.0982	-0.0446

Charging Mode with iPhone, battery 90% Charge

H-Field Measurement (Closest distance @ 6cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.0860	0.0870	0.0910	0.0730	0.1440
Max H-field (A/m)	0.0688	0.0696	0.0728	0.0584	0.1152
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0942	-0.0934	-0.0902	-0.1046	-0.0478

Charging Mode with iPhone, battery 10% Charge

H-Field Measurement (Closest distance @ 8cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.1070	0.1100	0.1200	0.1180	0.1960
Max H-field (A/m)	0.0856	0.0880	0.0960	0.0944	0.1568
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0774	-0.0750	-0.0670	-0.0686	-0.0062

Charging Mode with iPhone, battery 50% Charge

H-Field Measurement (Closest distance @ 8cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.0850	0.0880	0.0930	0.0710	0.1350
Max H-field (A/m)	0.0680	0.0704	0.0744	0.0568	0.1080
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0950	-0.0926	-0.0886	-0.1062	-0.0550

Charging Mode with iPhone, battery 90% Charge

H-Field Measurement (Closest distance @ 8cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.0830	0.0850	0.0880	0.0610	0.1290
Max H-field (A/m)	0.0664	0.0680	0.0704	0.0488	0.1032
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0966	-0.0950	-0.0926	-0.1142	-0.0598

Charging Mode with iPhone, battery 10% Charge

H-Field Measurement (Closest distance @ 10cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.1040	0.1050	0.1170	0.0960	0.1420
Max H-field (A/m)	0.0832	0.0840	0.0936	0.0768	0.1136
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0798	-0.0790	-0.0694	-0.0862	-0.0494

Charging Mode with iPhone, battery 50% Charge

H-Field Measurement (Closest distance @ 10cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.0820	0.0840	0.0900	0.0670	0.1200
Max H-field (A/m)	0.0656	0.0672	0.0720	0.0536	0.0960
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.0974	-0.0958	-0.0910	-0.1094	-0.0670

Charging Mode with iPhone, battery 90% Charge

H-Field Measurement (Closest distance @ 10cm)					
EUT Side	Left	Right	Top	Bottom	Z-axis
Max H-field (uT)	0.0780	0.0810	0.0860	0.0530	0.1170
Max H-field (A/m)	0.0624	0.0648	0.0688	0.0424	0.0936
10 % Limit (A/m)	0.163	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.1006	-0.0982	-0.0942	-0.1206	-0.0694

Standby Mode

H-Field Measurement (Closest distance @ 0 cm)				
EUT Side	Left	Right	Bottom	Z-axis
Max H-field (uT)	0.1810	0.1680	0.6230	1.2060
Max H-field (A/m)	0.1448	0.1344	0.4984	0.9648
Time average H-field (A/m)	0.0029	0.0027	0.0100	0.0193
10 % Limit (A/m)	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.1601	-0.1603	-0.1530	-0.1437

Note: Time average H-field (A/m) = Max H-field (A/m) * Duty cycle (2%) = 0.9648 * 0.02 = 0.0193 A/m

H-Field Measurement (Closest distance @ 2cm)				
EUT Side	Left	Right	Bottom	Z-axis
Max H-field (uT)	0.1410	0.1520	0.1860	0.7630
Max H-field (A/m)	0.1128	0.1216	0.1488	0.6104
Time average H-field (A/m)	0.0023	0.0024	0.0030	0.0122
10 % Limit (A/m)	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.1607	-0.1606	-0.1600	-0.1508

Note: Time average H-field (A/m) = Max H-field (A/m) * Duty cycle (2%) = 0.6104 * 0.02 = 0.0122 A/m

H-Field Measurement (Closest distance @ 4cm)				
EUT Side	Left	Right	Bottom	Z-axis
Max H-field (uT)	0.1260	0.1330	0.1740	0.5680
Max H-field (A/m)	0.1008	0.1064	0.1392	0.4544
Time average H-field (A/m)	0.0020	0.0021	0.0028	0.0091
10 % Limit (A/m)	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.1610	-0.1609	-0.1602	-0.1539

Note: Time average H-field (A/m) = Max H-field (A/m) * Duty cycle (2%) = 0.4544 * 0.02 = 0.0091 A/m

