

RF Exposure Test Report

Report No.: SA200623C08

FCC ID: A3LSMT970

Test Model: SM-T970

Received Date: Jun. 23, 2020

Test Date: Jun. 23, 2020

Issued Date: Jun. 24, 2020

Applicant: Samsung Electronics Co Ltd

Address: 129 Samsung-ro, Yeongtong-gu, Suwon-Si Gyeonggi-do 16677 Korea
(Republic Of)

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



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Release Control Record

Issue No.	Description	Date Issued
SA200623C08	Original release.	Jun. 24, 2020

1 Certificate of Conformity

Product: Tablet

Brand: Samsung

Test Model: SM-T970

Sample Status: Engineering sample

Applicant: Samsung Electronics Co Ltd

Test Date: Jun. 23, 2020

Standards: FCC Part 2 (Section 2.1091)

FCC Part 1 (Section 1.1307(c) and (d), Section 1.1310)

References Test Guidance: 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:

Jun. 24, 2020

Annie Chang / Senior Specialist

Approved by :

Rex Lai

Date:

Jun. 24, 2020

Rex Lai / Associate Technical Manager

2 General Information

2.1 General Description of EUT

Product	Tablet
Brand	Samsung
Test Model	SM-T970
Sample Status	Engineering sample
Power Supply Rating	I/P rating: 5Vdc or 9Vdc O/P rating: 0.05W
Modulation Type	FSK
Operating Frequency	530 kHz
Antenna Type	Coil antenna
Accessory Device	Refer to note as below
Data Cable Supplied	Refer to note as below
Maximum Power Output from the Charging Coil	0.05W

Note:

1. The EUT is a Tablet which could charge to Stylus Pen (S-pen) via Qi function as the following.

Product	Model	FCC ID
Stylus Pen (S-pen)	EJ-PT870	A3LEJPT870

2. The EUT consumes power from an AC adapter, as the following:

Brand	Model	Specification
SAMSUNG	EP-TA200	AC I/P: 100-240V~50-60Hz 0.5A DC O/P: 9.0V / 1.67A or 5.0V/2.0A Shielded USB cable (0.93m)

2.2 Description of Test Modes

The EUT has been pre-tested under following test modes, and test mode 1 was the worst case for final test:

Condition: AC Adaptor

Test Condition	Test Mode	Description
S-Pen charging mode	1	Tablet condition: Charging with AC adaptor, charging from EUT to S-Pen
	2	Tablet condition: Portable without AC adaptor, charging from EUT to S-Pen

Condition: All RF communications

Test Condition	Test Mode	Description
Connections	1	WLAN (2.4 GHz) + WLAN (5 GHz) + GNSS
	2	Bluetooth (2.4GHz) + WLAN (2.4 GHz) + GNSS
	3	Bluetooth (2.4GHz) + WLAN (5 GHz) + GNSS

Test modes are presented in the report as below.

Test Mode	Description	
	S-Pen charging mode	Connections
1	Tablet condition: Charging with AC adaptor, charging from EUT to S-Pen	WLAN (2.4 GHz) + WLAN (5 GHz) + GNSS

Remark

1. The H-field test was conducted while all other wireless technologies/RF communications operating at their under perspective maximum RF output.
2. RF Exposure measurement is considered as highest power of each band/channel/RB condition/offset/mode etc.
3. RF exposure measurement should be adjusted from worst angle.

3 RF Exposure

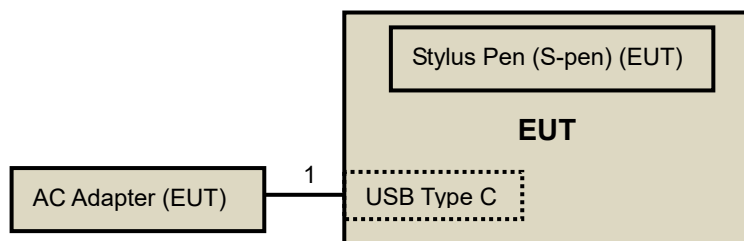
3.1 Description of Support Units

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.

