# CERTIFICATION TEST REPORT

**Report Number. :** 4789497455-E8V2

| | | |
|---|---|---|
| **Applicant** | : | SAMSUNG ELECTRONICS CO., LTD.<br>129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,<br>GYEONGGI-DO, 16677, KOREA |
| **Model** | : | SM-N985F/DS, SM-N985F |
| **FCC ID** | : | A3LSMN985F |
| **EUT Description** | : | GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, UWB, WPT and NFC |
| **Test Standard(s)** | : | FCC 47 CFR PART 15 SUBPART C |

**Date Of Issue:**
July 08, 2020

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IAS ACCREDITED
Testing Laboratory
TL-637

## Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| V1 | 07/02/20 | Initial issue | Sangyun Kim |
| V2 | 07/08/20 | Updated to address TCB's question | Sangyun Kim |


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# 1. ATTESTATION OF TEST RESULTS

| | |
|---|---|
| **COMPANY NAME:** | SAMSUNG ELECTRONICS CO., LTD. |
| **EUT DESCRIPTION:** | GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, UWB, WPT and NFC |
| **MODEL:** | SM-N985F/DS, SM-N985F |
| **SERIAL NUMBER:** | R3CN40CD4FP (RADIATED)<br>R38N406WGAX (Spot Check); |
| **DATE TESTED:** | JUN 19, 2020 – JUN 23, 2020 (Original)<br>JUN 23, 2020 (Spot Check); |

| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULTS** |
| CFR 47 Part 15 Subpart C | Pass |

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested 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.

Approved & Released For
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Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Sangyun Kim
Suwon Lab Engineer
UL Korea, Ltd.


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## 1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMN986B DCD WPT(FCC CFR 47 Part 15C). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

## 1.2. DIFFERENCE

The FCC ID: A3LSMN985F shares the same enclosure and circuit board as FCC ID: A3LSMN986B. The WPT antennas and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMN986B remains representative of FCC ID: A3LSMN985F. The test data of FCC ID: A3LSMN986B being submitted for this application to cover WPT features.

## 1.3. SPOT CHECK VERIFICATION DATA

| Band | Test Item | Mode | Frequency | Test Limit | Original model | Spot-check model | Deviation | Remark |
|---|---|---|---|---|---|---|---|---|
| | | | | | SM-N986B/DS Results | SM-N985F/DS Results | | |
| | | | | | FCC ID : A3LSMN986B | FCC ID : A3LSMN985F | | |
| WPT (110 to 148kHz) | FUND. | Power Sharing | 0.11 MHz | 46.76 dBuV/m | 2.00 dBuV/m | 1.26 dBuV/m | -0.74 dB | - |
| | RSE | Power Sharing | 0.55 MHz | 32.74 dBuV/m | 17.29 dBuV/m | 11.32 dBuV/m | -5.97 dB | - |
| WPT (590 - 625kHz) | FUND. | Charging S-Pen | 0.59 MHz | 32.13 dBuV/m | 18.12 dBuV/m | 15.47 dBuV/m | -2.65 dB | - |
| | RSE | Charging S-Pen | 1.98 MHz | 29.5 dBuV/m | 8.80 dBuV/m | 10.17 dBuV/m | 1.37 dB | - |

Comparison of two models, upper deviation is within 3dB range and all test results are under FCC Technical Limits.


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## 1.4. REFERENCE DETAIL

Reference application that contains the reused reference data in the individual test reports:

| Equipment Class | Reference FCC ID (Parent) | Application Type | Reference Test report number | Exhibit Type | Variant Test Report Number | Data Re-used |
|---|---|---|---|---|---|---|
| PCE | A3LSMN986B | Original Grant | 4789468331-E2 | Test Report | 4789497455-E2 | All |
| DTS | A3LSMN986B | Original Grant | 4789468331-E3 (802.11b/g/n/ax) | Test Report | 4789497455-E3 (802.11b/g/n/ax) | All |
| | | | 4789468331-E4 Bluetooth LE | Test Report | 4789497455-E4 Bluetooth LE | All |
| DSS | A3LSMN986B | Original Grant | 4789468331-E5 (Bluetooth) | Test Report | 4789497455-E5 (Bluetooth) | All |
| NII | A3LSMN986B | Original Grant | 4789468331-E6 (802.11a/n/ac/ax) | Test Report | 4789497455-E6 (802.11a/n/ac/ax) | All |
| DXX | A3LSMN986B | Original Grant | 4789468331-E7 (NFC) | Test Report | 4789497455-E7 (NFC) | All |
| DCD | A3LSMN986B | Original Grant | 4789468331-E8 (WPT) | Test Report | 4789497455-E8 (WPT) | All |

For this application the data reuse is summarized below for each equipment class:

| Equipment Class | Reference FCC ID (Parent) | Application Type | Test Item | Data Re-used |
|---|---|---|---|---|
| PCE | A3LSMN986B | Original Grant | WWAN | All except SAR (full test), HAC (full test) |
| DTS | A3LSMN986B | Original Grant | BLE | All |
| | | | WLAN | All except SAR (full test), HAC (full test) |
| | | | WLAN 802.11ax | All except HAC (full test) |
| DSS | A3LSMN986B | Original Grant | BT | All except SAR (full test) |
| NII | A3LSMN986B | Original Grant | WLAN | All except SAR (full test), HAC (full test) |
| | | | WLAN 802.11ax | All except HAC (full test) |
| DXX | A3LSMN986B | Original Grant | NFC | All |
| DCD | A3LSMN986B | Original Grant | WPT | All except RF exposure |


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# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. ANSI C63.10-2013.
4. 680106 D01 RF Exposure Wireless Charging Apps v03.
5. KDB 484596 D01 Referencing Test Data v01

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 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.

| 218 Maeyeong-ro |
|---|
| ☐ Chamber 1 |
| ☒ Chamber 2 |
| ☐ Chamber 3 |

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf.

# 4. CALIBRATION AND UNCERTAINTY

## 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

## 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

## 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER | UNCERTAINTY |
|---|---|
| Conducted Disturbance, 0.15 to 30 MHz | 2.35 dB |
| Radiated Disturbance, 9 kHz to 30 MHz | 1.72 dB |
| Radiated Disturbance, 30 MHz to 1 GHz | 3.49 dB |

Uncertainty figures are valid to a confidence level of 95%.

## 4.4. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 1, Clause 4.4.2 in IEC Guide 115:2007.


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# 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, UWB, WPT and NFC.
This test report addresses the wireless low power Transmitter(DCD) operational mode.

This report covers the Samsung models SM-N986B/DS and SM-N986B.
These models are identical in hardware except SM-N986B has single SIM tray.
With some pre-scan, model SM-N986B/DS was set for final test.

## 5.2. MAXIMUM E-FIELD STRENGTH

- Power sharing mode

| Fundamental Frequency (KHz) | Mode | E field (300m distance) FCC (dBuV/m) |
|---|---|---|
| 110 - 148 | Charging | 2.00 |

- S-pen charging mode

| Fundamental Frequency (KHz) | Mode | E field (30m distance) FCC (dBuV/m) |
|---|---|---|
| 590 - 625 | Charging | 18.12 |

## 5.3. PRELIMINARY TEST CONFIGURATIONS

The Power Sharing mode of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

The S-Pen charging mode of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

The Simutaneous charging mode of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.


