CERTIFICATION TEST REPORT

Report Number. : 4789551399-E10V2

Applicant	:	SAMSUNG ELECTRONICS CO., LTD. 129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI, GYEONGGI-DO, 16677, KOREA
Model	:	SM-G780F/DSM, SM-G780F/DS, SM-G780F
FCC ID	:	A3LSMG780F
EUT Description	:	GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, WPT and NFC
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
August 24, 2020

Prepared by:
UL Korea, Ltd.
26th floor, 152, Teheran-ro, Gangnam-gu Seoul, 06236, Korea

Suwon Test Site: UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16675, Korea
TEL: (031) 337-9902
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IAS ACCREDITED
Testing Laboratory
TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	08/13/20	Initial issue	Sangyun Kim
V2	08/24/20	Updated to address TCB's question	Sangyun Kim

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_15C(04)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

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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, WPT and NFC
MODEL NUMBER:	SM-G780F/DSM, SM-G780F/DS, SM-G780F
SERIAL NUMBER:	438370489a1e7ece (RADIATED);
DATE TESTED:	JUL 21, 2020 – AUG 04, 2020;

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies

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
UL Korea, Ltd. By:

Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Sangyun Kim
Suwon Lab Engineer
UL Korea, Ltd.

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.

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.

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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

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

This report covers the Samsung models SM-G780F/DSM and SM-G780F/DS, SM-G780F. These models are identical in hardware except SM-G780F/DS has dual SIM tray(MST not supported). And SM-G780F has single SIM tray. With some pre-scan, model SM-G780F/DSM (Dual SIM tray, MST supported) 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	-2.41

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 X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

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5.4. WORST-CASE CONFIGURATION AND MODE

Mode	Test Case	Description
Power sharing mode	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

For radiated test, test case 1/3/5, 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)

During radiated test for test case 1/3/5, 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 6 is worst, so this test report described test case 6.

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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-TA200	R37M4NQ2ZZ1SE3	DoC
USB Data Cable	Samsung	EP-DR140AWE	-	-
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