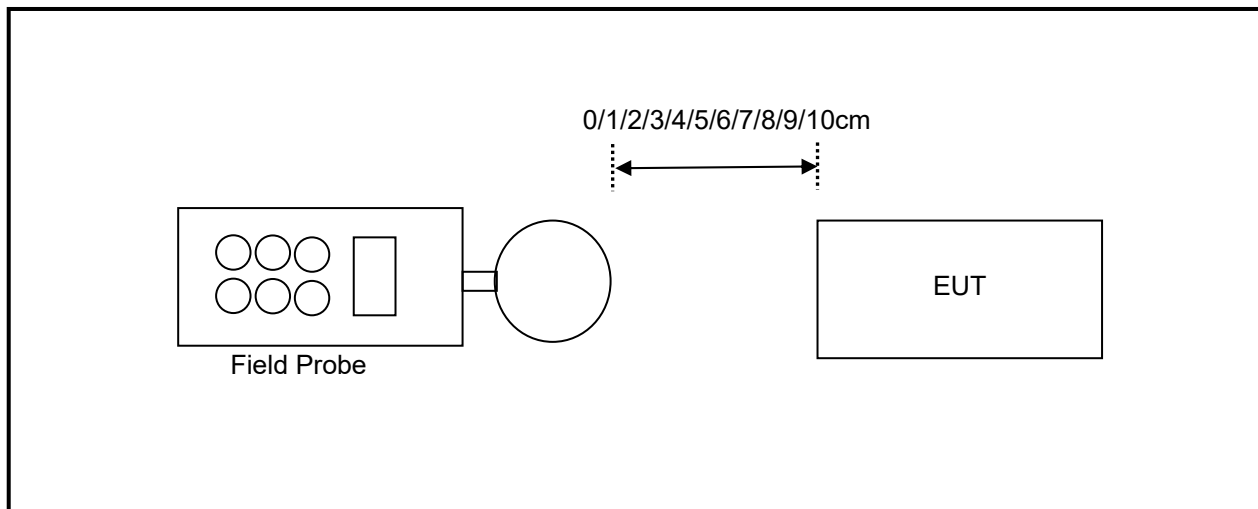
ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/ No)	Cores (Qty.)	Remarks
1.	USB cable	1	0.93	Y	0	Supplied by client

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

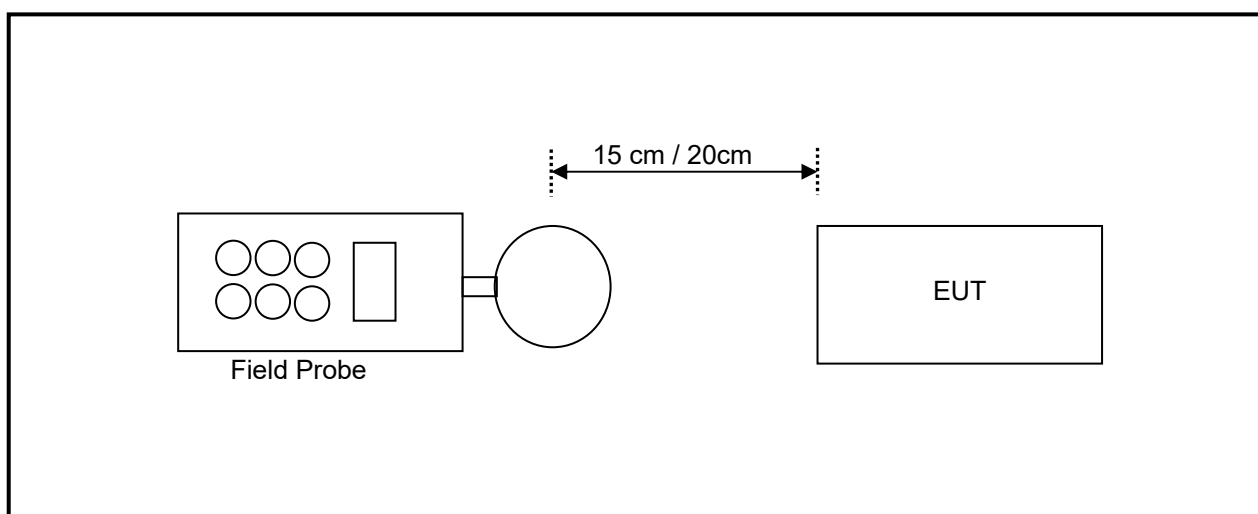
3.1.1 Configuration of System under Test



3.2 Test Setup



Note: Measurements should be made from all sides and the top of the primary/client pair, with the 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10cm measured from the edge of the probe(s) to the edge of the device.