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## 5.4. WORST-CASE CONFIGURATION AND MODE

| Mode 1 | Test Case | Description |
|---|---|---|
| Power sharing mode (S-pen is fully charged condition) | 1 | Charging from EUT to Phone |
| | 2 | Charging from EUT(Charging from TA) to Phone |
| | 3 | Charging from EUT to Phone (Cross position) |
| | 4 | Charging from EUT(Charging from TA) to Phone (Cross position) |
| | 5 | Charging from EUT to Wearable device |
| | 6 | Charging from EUT(Charging from TA) to Wearable device |

| Mode 2 | Test Case | Description |
|---|---|---|
| S-pen Charging mode | 7 | Charging from EUT to S-Pen |
| | 8 | Charging from EUT(Charging from TA) to S-Pen |

| Mode 3 | Test Case | Description |
|---|---|---|
| Simutaneous charging mode(Power sharing and S-pen charging) | 9 | Charging from EUT to Phone (Cross position) and Charging from EUT to S-Pen |
| | 10 | Charging from EUT to Phone (Cross position) and Charging from EUT to S-Pen(EUT was Charging from TA) |

For radiated test, test case 1/3/5/7/9, the EUT can operate the power sharing mode when battery level is over 30%. Because test results are not different between fully charged status and battery level 30% status(EUT condition), test were performed fully charged condition.

Also according to current client device's(Phone and Wearable device) battery level, test results are different.Because the test results were worst when the battery level was 1%~20%, tests were performed when the battery level was 1%~20%.(Client device)
For S-pen, both fully charged and non-fully charged condition were investigated, test case 7/8/9 were performed non-fully charged condition as worst case.

During radiated test for test case 1/3/5/7/9, the EUT didn't connected AC adapter, but for AC line conducted test for all test case was performed with connected with AC adapter.

For power sharing mode, test results of case 4 is worst and S-pen Charging mode, test results of case 8 is worst, so this test report described test case 4, test case 8 and test case 10.


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## 5.5. MODIFICATIONS

No modifications were made during testing.

## 5.6. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT & PERIPHERALS**

| Support Equipment List | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Serial Number** | **FCC ID/DoC** |
| Tavel Adapter | Samsung | EP-TA800 | R37N39301T8SE3 | DoC |
| USB Data Cable | Samsung | EP-DG980 | - | - |
| Mobile Phone | Samsung | SM-G986B | R3CMB0C70XN | A3LSMG986B |
| Wearable Device | Samsung | SM-R835 | RFAM90ZXFTF | A3LSMR835 |

**I/O CABLES**

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| **Cable No** | **Port** | **# of identical ports** | **Connector Type** | **Cable Type** | **Cable Length (m)** | **Remarks** |
| 1 | DC Power | 1 | C Type | Shielded | 1.1m | N/A |

**TEST SETUP**

The EUT is installed in a typical configuration. Charging from EUT.


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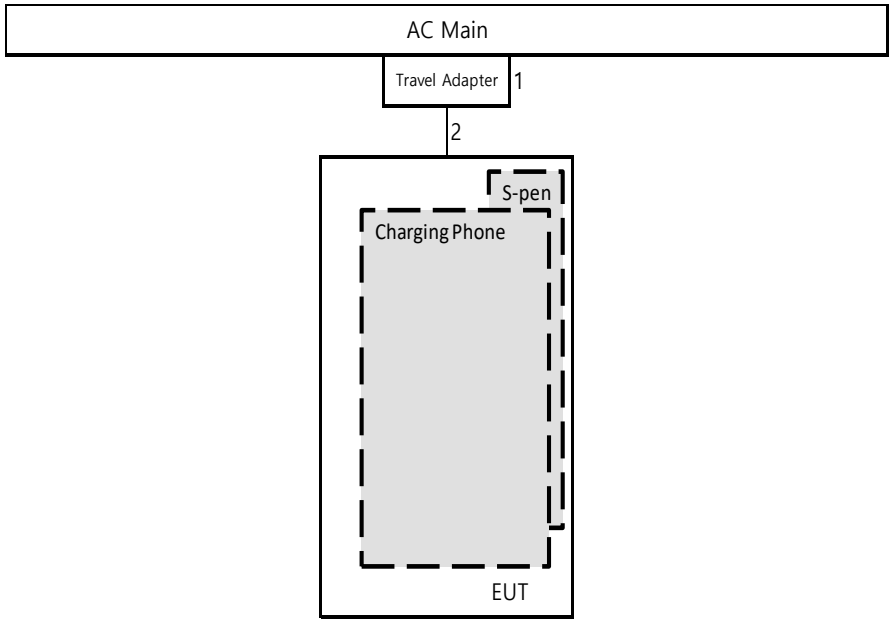
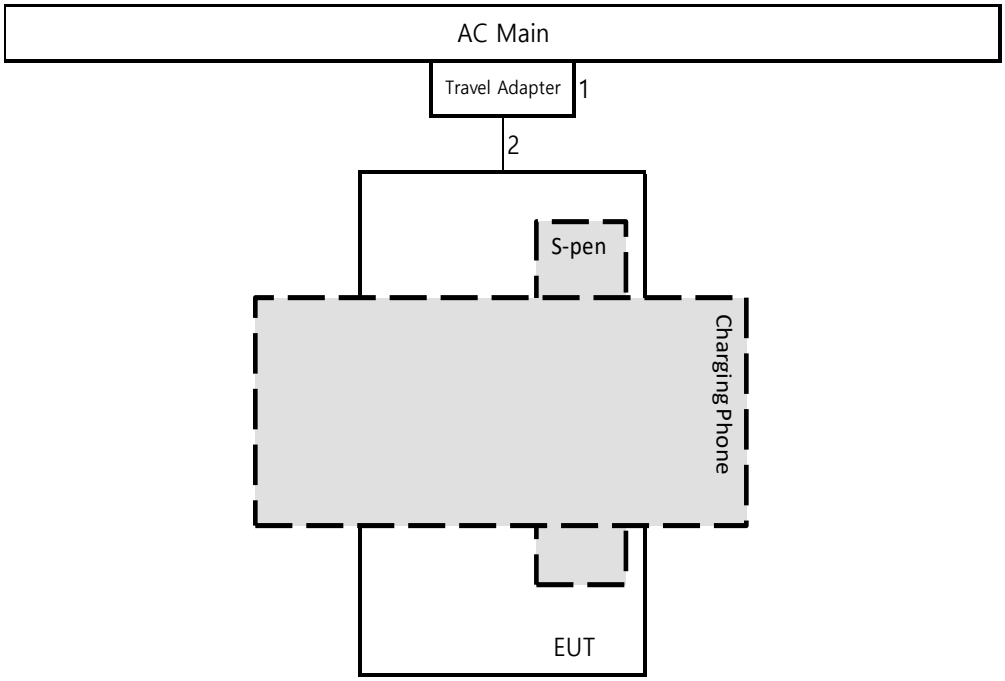
**TEST SETUP DIAGRAM**

NOTE : Test case 1/3/5/7/9, EUT did not connected with Travel adapter(AC Main) in below set-up diagram for radiated test.