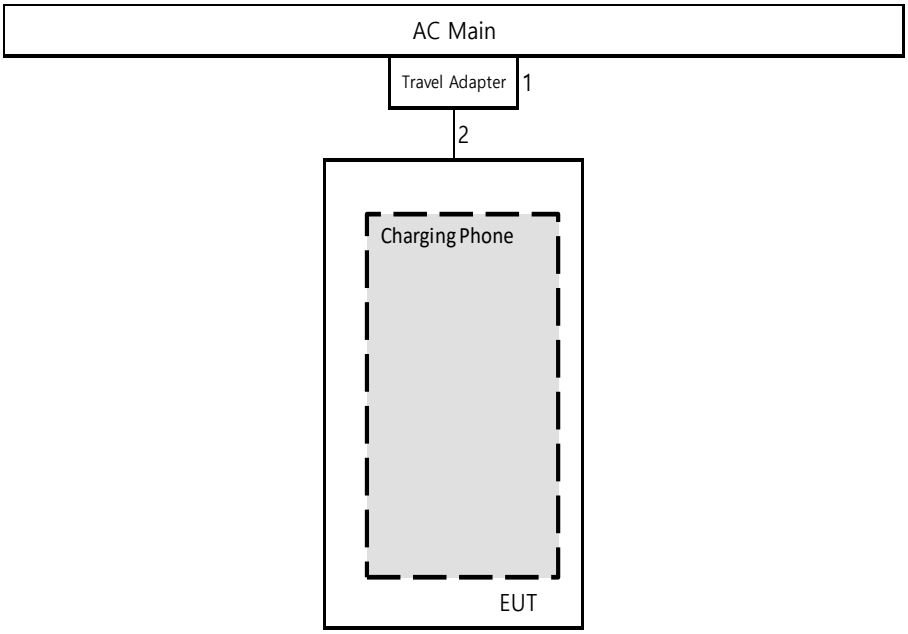
TEST SETUP

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

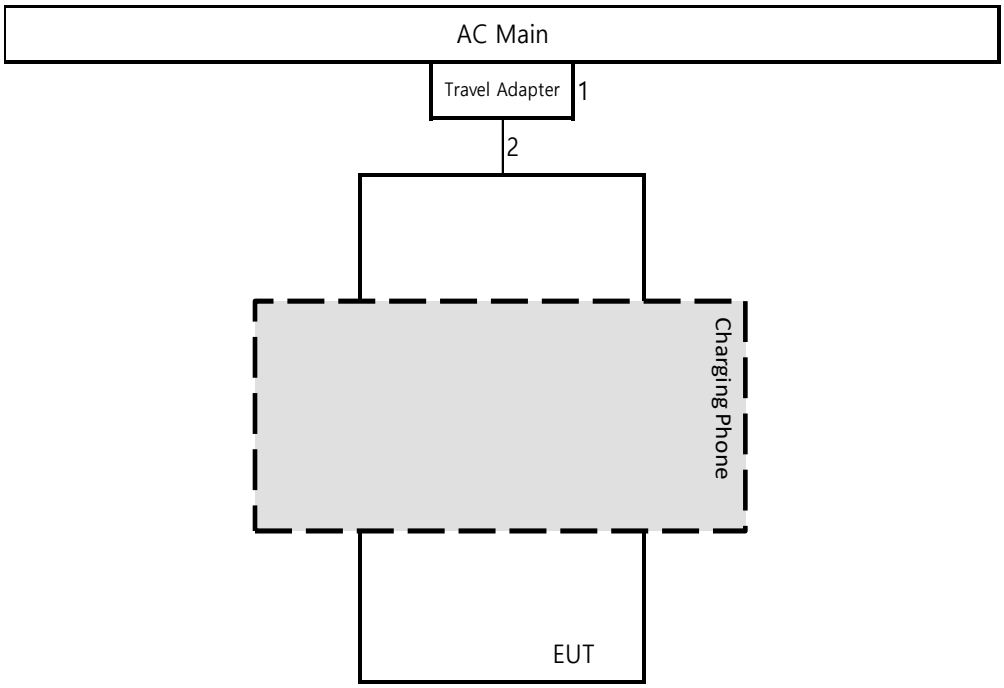
TEST SETUP DIAGRAM

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

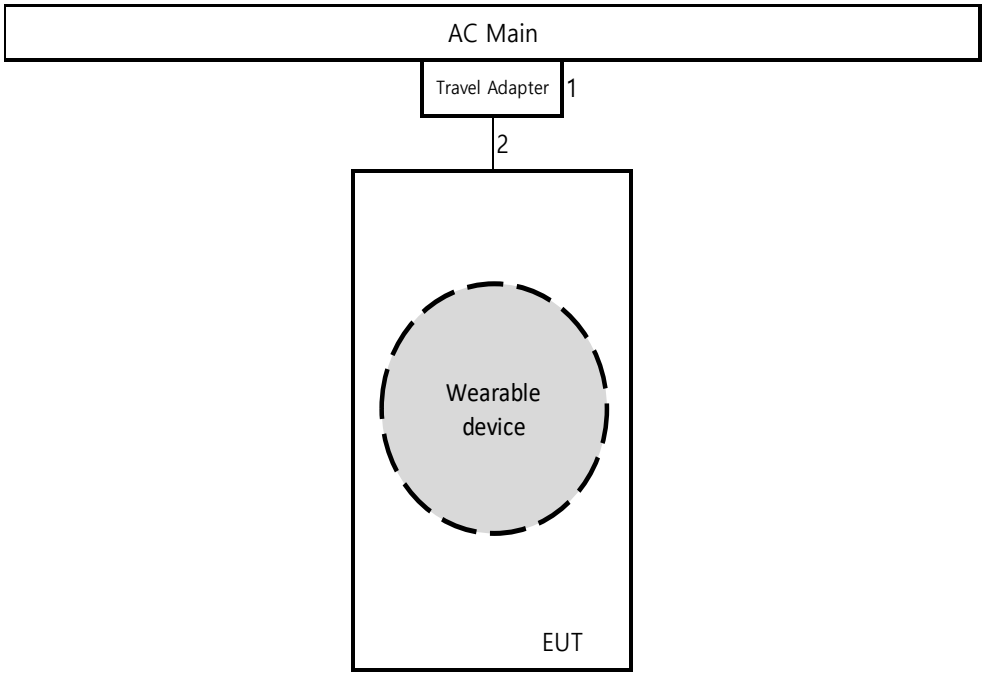
- Test Case1 and 2 : Charging Phone



- Test Case 3 and 4 : Charging Phone(Cross position)



- Test Case 5 and 6 : Charging Wearable device



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**	**Next Cal. Date**	
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845(Note)	08-04-20	08-13-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749(Note)	08-04-20	08-13-22
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-05-20	08-03-21
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-05-20	08-03-21
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-20	08-03-21
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-20	08-03-21
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-05-20	08-03-21
Spectrum Analyzer, 7 GHz	Agilent / HP	N9010A	MY54200580	08-07-20	08-05-21
LISN	R&S	ENV-216	101837	08-09-20	08-06-21
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-02-21	
UL Software					
Description	**Manufacturer**	**Model**	**Version**		
Radiated software	UL	UL EMC	Ver 9.5		
AC Line Conducted software	UL	UL EMC	Ver 9.5		

Note. The above antenna was not used for testing from August 4th to August 13th.

