



FCC 47 CFR PART 15 SUBPART C

WPT

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, ANT+, NFC and WPT

MODEL NUMBER : SM-G973F/DS, SM-G973F, SM-G973X

FCC ID: A3LSMG973F

REPORT NUMBER: 4788725460-E10V1

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Prepared for
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ACCREDITED*

Testing
Laboratory

TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	12/20/18	Initial issue	Sangyun Kim
V2	12/24/18	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, ANT+, NFC and WPT

MODEL NUMBER: SM-G973F/DS, SM-G973F, SM-G973X

SERIAL NUMBER: R38KA0BE5CF

DATE TESTED: NOV 29, 2018 – NOV 30, 2018

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
UL Korea, Ltd. By:

Tested By:



Changyoung Choi
Suwon Lab Engineer
UL Korea, Ltd.



Sangyun Kim
Suwon Lab Engineer
UL Korea, Ltd.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, and FCC CFR 47 Part 15.

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 <http://www.iasonline.org/PDF/TL/TL-637.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:

$$\begin{aligned}\text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m}\end{aligned}$$

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	2.32 dB
Radiated Disturbance, Below 1GHz	3.86 dB
Radiated Disturbance, Above 1 GHz	5.97 dB

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

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, ANT+, NFC and WPT.

5.2. MAXIMUM OUTPUT POWER

Fundamental Frequency (KHz)	Mode	E field (300m distance) FCC (dBuV/m)
110-148kHz	Charging	-12.83

5.3. PRELIMINARY TEST CONFIGURATIONS

The EUT was user operation location fixed locaton X; therefore, the EUT is user operation location fix X all final radiated testing was performed with the EUT in X orientation with data transfer.

5.4. WORST-CASE CONFIGURATION AND MODE

Mode	Description
Power Sharing Case 1	Charging from Phone(Across on the EUT) to EUT
Power Sharing Case 2	Charging from Phone to EUT(TA Charging from EUT)
Power Sharing Case 3	Charging from Phone(Across on the EUT) to EUT
Power Sharing Case 4	Charging from Phone(Across on the EUT) to EUT(TA Charging from EUT)
Power Sharing Case 5	Charging from Wearable device to EUT
Power Sharing Case 6	Charging from Wearable device to EUT(TA Charging from EUT)

[Remark]

The EUT is in case of charge turn on power sharing mode on, it is should be battery level is over 30% to support power sharing mode. Confirmed that full charging and 30% of the data was the same. Thus when EUT operate with standalone, EUT was tested in full charging condition.

Each charging mode with client device(1-20%, 40-60% and 90-100% of battery was tested. As worst condition, charging mode with client device 1-20% is reported.

Phone to phone mode charging power is 9W and Phone to watch mode charging power is 3.75W. Thus we include phone to phone test case data.

The EUT test result worst case is Power Sharing Case 4.

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	R37KB5B03T1SE3	DoC
USB Data Cable	Samsung	EP-DG970BBE		-
Mobile Phone	Samsung	SM-G965U1	R38JC0CWWSX	A3LSMG965
Wearable Device	Samsung	SM-R805U	R3AK4005MCY	A3LSMR805U