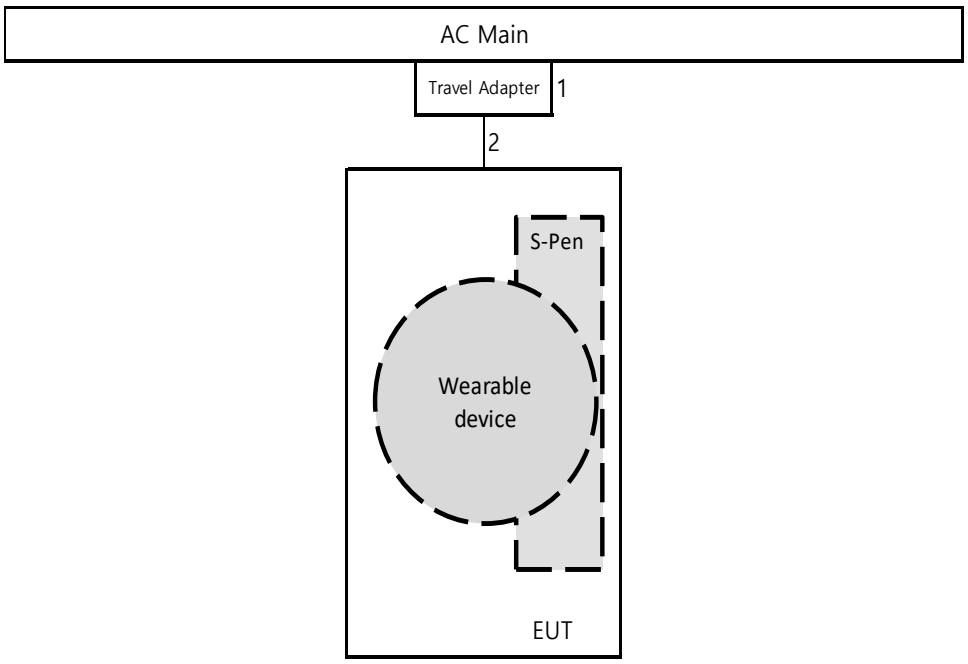
- Test Case1 and 2 : Charging Phone(S-pen is fully charged condition)



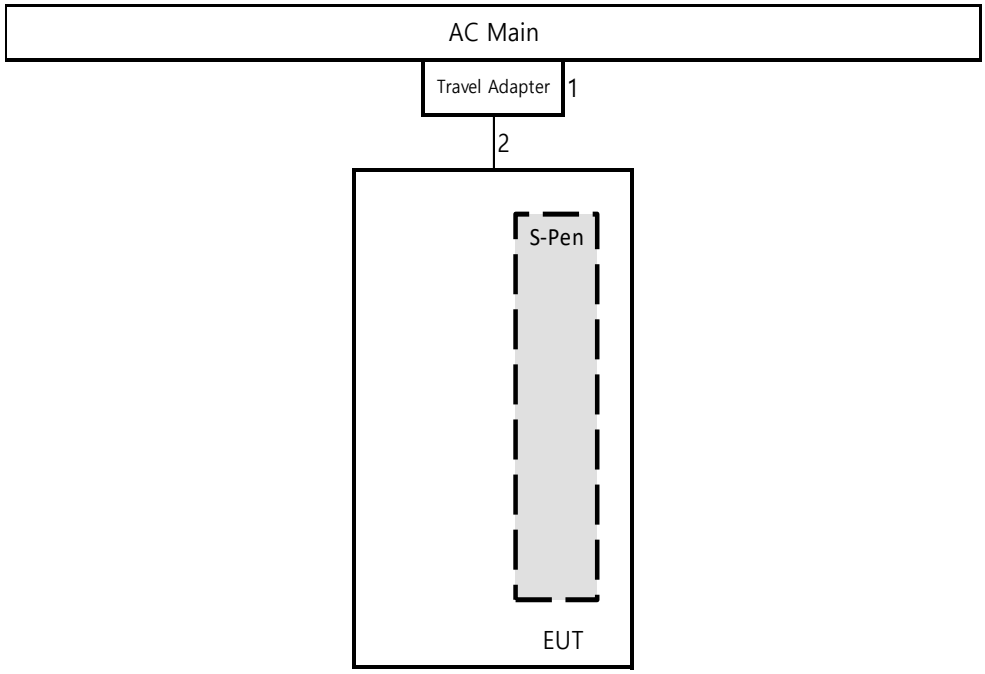

- Test Case 3 and 4 : Charging Phone(Cross position, S-pen is fully charged condition)



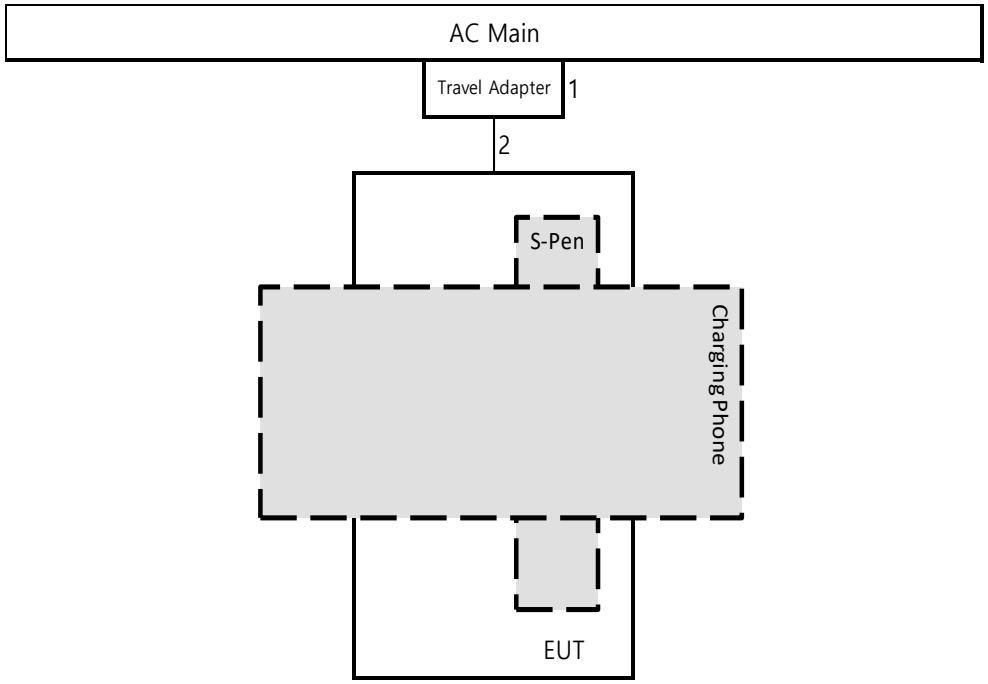
- Test Case 5 and 6 : Charging Wearable device(S-pen is fully charged condition)