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 148 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.

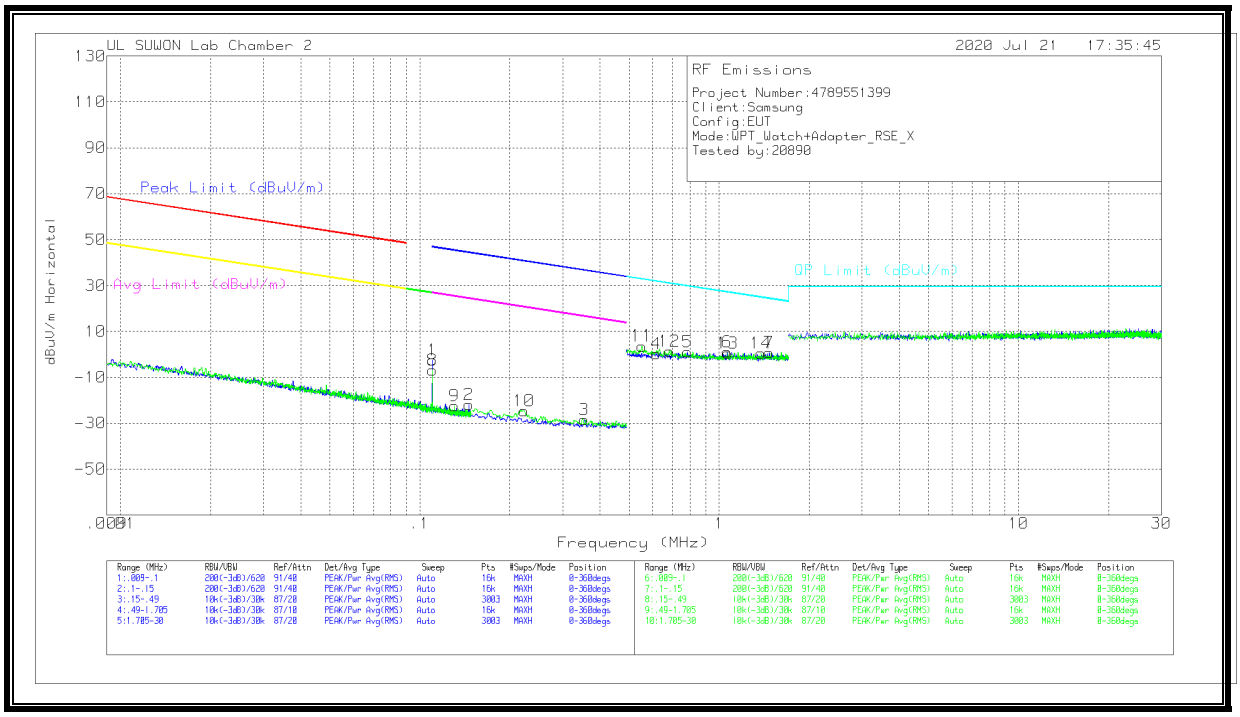
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100	3
88 to 216	150	3
216 to 960	200	3
Above 960 MHz	500	3
Note: The lower limit shall apply at the transition frequency.		

RESULTS

The EUT belongs to Test Case 3.

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 6)



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	.11021	57.69	Pk	19.8	.1	-80	-2.41	46.78	-49.19	26.78	-29.19	0-360
2	.14576	38.17	Pk	19.8	.1	-80	-21.93	44.35	-66.28	24.35	-46.28	0-360
3	.35402	31.69	Pk	19.7	.1	-80	-28.51	36.63	-65.14	16.63	-45.14	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)
4	.61734	20.52	Pk	19.7	.1	-40	.32	31.8	-31.48	0-360
5	.7837	21	Pk	19.8	.2	-40	1	29.73	-28.73	0-360
6	1.06369	20.97	Pk	19.8	.2	-40	.97	27.09	-26.12	0-360
7	1.46633	20.81	Pk	19.8	.2	-40	.81	24.31	-23.5	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	.11026	53.15	Pk	19.8	.1	-80	-6.95	46.78	-53.73	26.78	-33.73	0-360
9	.13057	37.71	Pk	19.8	.1	-80	-22.39	45.31	-67.7	25.31	-47.7	0-360
10	.22266	35.69	Pk	19.7	.1	-80	-24.51	40.66	-65.17	20.66	-45.17	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)
11	.55183	23.88	Pk	19.7	.1	-40	3.68	32.77	-29.09	0-360
12	.68144	21.65	Pk	19.7	.1	-40	1.45	30.94	-29.49	0-360
13	1.06855	20.52	Pk	19.8	.2	-40	.52	27.05	-26.53	0-360
14	1.37848	20.52	Pk	19.8	.2	-40	.52	24.84	-24.32	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.