I/O CABLES

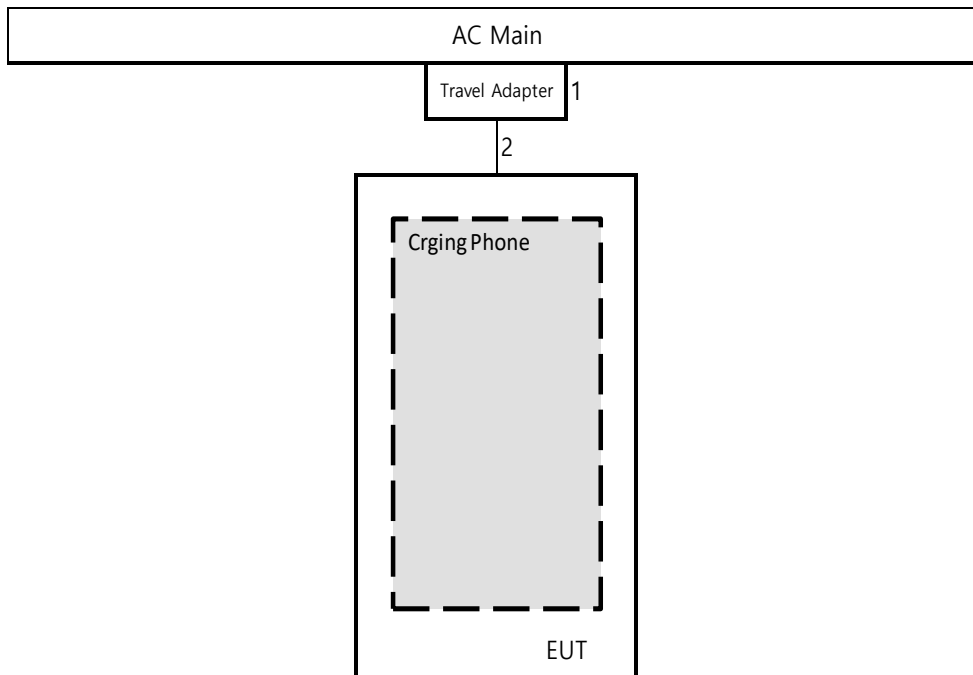
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length(m)	Remarks
1	AC Power	1	Power	Unshielded	1.5m	From Travel Adapter to AC Main
2	USB	1	USB	Shielded	1.2m	From EUT to Travel Adapter

TEST SETUP

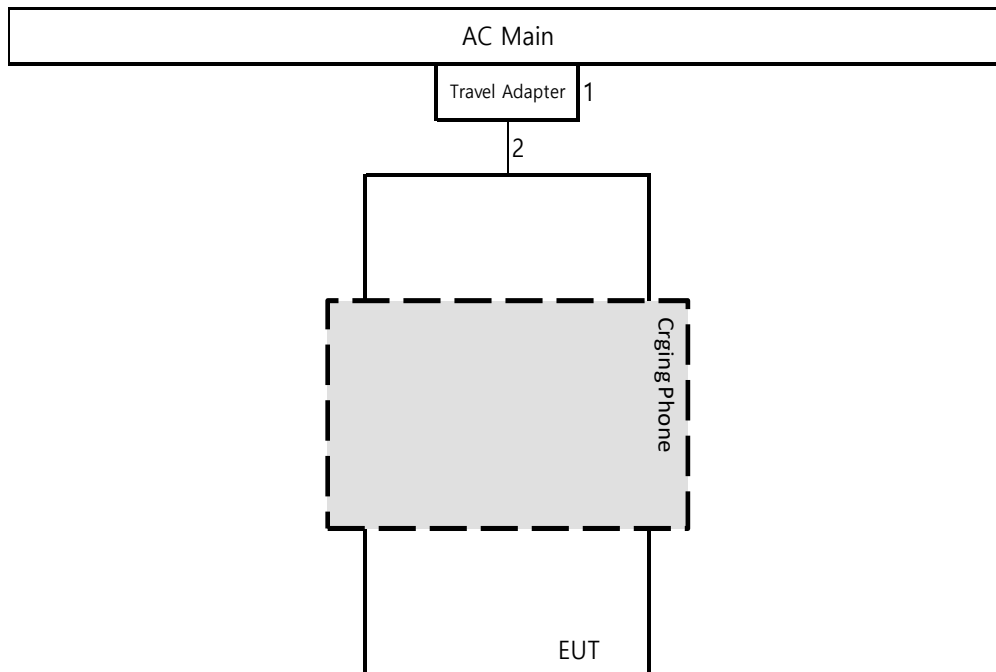
The EUT is installed in a typical configuration. Charging from EUT.