- Test Case 7 and 8 : S-Pen Charging



- Test case 9 and 10 : Simutaneous charging (Power sharing and S-pen charging)



# 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| Test Equipment List | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **S/N** | **New Cal Due** |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 750 | 08-04-20 |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 749 | 08-04-20 |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 845 | 08-04-20 |
| Antenna, Horn, 18 GHz | ETS | 3115 | 00167211 | 08-04-20 |
| Antenna, Horn, 18 GHz | ETS | 3115 | 00161451 | 08-04-20 |
| Antenna, Horn, 18 GHz | ETS | 3117 | 00168724 | 08-04-20 |
| Antenna, Horn, 18 GHz | ETS | 3117 | 00168717 | 08-04-20 |
| Antenna, Horn, 18 GHz | ETS | 3117 | 00205959 | 08-04-20 |
| Antenna, Horn, 40 GHz | ETS | 3116C | 00166155 | 08-14-20 |
| Antenna, Horn, 40 GHz | ETS | 3116C | 00168645 | 10-02-21 |
| Preamplifier | ETS | 3116C-PA | 00168841 | 08-08-20 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 341282 | 08-05-20 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 351741 | 08-05-20 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 370599 | 08-05-20 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 1876511 | 08-06-20 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 1896138 | 08-06-20 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 2029169 | 08-06-20 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | N9030A | MY54170614 | 08-06-20 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | N9030A | MY54490312 | 08-06-20 |
| Spectrum Analyzer, 43.5 GHz | R&S | FSW43 | 104089 | 08-06-20 |
| Average Power Sensor | Agilent / HP | U2000 | MY54270007 | 08-09-20 |
| Attenuator | PASTERNACK | PE7087-10 | A001 | 08-08-20 |
| Attenuator | PASTERNACK | PE7087-10 | A008 | 08-08-20 |
| Attenuator | PASTERNACK | PE7004-10 | 2 | 08-06-20 |
| Attenuator | PASTERNACK | PE7087-10 | A009 | 08-08-20 |
| EMI Test Receive, 40 GHz | R&S | ESU40 | 100439 | 08-06-20 |
| EMI Test Receive, 40 GHz | R&S | ESU40 | 100457 | 08-06-20 |
| EMI Test Receive, 44 GHz | R&S | ESW44 | 101590 | 08-05-20 |
| EMI Test Receive, 3 GHz | R&S | ESR3 | 101832 | 08-05-20 |
| Low Pass Filter 5GHz | Micro-Tronics | LPS17541 | 009 | 08-06-20 |
| Low Pass Filter 5GHz | Micro-Tronics | LPS17541 | 015 | 08-06-20 |
| Low Pass Filter 5GHz | Micro-Tronics | LPS17541 | 020 | 08-06-20 |
| High Pass Filter 3GHz | Micro-Tronics | HPM17543 | 010 | 08-06-20 |
| High Pass Filter 3GHz | Micro-Tronics | HPM17543 | 015 | 08-06-20 |
| High Pass Filter 3GHz | Micro-Tronics | HPM17543 | 020 | 08-06-20 |
| High Pass Filter 6GHz | Micro-Tronics | HPS17542 | 009 | 08-06-20 |
| High Pass Filter 6GHz | Micro-Tronics | HPS17542 | 016 | 08-06-20 |
| High Pass Filter 6GHz | Micro-Tronics | HPS17542 | 021 | 08-06-20 |
| LISN | R&S | ENV-216 | 101837 | 08-09-20 |
| Antenna, Loop, 9kHz-30MHz | R&S | HFH2-Z2 | 100418 | 10-02-21 |
| **Antenna, Loop, 9kHz-30MHz** | | | | |
| **Description** | **Manufacturer** | **Model** | **Version** | |
| Radiated software | UL | UL EMC | Ver 9.5 | |
| AC Line Conducted software | UL | UL EMC | Ver 9.5 | |

# 7. APPLICABLE LIMITS AND TEST RESULTS

## 7.1. RADIATED EMISSIONS

**TEST PROCEDURE**

ANSI C63.10: 2013

The highest clock frequency generated or used in the EUT is 600 kHz therefore the frequency range was investigated from 9 kHz to 30 MHz.

**LIMIT**

FCC §15.209 (a)
ICES-001 Section 6.2, IC RSS-216 6.2.2, and IC RSS-GEN Sections 8.9 and 8.10.

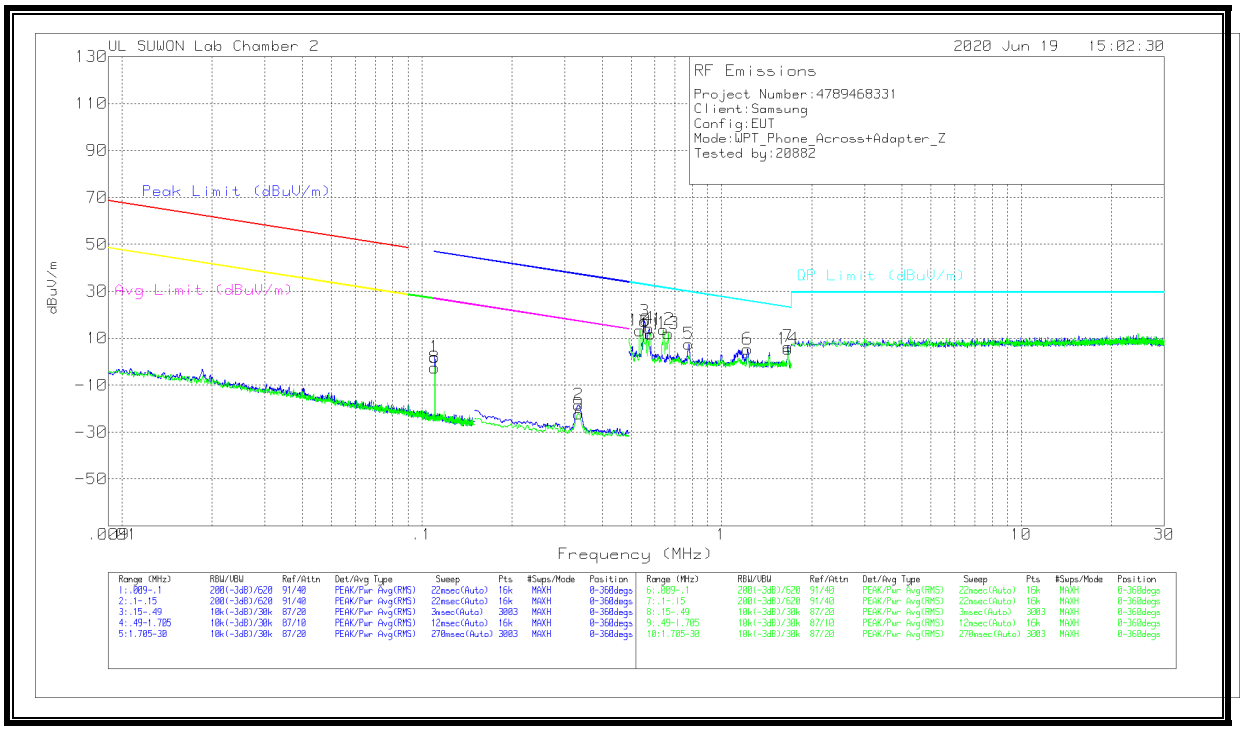
| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (m) |
|---|---|---|
| 0.009–0.490 | 2400/F(kHz) | 300 |
| 0.490–1.705 | 24000/F(kHz) | 30 |
| 1.705–30.0 | 30 | 30 |
| 30–88 | 100 | 3 |
| 88 to 216 | 150 | 3 |
| 216 to 960 | 200 | 3 |
| Above 960 MHz | 500 | 3 |
| Note: The lower limit shall apply at the transition frequency. | | |

**RESULTS**

The EUT belongs to Test Case 4 and 8 and 10.