7.1. 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)

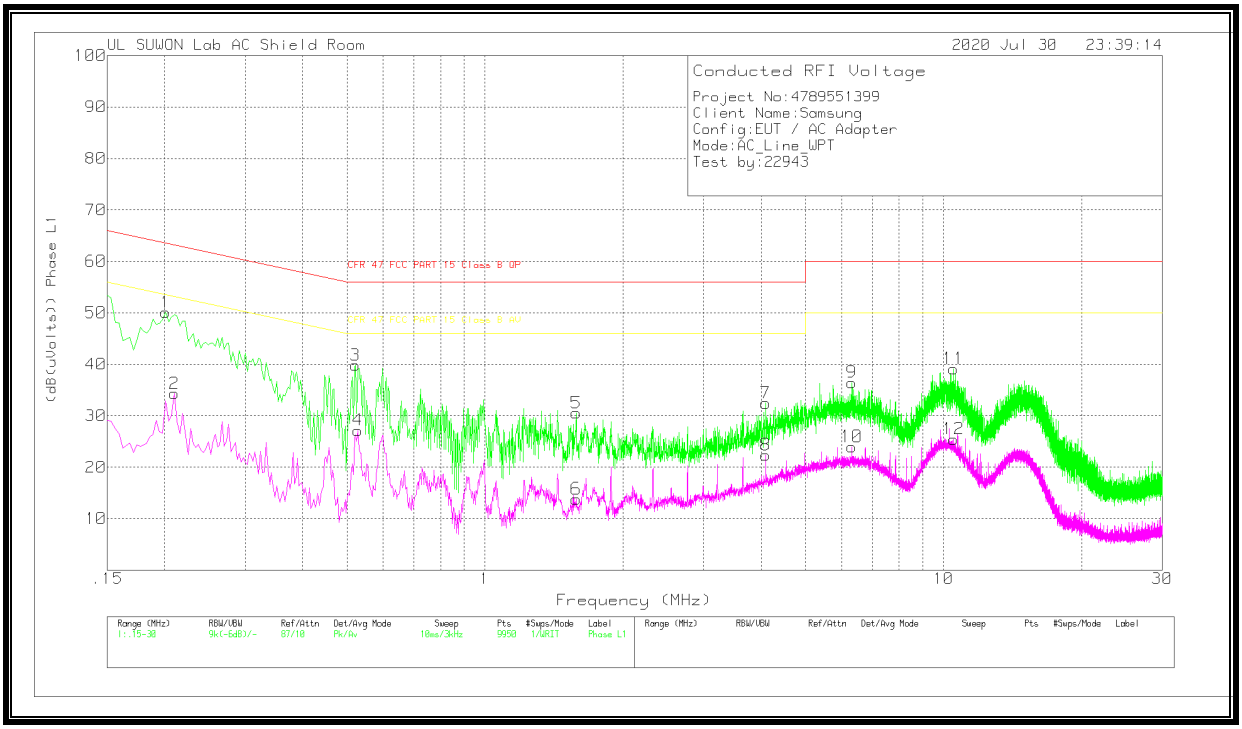
Frequency range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50
*Decreases with the logarithm of the frequency.		

RESULTS

The EUT belongs to Test Case 3 and 7.

6 WORST EMISSIONS(Power sharing mode Test Case 6)

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	.201	39.99	Pk	9.9	.2	50.09	63.57	-13.48	-	-
2	.21	24.23	Av	9.9	.2	34.33	-	-	53.21	-18.88
3	.522	29.71	Pk	9.9	.2	39.81	56	-16.19	-	-
4	.528	17.08	Av	9.9	.2	27.18	-	-	46	-18.82
5	1.581	20.41	Pk	9.8	.3	30.51	56	-25.49	-	-
6	1.581	3.71	Av	9.8	.3	13.81	-	-	46	-32.19
7	4.095	22.35	Pk	9.8	.3	32.45	56	-23.55	-	-
8	4.095	12.26	Av	9.8	.3	22.36	-	-	46	-23.64
9	6.306	26.36	Pk	9.8	.3	36.46	60	-23.54	-	-
10	6.306	13.88	Av	9.8	.3	23.98	-	-	50	-26.02
11	10.512	28.73	Pk	10	.4	39.13	60	-20.87	-	-
12	10.512	15.06	Av	10	.4	25.46	-	-	50	-24.54

