# 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 |

Testing Laboratory
2021

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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)<br>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<br>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<br>DC O/P: 9.0V / 1.67A or 5.0V/2.0A<br>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

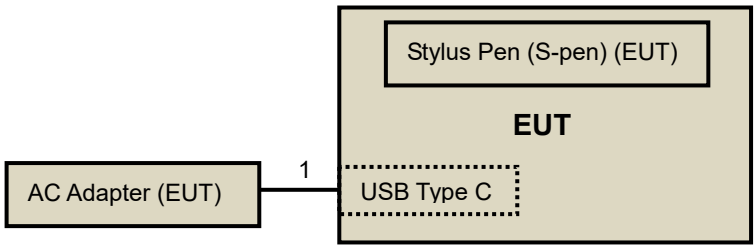
## 3.1 Description of Support Units

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.

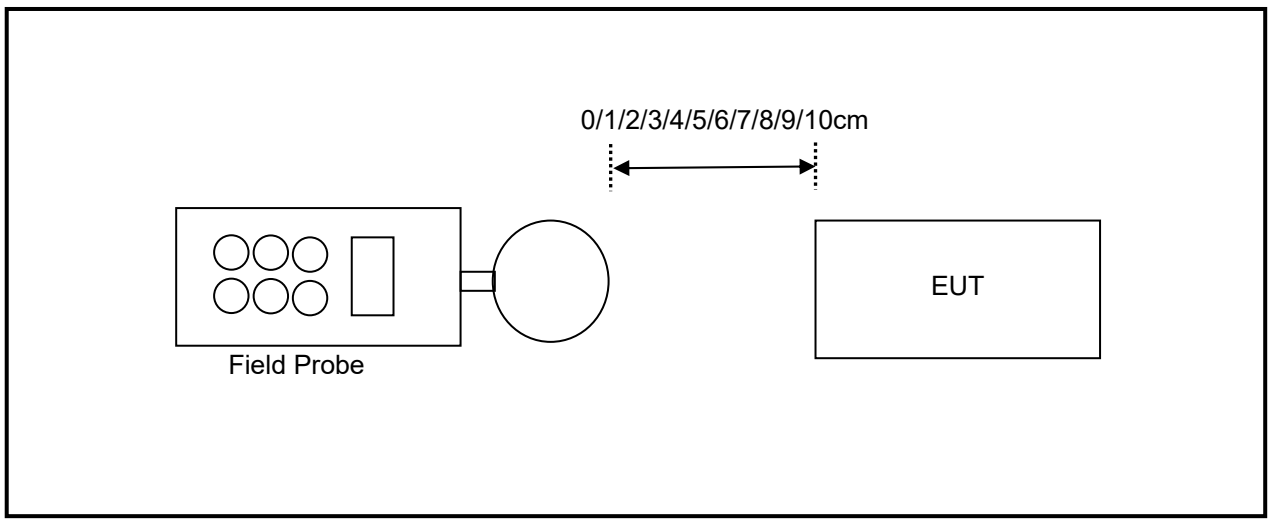
| ID | Cable Descriptions | Qty. | Length (m) | Shielding (Yes/ No) | Cores (Qty.) | Remarks |
|---|---|---|---|---|---|---|
| 1. | USB cable | 1 | 0.93 | Y | 0 | Supplied by client |

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

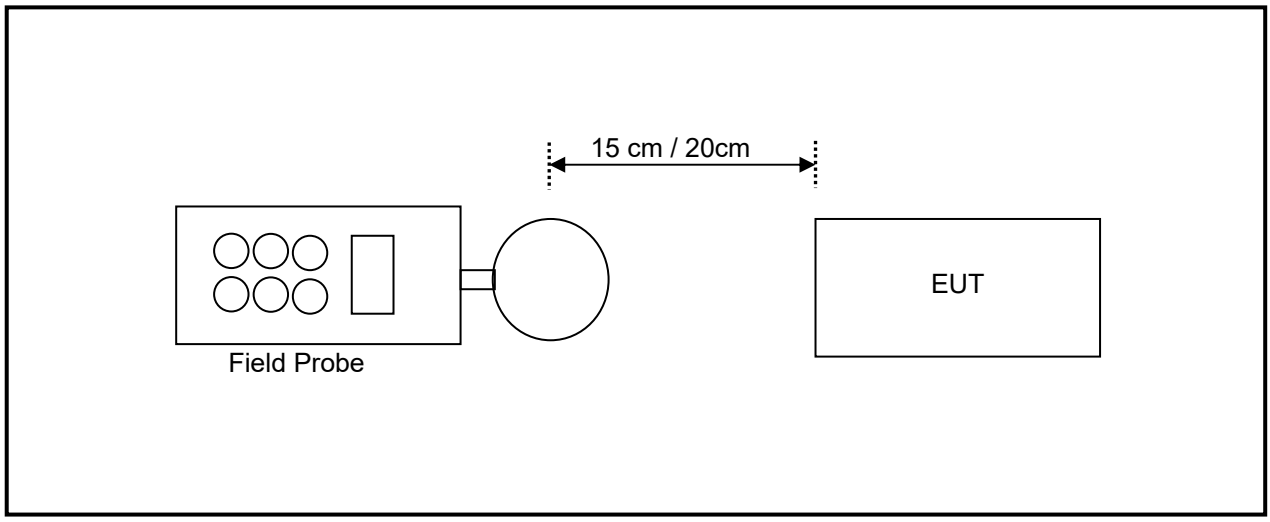
### 3.1.1 Configuration of System under Test



### 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.

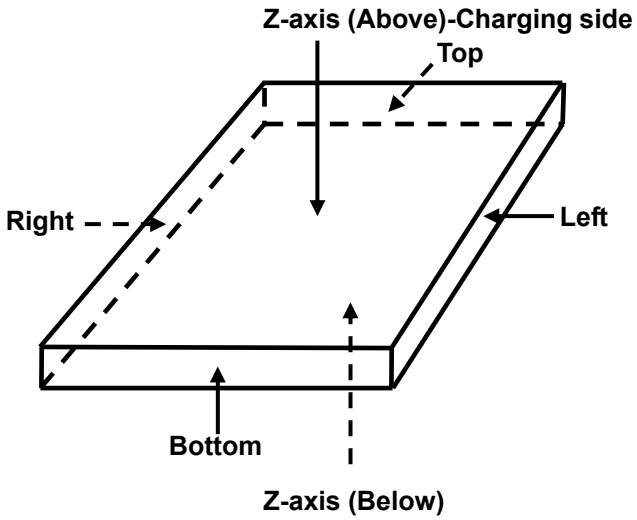
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

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 correnction 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).

**--- END ---**