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 300 m open field test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788 D01.

**RADIATED EMISSIONS 9 KHz to 30 MHz(Power sharing mode Test Case 4)**



## TEST DATA

Trace Markers

[Face-On]

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | HFH2-Z2_Loop Antenna | Cable Loss | Dist Corr 300m | Corrected Reading dBuV/m | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 | .11056 | 62.1 | Pk | 19.8 | .1 | -80 | 2 | 46.76 | -44.76 | 26.76 | -24.76 | 0-360 |
| 2 | .33413 | 41.78 | Pk | 19.7 | .1 | -80 | -18.42 | 37.13 | -55.55 | 17.13 | -35.55 | 0-360 |

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | HFH2-Z2_Loop Antenna | Cable Loss | Dist Corr 30m | Corrected Reading dBuV/m | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | .55388 | 37.49 | Pk | 19.7 | .1 | -40 | 17.29 | 32.74 | -15.45 | 0-360 |
| 4 | .57379 | 34.44 | Pk | 19.7 | .1 | -40 | 14.24 | 32.43 | -18.19 | 0-360 |
| 5 | .77755 | 27.59 | Pk | 19.8 | .2 | -40 | 7.59 | 29.8 | -22.21 | 0-360 |
| 6 | 1.22169 | 25.37 | Pk | 19.8 | .2 | -40 | 5.37 | 25.89 | -20.52 | 0-360 |
| 7 | 1.66899 | 26.46 | Pk | 19.8 | .2 | -40 | 6.46 | 23.18 | -16.72 | 0-360 |

[Face-Off]

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | HFH2-Z2_Loop Antenna | Cable Loss | Dist Corr 300m | Corrected Reading dBuV/m | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **8 | .11055 | 57.54 | Pk | 19.8 | .1 | -80 | -2.56 | 46.76 | -49.32 | 26.76 | -29.32 | 0-360 |
| 9 | .33346 | 37.85 | Pk | 19.7 | .1 | -80 | -22.35 | 37.15 | -59.5 | 17.15 | -39.5 | 0-360 |

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | HFH2-Z2_Loop Antenna | Cable Loss | Dist Corr 30m | Corrected Reading dBuV/m | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | .5345 | 33.49 | Pk | 19.7 | .1 | -40 | 13.29 | 33.05 | -19.76 | 0-360 |
| 11 | .58067 | 31.89 | Pk | 19.7 | .1 | -40 | 11.69 | 32.33 | -20.64 | 0-360 |
| 12 | .64132 | 33.91 | Pk | 19.7 | .1 | -40 | 13.71 | 31.47 | -17.76 | 0-360 |
| 13 | .66438 | 32.31 | Pk | 19.7 | .1 | -40 | 12.11 | 31.16 | -19.05 | 0-360 |
| 14 | 1.66735 | 25.42 | Pk | 19.8 | .2 | -40 | 5.42 | 23.19 | -17.77 | 0-360 |

Pk - Peak detector
** Fundamental

Note : Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.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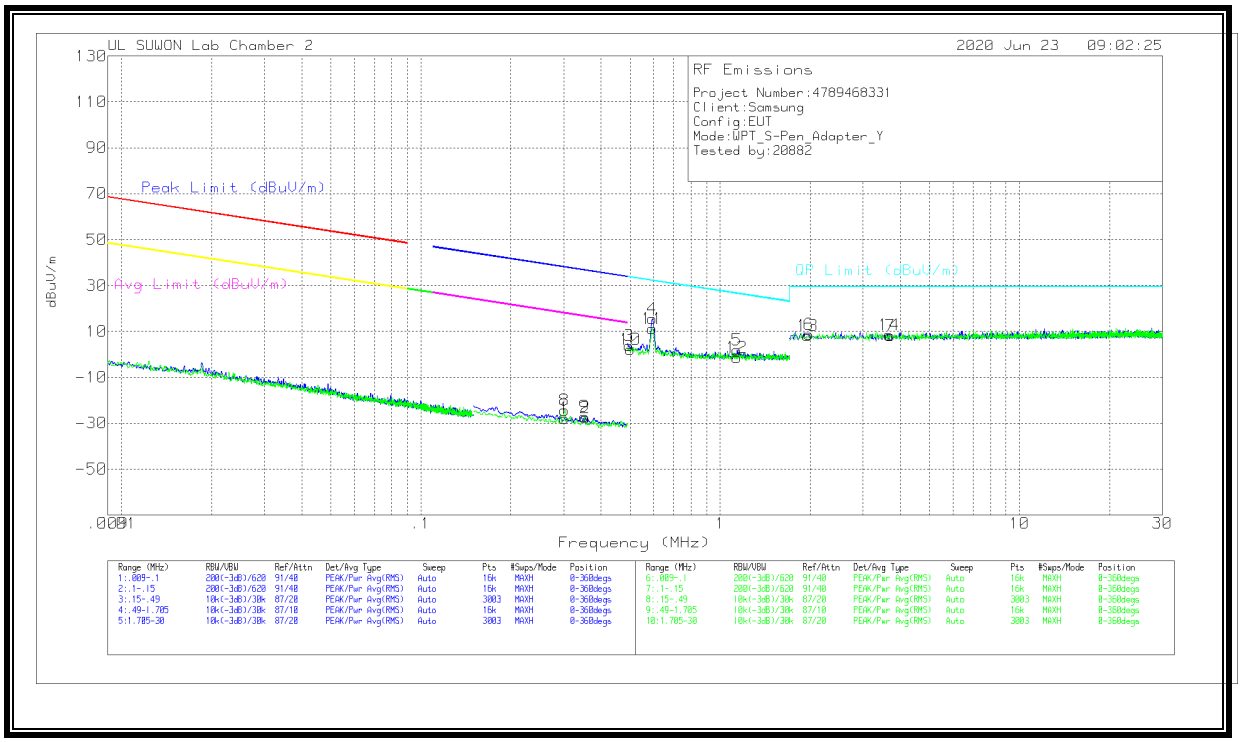
**RADIATED EMISSIONS 9 KHz to 30 MHz(S-pen charging mode_Test case 8)**