Pk - Peak detector
Av - Average detection

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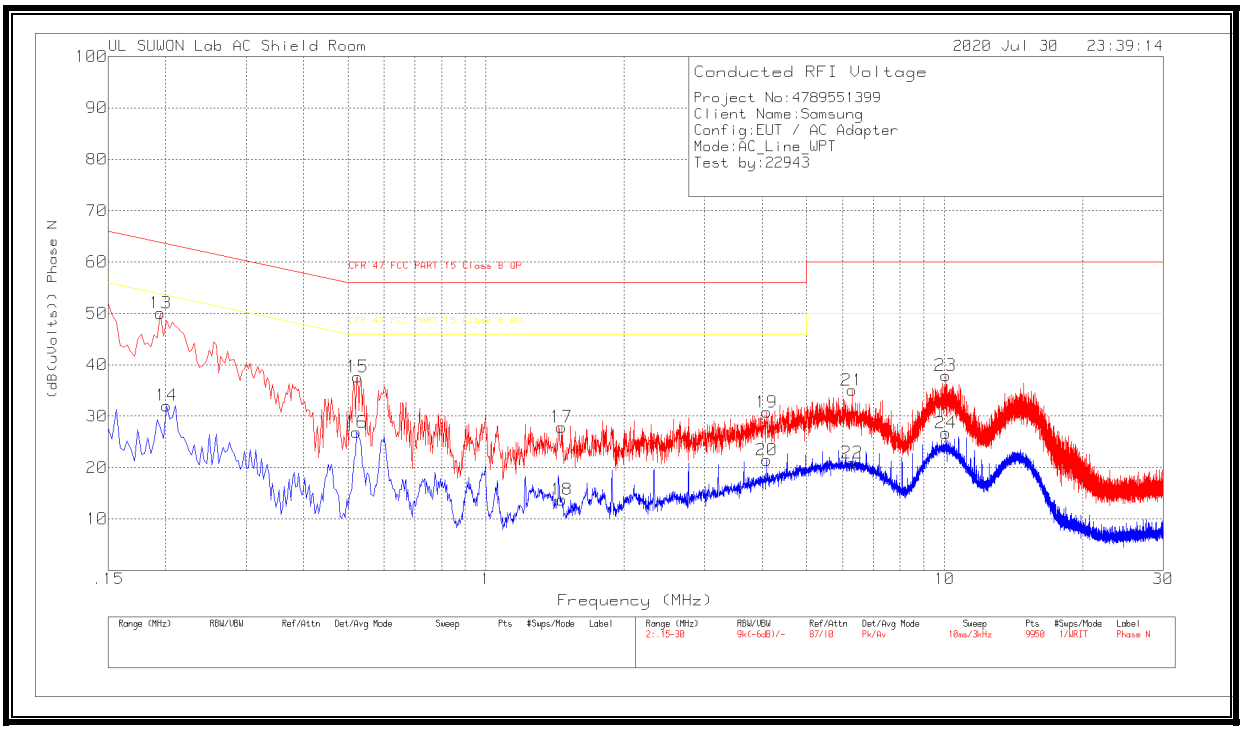
Line-L2 .15 - 30MHz



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	.195	39.95	Pk	9.9	.2	50.05	63.82	-13.77	-	-
14	.201	21.97	Av	9.9	.2	32.07	-	-	53.57	-21.5
15	.525	27.55	Pk	9.9	.2	37.65	56	-18.35	-	-
16	.522	16.78	Av	9.9	.2	26.88	-	-	46	-19.12
17	1.461	17.78	Pk	9.8	.3	27.88	56	-28.12	-	-
18	1.464	3.64	Av	9.8	.3	13.74	-	-	46	-32.26
19	4.092	20.66	Pk	9.8	.3	30.76	56	-25.24	-	-
20	4.095	11.36	Av	9.8	.3	21.46	-	-	46	-24.54
21	6.285	24.95	Pk	9.8	.3	35.05	60	-24.95	-	-
22	6.288	10.8	Av	9.8	.3	20.9	-	-	50	-29.1
23	10.056	27.51	Pk	10	.4	37.91	60	-22.09	-	-
24	10.071	16.31	Av	10	.4	26.71	-	-	50	-23.29

Pk - Peak detector
Av - Average detection

END OF TEST REPORT

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