H-Field Measurement (Closest distance @ 6cm)				
EUT Side	Left	Right	Bottom	Z-axis
Max H-field (uT)	0.1120	0.1240	0.1120	0.3420
Max H-field (A/m)	0.0896	0.0992	0.0896	0.2736
Time average H-field (A/m)	0.0018	0.0020	0.0018	0.0055
10 % Limit (A/m)	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.1612	-0.1610	-0.1612	-0.1575

Note: Time average H-field (A/m) = Max H-field (A/m) * Duty cycle (2%) = 0.2736 * 0.02 = 0.0055 A/m

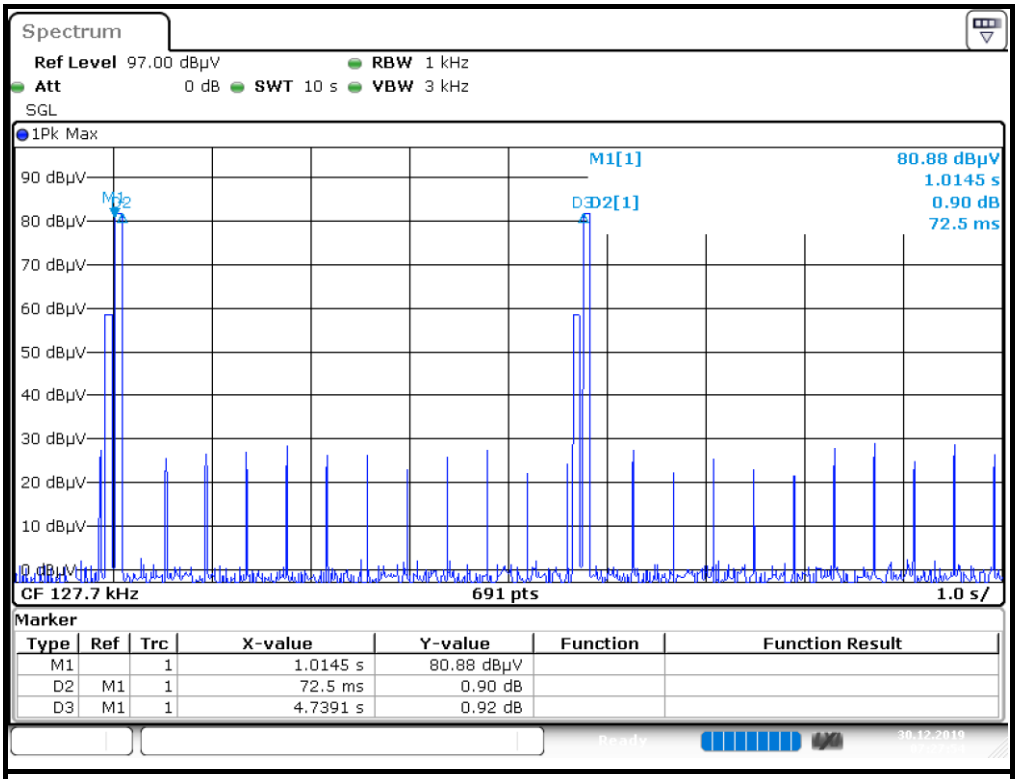
H-Field Measurement (Closest distance @ 8cm)				
EUT Side	Left	Right	Bottom	Z-axis
Max H-field (uT)	0.1020	0.1170	0.1010	0.1540
Max H-field (A/m)	0.0816	0.0936	0.0808	0.1232
Time average H-field (A/m)	0.0016	0.0019	0.0016	0.0025
10 % Limit (A/m)	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.1614	-0.1611	-0.1614	-0.1605

Note: Time average H-field (A/m) = Max H-field (A/m) * Duty cycle (2%) = 0.1232 * 0.02 = 0.0025 A/m

H-Field Measurement (Closest distance @ 10cm)				
EUT Side	Left	Right	Bottom	Z-axis
Max H-field (uT)	0.0960	0.1030	0.0940	0.1420
Max H-field (A/m)	0.0768	0.0824	0.0752	0.1136
Time average H-field (A/m)	0.0015	0.0016	0.0015	0.0023
10 % Limit (A/m)	0.163	0.163	0.163	0.163
10 % Margin (A/m)	-0.1615	-0.1614	-0.1615	-0.1607

Note: Time average H-field (A/m) = Max H-field (A/m) * Duty cycle (2%) = 0.1136 * 0.02 = 0.0023 A/m

Duty Cycle (Standby mode)



Duty cycle = 72.5 ms / 4739.1 ms = 0.02

5 Photographs of the Test Configuration

Please refer to the attached file (Test Setup Photo).

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