## TEST DATA

### Trace Markers

[Face-On]

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | HFH2-Z2_Loop Antenna | Cable Loss | Dist Corr 300m | Corrected Reading dBuV/m | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .30142 | 32.38 | Pk | 19.7 | .1 | -80 | -27.82 | 38.03 | -65.85 | 18.03 | -45.85 | 0-360 |
| 2 | .35442 | 32.65 | Pk | 19.7 | .1 | -80 | -27.55 | 36.62 | -64.17 | 16.62 | -44.17 | 0-360 |

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | HFH2-Z2_Loop Antenna | Cable Loss | Dist Corr 30m | Corrected Reading dBuV/m | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | .49627 | 24.07 | Pk | 19.7 | .1 | -40 | 3.87 | 33.69 | -29.82 | 0-360 |
| **4 | .59393 | 35.69 | Pk | 19.7 | .1 | -40 | 15.49 | 32.13 | -16.64 | 0-360 |
| 5 | 1.13877 | 21.85 | Pk | 19.8 | .2 | -40 | 1.85 | 26.5 | -24.65 | 0-360 |
| 6 | 1.97833 | 28.8 | Pk | 19.8 | .2 | -40 | 8.8 | 29.5 | -20.7 | 0-360 |
| 7 | 3.7031 | 28.01 | Pk | 19.9 | .3 | -40 | 8.21 | 29.5 | -21.29 | 0-360 |

[Face-Off]

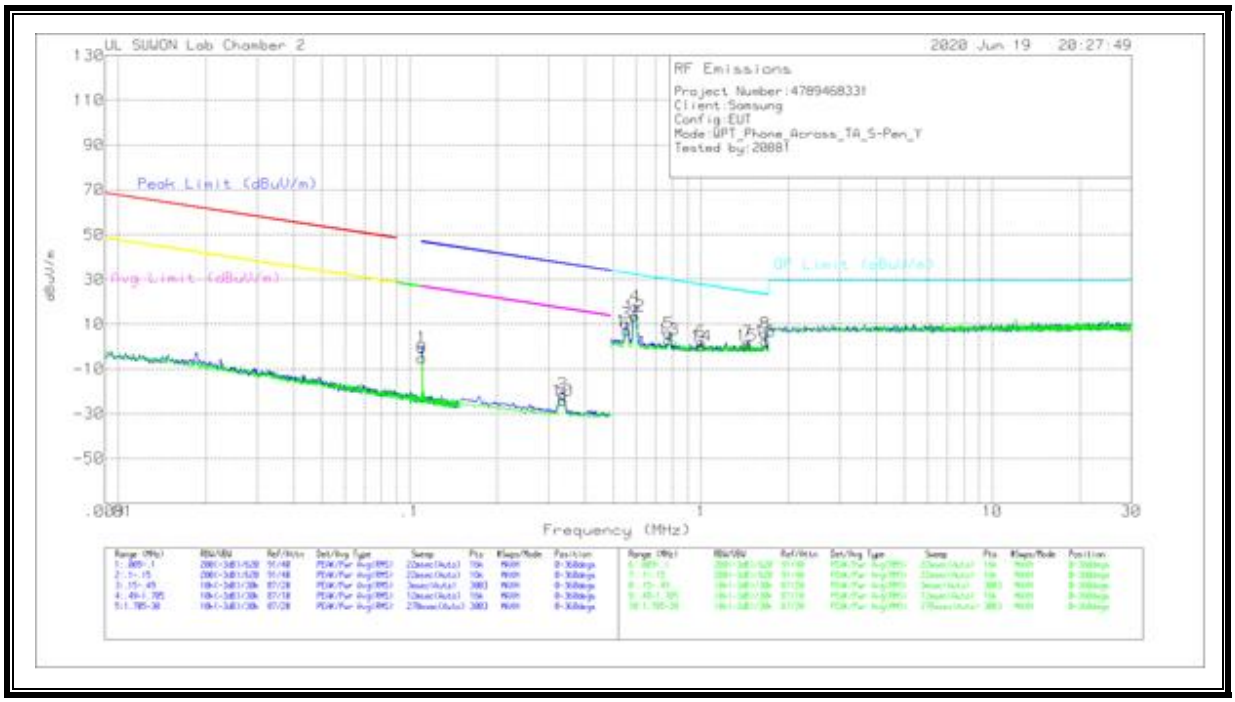
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | HFH2-Z2_Loop Antenna | Cable Loss | Dist Corr 300m | Corrected Reading dBuV/m | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | .30261 | 35.9 | Pk | 19.7 | .1 | -80 | -24.3 | 37.99 | -62.29 | 17.99 | -42.29 | 0-360 |
| 9 | .35176 | 33.18 | Pk | 19.7 | .1 | -80 | -27.02 | 36.68 | -63.7 | 16.68 | -43.7 | 0-360 |

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | HFH2-Z2_Loop Antenna | Cable Loss | Dist Corr 30m | Corrected Reading dBuV/m | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | .50037 | 22.39 | Pk | 19.7 | .1 | -40 | 2.19 | 33.62 | -31.43 | 0-360 |
| **11 | .59366 | 31.41 | Pk | 19.7 | .1 | -40 | 11.21 | 32.14 | -20.93 | 0-360 |
| 12 | 1.13741 | 18.73 | Pk | 19.8 | .2 | -40 | -1.27 | 26.51 | -27.78 | 0-360 |
| 13 | 1.95948 | 28.24 | Pk | 19.8 | .2 | -40 | 8.24 | 29.5 | -21.26 | 0-360 |
| 14 | 3.67483 | 28.25 | Pk | 19.9 | .3 | -40 | 8.45 | 29.5 | -21.05 | 0-360 |

Pk - Peak detector
** Fundamental

Note 1: Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.

**RADIATED EMISSIONS 9 KHz to 30 MHz(Simutaneous charging mode Test Case 10)**



## TEST DATA

### Trace Markers

[Face On]

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | HFH2-Z2_Loop Antenna | Cable Loss | Dist Corr 300m | Corrected Reading dBuV/m | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *1 | .11053 | 59.87 | Pk | 19.8 | .1 | -80 | -.23 | 46.76 | -46.99 | 26.76 | -26.99 | 0-360 |
| 2 | .33509 | 39.23 | Pk | 19.7 | .1 | -80 | -20.97 | 37.11 | -58.08 | 17.11 | -38.08 | 0-360 |

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | HFH2-Z2_Loop Antenna | Cable Loss | Dist Corr 30m | Corrected Reading dBuV/m | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | .55247 | 30.51 | Pk | 19.7 | .1 | -40 | 10.31 | 32.76 | -22.45 | 0-360 |
| **4 | .59458 | 38.32 | Pk | 19.7 | .1 | -40 | 18.12 | 32.12 | -14 | 0-360 |
| 5 | .77679 | 25.91 | Pk | 19.8 | .2 | -40 | 5.91 | 29.81 | -23.9 | 0-360 |
| 6 | 1.00114 | 22.28 | Pk | 19.8 | .2 | -40 | 2.28 | 27.61 | -25.33 | 0-360 |
| 7 | 1.44904 | 22.04 | Pk | 19.8 | .2 | -40 | 2.04 | 24.41 | -22.37 | 0-360 |
| 8 | 1.66568 | 25.91 | Pk | 19.8 | .2 | -40 | 5.91 | 23.2 | -17.29 | 0-360 |