Note: Measurements should be made from all sides and the top of the primary/client pair, with the 15 cm or 20 cm measured from the center 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. 25, 2020	Mar. 24, 2022
Magnetic Field Meter	NARDA	ELT-400	1Hz – 400kHz	Apr. 17, 2020	Apr. 16, 2022
Magnetic Probe	NARDA	HF-3061	300kHz – 30MHz	Apr. 16, 2020	Apr. 15, 2022
Magnetic Probe	NARDA	HF-0191	27 – 1000MHz	Apr. 21, 2020	Apr. 20, 2022
Electric Field Meter	COMBINOVA	EFM 200	5Hz – 400kHz	Dec. 6, 2019	Dec. 5, 2021
E-Field Probe	NARDA	EF-0391	100kHz – 3GHz	Mar. 25, 2020	Mar. 24, 2022
E-Field Probe	NARDA	EF-6091	100MHz – 60GHz	Mar. 25, 2020	Mar. 24, 2022
Wireless Connection Tester	R&S	CMW270	-	Mar. 19, 2020	Mar. 18, 2021
Radio Communication Analyzer Anritsu	R&S	CBT	-	Aug. 09, 2018	Aug. 08, 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.

This document is prepared to show compliance with the RF Exposure requirements as required in 1.1310 of the FCC Rules and Regulations.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1.

According to FCC §1.1310: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b).

For Measurement Distance: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10cm

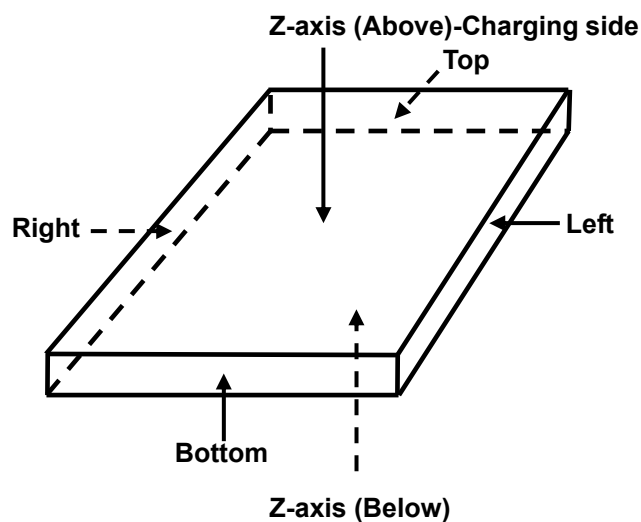
Note: The aggregate H-field strengths as close as passable surrounding the device and above the top surface from all simultaneous transmitting coils.

For Measurement Distance: 15, 20cm

680106 D01 RF Exposure Wireless Charging App v03

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.

3.5 Test Point Description



Operational correction factor

The EUT charges of 15 minutes at maximum illumination to full charge. It recharges at maximum illumination when 10% or more of the battery level drop is detected.

Operational correction factor = 15 min / 30 min = 0.5

4 Calculation Result of Maximum Conducted Power

Charging with Adapter

For Measurement Distance: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10cm

H-Field Measurement (Closest distance @ 10 cm)						
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Below)
Max H-field (uT)	0.0475	0.0480	0.0485	0.0465	0.0510	0.0485
Max H-field (A/m)	0.0380	0.0384	0.0388	0.0372	0.0408	0.0388
Limit (A/m)	1.63	1.63	1.63	1.63	1.63	1.63
Margin (A/m)	-1.5920	-1.5916	-1.5912	-1.5928	-1.5892	-1.5912
50 % Limit (A/m)	0.815	0.815	0.815	0.815	0.815	0.815
50 % Margin (A/m)	-0.7770	-0.7766	-0.7762	-0.7778	-0.7742	-0.7762