TEST SETUP DIAGRAM

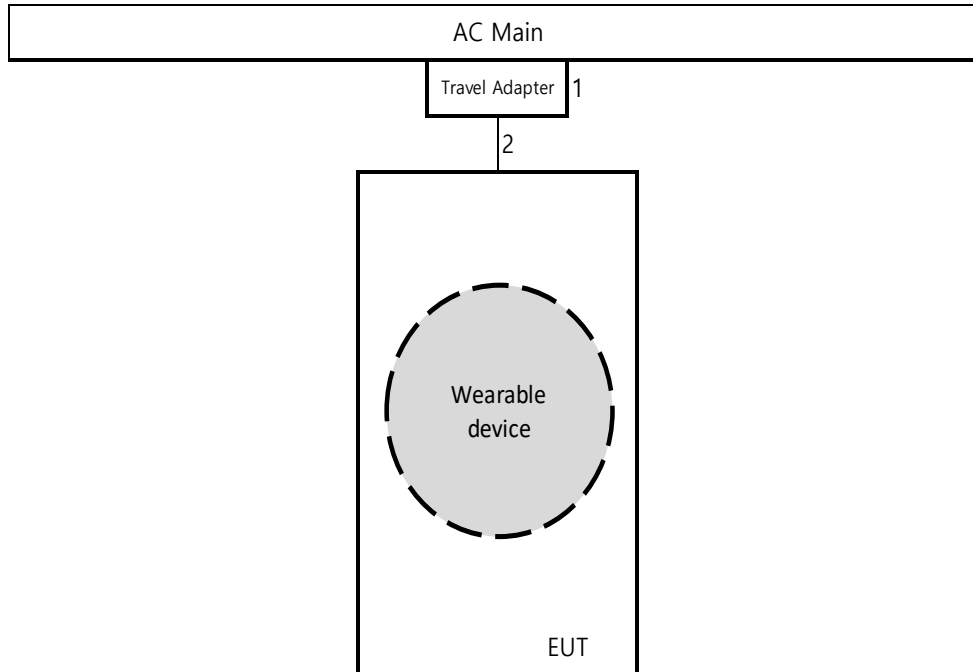
- Charging Phone



- Charging Phone(Across on the EUT)



- 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	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, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-26-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-07-19
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-19
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-06-19
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-06-19
Spectrum Analyzer, 7 GHz	Agilent / HP	N9010A	MY54200580	08-07-19
LISN	R&S	ENV-216	101837	08-09-19
LISN	R&S	ENV-216	101837	08-09-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-07-19
UL Software				
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 148 KHz therefore the frequency range was investigated from 30 MHz to 1 GHz.

LIMIT

FCC §15.209 (a)

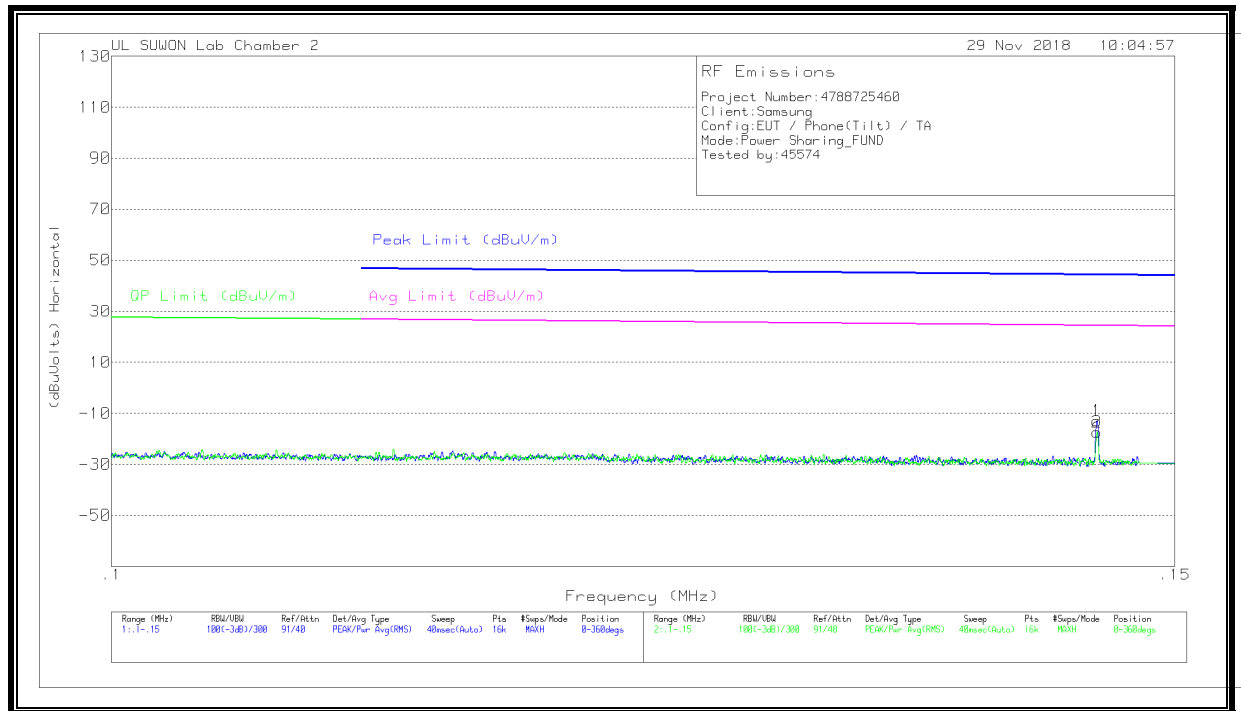
ICES-001 Section 6.2, IC RSS-216 6.2.2, and IC RSS-GEN Sections 8.9 and 8.10.