[Face Off]

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | HFH2-Z2_Loop Antenna | Cable Loss | Dist Corr 300m | Corrected Reading dBuV/m | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *9 | .11053 | 54.91 | Pk | 19.8 | .1 | -80 | -5.19 | 46.76 | -51.95 | 26.76 | -31.95 | 0-360 |
| 10 | .33526 | 36.05 | Pk | 19.7 | .1 | -80 | -24.15 | 37.1 | -61.25 | 17.1 | -41.25 | 0-360 |

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | HFH2-Z2_Loop Antenna | Cable Loss | Dist Corr 30m | Corrected Reading dBuV/m | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | .55616 | 27.3 | Pk | 19.7 | .1 | -40 | 7.1 | 32.7 | -25.6 | 0-360 |
| **12 | .59401 | 33.76 | Pk | 19.7 | .1 | -40 | 13.56 | 32.13 | -18.57 | 0-360 |
| 13 | .77812 | 23.14 | Pk | 19.8 | .2 | -40 | 3.14 | 29.79 | -26.65 | 0-360 |
| 14 | 1.00137 | 20.32 | Pk | 19.8 | .2 | -40 | .32 | 27.61 | -27.29 | 0-360 |
| 15 | 1.4427 | 20.46 | Pk | 19.8 | .2 | -40 | .46 | 24.45 | -23.99 | 0-360 |
| 16 | 1.66397 | 22.46 | Pk | 19.8 | .2 | -40 | 2.46 | 23.21 | -20.75 | 0-360 |

Pk - Peak detector
*Power Sharing Fundamental
**S-Pen Fundamental

Note 1 : Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.

## 7.2. AC MAINS LINE CONDUCTED EMISSIONS

**TEST PROCEDURE**

ANSI C63.10: 2013

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

**LIMIT**

FCC §15.207 (a)

| Frequency range (MHz) | Limits (dBµV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56* | 56 to 46* |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |
| *Decreases with the logarithm of the frequency. | | |

**RESULTS**

The EUT belongs to Test Case 3 and 7.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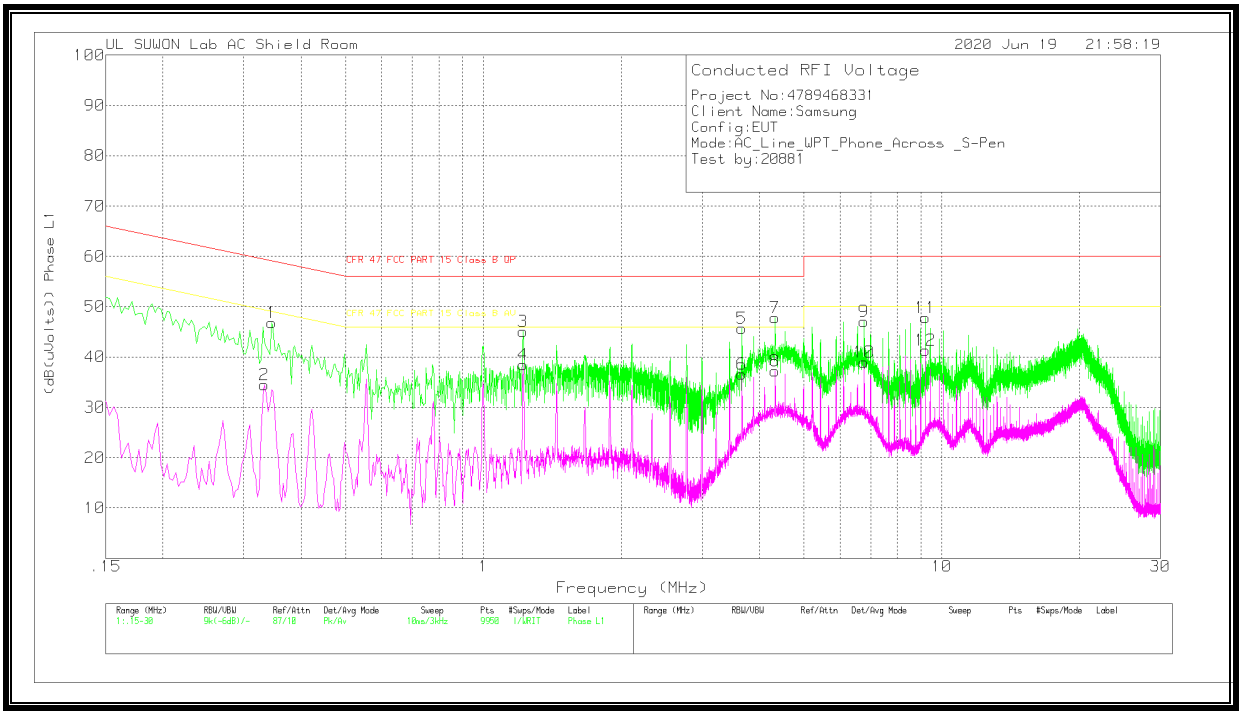
**6 WORST EMISSIONS(Power sharing mode Test Case 10)**

## Line-L1 .15 - 30MHz



**LINE 1 RESULTS**

## Trace Markers

Range 1: Phase L1 .15 - 30MHz

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | 101836_With Ex_L1[dB] | CABLELOSS(dB) | Corrected Reading (dB(uVolts)) | CFR 47 FCC PART 15 Class B QP | Margin (dB) | CFR 47 FCC PART 15 Class B AV | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .345 | 36.72 | Pk | 9.9 | .2 | 46.82 | 59.08 | -12.26 | - | - |
| 2 | .333 | 24.47 | Av | 9.8 | .2 | 34.47 | - | - | 49.38 | -14.91 |
| 3 | 1.221 | 34.98 | Pk | 9.8 | .3 | 45.08 | 56 | -10.92 | - | - |
| 4 | 1.221 | 28.34 | Av | 9.8 | .3 | 38.44 | - | - | 46 | -7.56 |
| 5 | 3.663 | 35.57 | Pk | 9.8 | .3 | 45.67 | 56 | -10.33 | - | - |
| 6 | 3.663 | 26.45 | Av | 9.8 | .3 | 36.55 | - | - | 46 | -9.45 |
| 7 | 4.329 | 37.76 | Pk | 9.8 | .3 | 47.86 | 56 | -8.14 | - | - |
| 8 | 4.329 | 27.13 | Av | 9.8 | .3 | 37.23 | - | - | 46 | -8.77 |
| 9 | 6.771 | 36.87 | Pk | 9.9 | .3 | 47.07 | 60 | -12.93 | - | - |
| 10 | 6.771 | 28.75 | Av | 9.9 | .3 | 38.95 | - | - | 50 | -11.05 |
| 11 | 9.213 | 37.53 | Pk | 9.9 | .4 | 47.83 | 60 | -12.17 | - | - |
| 12 | 9.213 | 31 | Av | 9.9 | .4 | 41.3 | - | - | 50 | -8.7 |