H-Field Measurement (Closest distance @ 9 cm)						
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Below)
Max H-field (uT)	0.0475	0.0485	0.0490	0.0465	0.0515	0.0490
Max H-field (A/m)	0.0380	0.0388	0.0392	0.0372	0.0412	0.0392
Limit (A/m)	1.63	1.63	1.63	1.63	1.63	1.63
Margin (A/m)	-1.5920	-1.5912	-1.5908	-1.5928	-1.5888	-1.5908
50 % Limit (A/m)	0.815	0.815	0.815	0.815	0.815	0.815
50 % Margin (A/m)	-0.7770	-0.7762	-0.7758	-0.7778	-0.7738	-0.7758

H-Field Measurement (Closest distance @ 8 cm)						
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Below)
Max H-field (uT)	0.0480	0.0485	0.0495	0.0470	0.0525	0.0505
Max H-field (A/m)	0.0384	0.0388	0.0396	0.0376	0.0420	0.0404
Limit (A/m)	1.63	1.63	1.63	1.63	1.63	1.63
Margin (A/m)	-1.5916	-1.5912	-1.5904	-1.5924	-1.5880	-1.5896
50 % Limit (A/m)	0.815	0.815	0.815	0.815	0.815	0.815
50 % Margin (A/m)	-0.7766	-0.7762	-0.7754	-0.7774	-0.7730	-0.7746

H-Field Measurement (Closest distance @ 7 cm)						
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Below)
Max H-field (uT)	0.0480	0.0490	0.0495	0.0475	0.0525	0.0505
Max H-field (A/m)	0.0384	0.0392	0.0396	0.0380	0.0420	0.0404
Limit (A/m)	1.63	1.63	1.63	1.63	1.63	1.63
Margin (A/m)	-1.5916	-1.5908	-1.5904	-1.5920	-1.5880	-1.5896
50 % Limit (A/m)	0.815	0.815	0.815	0.815	0.815	0.815
50 % Margin (A/m)	-0.7766	-0.7758	-0.7754	-0.7770	-0.7730	-0.7746

H-Field Measurement (Closest distance @ 6 cm)						
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Below)
Max H-field (uT)	0.0485	0.0490	0.0495	0.0485	0.0535	0.0510
Max H-field (A/m)	0.0388	0.0392	0.0396	0.0388	0.0428	0.0408
Limit (A/m)	1.63	1.63	1.63	1.63	1.63	1.63
Margin (A/m)	-1.5912	-1.5908	-1.5904	-1.5912	-1.5872	-1.5892
50 % Limit (A/m)	0.815	0.815	0.815	0.815	0.815	0.815
50 % Margin (A/m)	-0.7762	-0.7758	-0.7754	-0.7762	-0.7722	-0.7742

H-Field Measurement (Closest distance @ 5 cm)						
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Below)
Max H-field (uT)	0.0500	0.0505	0.0510	0.0500	0.0550	0.0530
Max H-field (A/m)	0.0400	0.0404	0.0408	0.0400	0.0440	0.0424
Limit (A/m)	1.63	1.63	1.63	1.63	1.63	1.63
Margin (A/m)	-1.5900	-1.5896	-1.5892	-1.5900	-1.5860	-1.5876
50 % Limit (A/m)	0.815	0.815	0.815	0.815	0.815	0.815
50 % Margin (A/m)	-0.7750	-0.7746	-0.7742	-0.7750	-0.7710	-0.7726

H-Field Measurement (Closest distance @ 4 cm)						
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Below)
Max H-field (uT)	0.0500	0.0515	0.0515	0.0505	0.0560	0.0540
Max H-field (A/m)	0.0400	0.0412	0.0412	0.0404	0.0448	0.0432
Limit (A/m)	1.63	1.63	1.63	1.63	1.63	1.63
Margin (A/m)	-1.5900	-1.5888	-1.5888	-1.5896	-1.5852	-1.5868
50 % Limit (A/m)	0.815	0.815	0.815	0.815	0.815	0.815
50 % Margin (A/m)	-0.7750	-0.7738	-0.7738	-0.7746	-0.7702	-0.7718

H-Field Measurement (Closest distance @ 3 cm)						
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Below)
Max H-field (uT)	0.0520	0.0530	0.0525	0.0510	0.0575	0.0555
Max H-field (A/m)	0.0416	0.0424	0.0420	0.0408	0.0460	0.0444
Limit (A/m)	1.63	1.63	1.63	1.63	1.63	1.63
Margin (A/m)	-1.5884	-1.5876	-1.5880	-1.5892	-1.5840	-1.5856
50 % Limit (A/m)	0.815	0.815	0.815	0.815	0.815	0.815
50 % Margin (A/m)	-0.7734	-0.7726	-0.7730	-0.7742	-0.7690	-0.7706