Pk - Peak detector
Av - Average detection

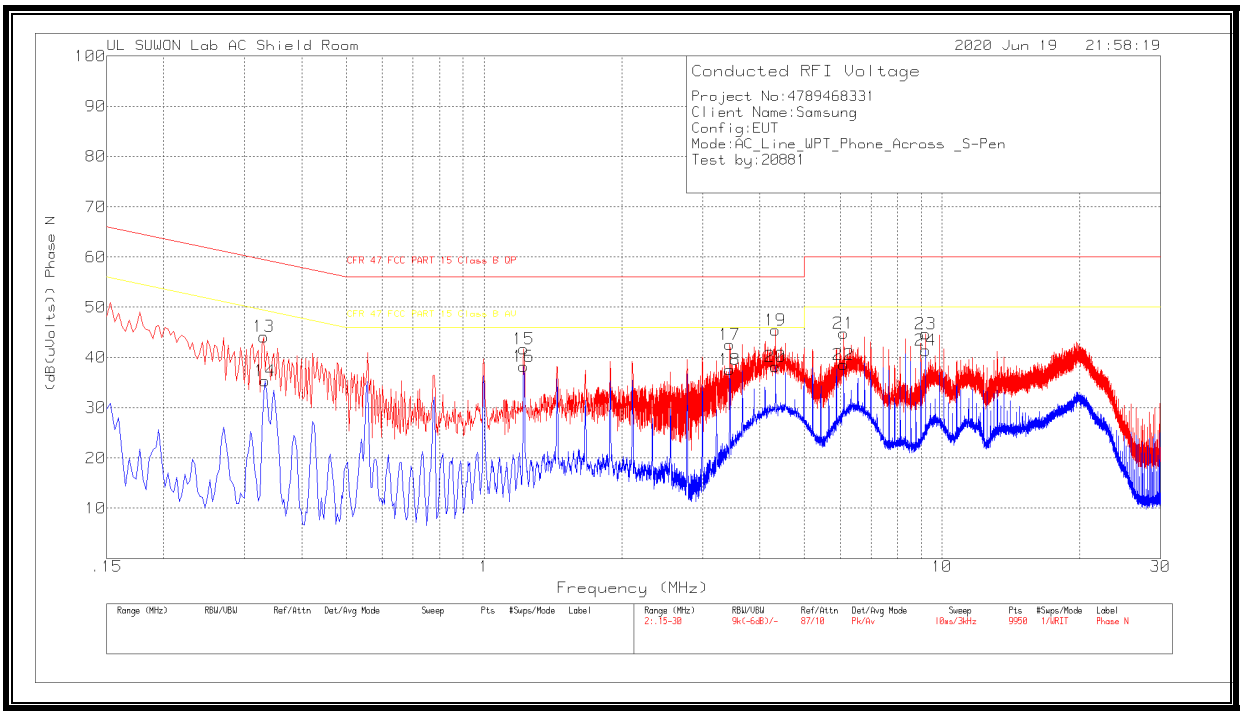
## Quasi-Peak Emissions

Range 1: Phase L1 .15 - 30MHz

| Frequency (MHz) | Meter Reading (dBuV) | Det | 101836_With Ex_L1[dB] | CABLELOSS(dB) | Corrected Reading (dB(uVolts)) | CFR 47 FCC PART 15 Class B QP | Margin (dB) | CFR 47 FCC PART 15 Class B AV | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 1.22175 | 31.67 | Qp | 9.8 | .3 | 41.77 | 56 | -14.23 | - | - |
| 3.66375 | 31.94 | Qp | 9.8 | .3 | 42.04 | 56 | -13.96 | - | - |
| 4.32825 | 29.06 | Qp | 9.8 | .3 | 39.16 | 56 | -16.84 | - | - |
| 9.21225 | 31.71 | Qp | 9.9 | .4 | 42.01 | 60 | -17.99 | - | - |

Qp - Quasi-Peak detector

## Line-L2 .15 - 30MHz





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**LINE 2 RESULTS**

## Trace Markers

Range 2: Phase N .15 - 30MHz

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | 101836_With EX_N[dB] | CABLELOSS(dB) | Corrected Reading (dB(uVolts)) | CFR 47 FCC PART 15 Class B QP | Margin (dB) | CFR 47 FCC PART 15 Class B AV | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | .33 | 34.14 | Pk | 9.8 | .2 | 44.14 | 59.45 | -15.31 | - | - |
| 14 | .333 | 25.31 | Av | 9.8 | .2 | 35.31 | - | - | 49.38 | -14.07 |
| 15 | 1.221 | 31.58 | Pk | 9.8 | .3 | 41.68 | 56 | -14.32 | - | - |
| 16 | 1.221 | 28.14 | Av | 9.8 | .3 | 38.24 | - | - | 46 | -7.76 |
| 17 | 3.441 | 32.53 | Pk | 9.8 | .3 | 42.63 | 56 | -13.37 | - | - |
| 18 | 3.441 | 27.5 | Av | 9.8 | .3 | 37.6 | - | - | 46 | -8.4 |
| 19 | 4.329 | 35.33 | Pk | 9.8 | .3 | 45.43 | 56 | -10.57 | - | - |
| 20 | 4.329 | 28.14 | Av | 9.8 | .3 | 38.24 | - | - | 46 | -7.76 |
| 21 | 6.102 | 34.75 | Pk | 9.8 | .3 | 44.85 | 60 | -15.15 | - | - |
| 22 | 6.105 | 28.52 | Av | 9.8 | .3 | 38.62 | - | - | 50 | -11.38 |
| 23 | 9.213 | 34.45 | Pk | 9.9 | .4 | 44.75 | 60 | -15.25 | - | - |
| 24 | 9.213 | 31.1 | Av | 9.9 | .4 | 41.4 | - | - | 50 | -8.6 |

Pk - Peak detector
Av - Average detection

## Quasi-Peak Emissions

Range 2: Phase N .15 - 30MHz

| Frequency (MHz) | Meter Reading (dBuV) | Det | 101836_With EX_N[dB] | CABLELOSS(dB) | Corrected Reading (dB(uVolts)) | CFR 47 FCC PART 15 Class B QP | Margin (dB) | CFR 47 FCC PART 15 Class B AV | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 1.22175 | 21.1 | Qp | 9.8 | .3 | 31.2 | 56 | -24.8 | - | - |
| 3.44025 | 26.64 | Qp | 9.8 | .3 | 36.74 | 56 | -19.26 | - | - |
| 4.32825 | 26.29 | Qp | 9.8 | .3 | 36.39 | 56 | -19.61 | - | - |
| 9.21225 | 29.41 | Qp | 9.9 | .4 | 39.71 | 60 | -20.29 | - | - |

Qp - Quasi-Peak detector

# END OF TEST REPORT



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