H-Field Measurement (Closest distance @ 2 cm)						
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Below)
Max H-field (uT)	0.0560	0.0585	0.0570	0.0555	0.0620	0.0600
Max H-field (A/m)	0.0448	0.0468	0.0456	0.0444	0.0496	0.0480
Limit (A/m)	1.63	1.63	1.63	1.63	1.63	1.63
Margin (A/m)	-1.5852	-1.5832	-1.5844	-1.5856	-1.5804	-1.5820
50 % Limit (A/m)	0.815	0.815	0.815	0.815	0.815	0.815
50 % Margin (A/m)	-0.7702	-0.7682	-0.7694	-0.7706	-0.7654	-0.7670

H-Field Measurement (Closest distance @ 1 cm)						
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Below)
Max H-field (uT)	0.0575	0.0605	0.0595	0.0570	0.0640	0.0615
Max H-field (A/m)	0.0460	0.0484	0.0476	0.0456	0.0512	0.0492
Limit (A/m)	1.63	1.63	1.63	1.63	1.63	1.63
Margin (A/m)	-1.5840	-1.5816	-1.5824	-1.5844	-1.5788	-1.5808
50 % Limit (A/m)	0.815	0.815	0.815	0.815	0.815	0.815
50 % Margin (A/m)	-0.7690	-0.7666	-0.7674	-0.7694	-0.7638	-0.7658

H-Field Measurement (Closest distance @ 0 cm)						
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Below)
Max H-field (uT)	0.0585	0.0610	0.0605	0.0575	0.0650	0.0635
Max H-field (A/m)	0.0468	0.0488	0.0484	0.0460	0.0520	0.0508
Limit (A/m)	1.63	1.63	1.63	1.63	1.63	1.63
Margin (A/m)	-1.5832	-1.5812	-1.5816	-1.5840	-1.5780	-1.5792
50 % Limit (A/m)	0.815	0.815	0.815	0.815	0.815	0.815
50 % Margin (A/m)	-0.7682	-0.7662	-0.7666	-0.7690	-0.7630	-0.7642

Measurements were made from all sides and the top of the primary/client pair, with the 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10cm measured from the edge of the probe(s) to the edge of the device. The highest emission level was recorded.

Charging with Adapter

For Measurement Distance: 15, 20cm

E-Field Measurement							
Distance	15cm				15cm	20cm	15cm
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Above)	Z-axis (Below)
Max E-field (V/m)	4.2500	5.4200	5.4000	4.2700	5.8800	5.0860	5.4800
Limit (V/m)	614	614	614	614	614	614	614
Margin (V/m)	-609.7500	-608.5800	-608.6000	-609.7300	-608.1200	-608.9140	-608.5200
50 % Limit (V/m)	307	307	307	307	307	307	307
50 % Margin (V/m)	-302.7500	-301.5800	-301.6000	-302.7300	-301.1200	-301.9140	-301.5200

H-Field Measurement							
Distance	15cm				15cm	20cm	15cm
EUT Side	Left	Right	Top	Bottom	Z-axis (Above)	Z-axis (Above)	Z-axis (Below)
Max H-field (uT)	0.0260	0.0270	0.0275	0.0260	0.0300	0.0265	0.0280
Max H-field (A/m)	0.0208	0.0216	0.0220	0.0208	0.0240	0.0212	0.0224
Limit (A/m)	1.63	1.63	1.63	1.63	1.63	1.63	1.63
Margin (A/m)	-1.6092	-1.6084	-1.6080	-1.6092	-1.6060	-1.6088	-1.6076
50 % Limit (A/m)	0.815	0.815	0.815	0.815	0.815	0.815	0.815
50 % Margin (A/m)	-0.7942	-0.7934	-0.7930	-0.7942	-0.7910	-0.7938	-0.7926

Measurements were made from all sides and the top of the primary/client pair, with the 15 cm or 20 cm measured from the center of the probe(s) to the edge of the device. The highest emission level was recorded.

5 Photographs of the Test Configuration

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

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