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 Power Sharing Case 4.

RADIATED EMISSIONS FUNDAMENTAL



FUNDAMENTAL DATA

Trace Markers

[Face-On]

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 300m	Corrected Reading (dBuV)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	145.62	47.37	Pk	19.7	.1	-80	-12.83	44.36	-57.19	24.36	-37.19	0-360

[Face-Off]

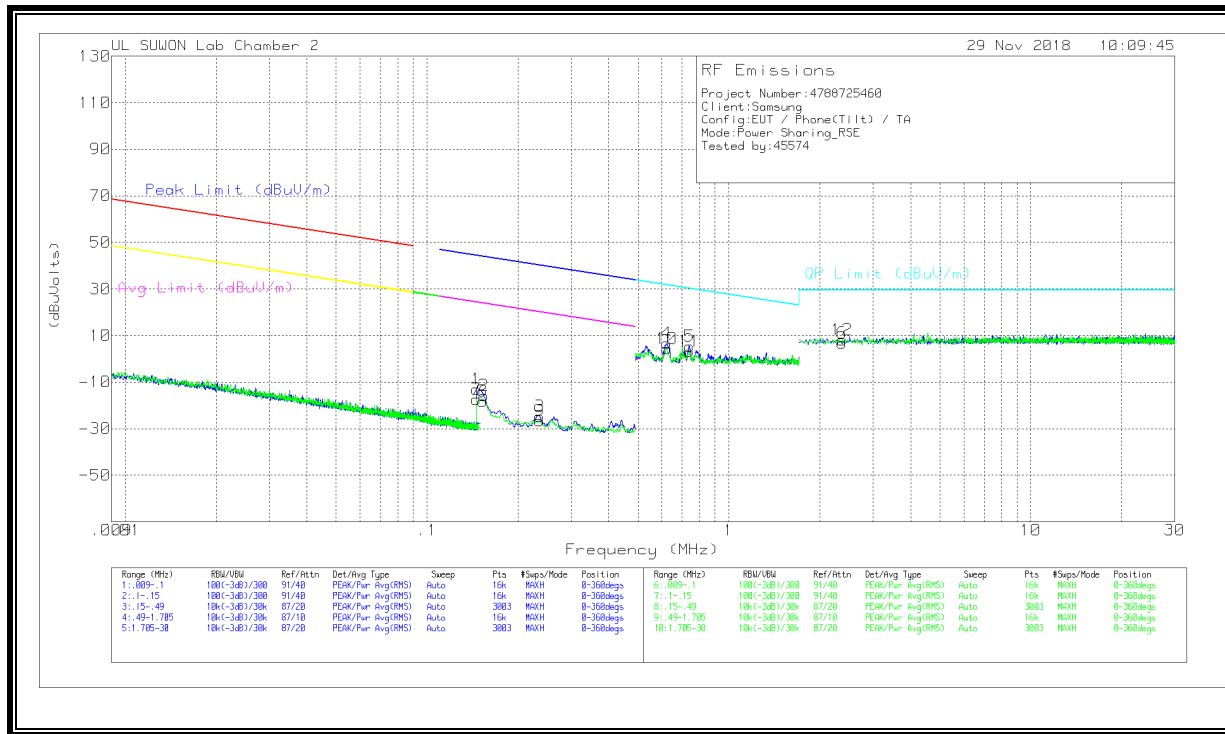
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 300m	Corrected Reading (dBuV)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
2	145.62	42.93	Pk	19.7	.1	-80	-17.27	44.36	-61.63	24.36	-41.63	0-360

Pk - Peak detector

[Remark]

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 300 m open area 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



TEST DATA

Trace Markers

[Face-On]

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.14563	47.26	Pk	19.7	.1	-80	-12.94	44.36	-57.3	24.36	-37.3	0-360
2	.15407	44.67	Pk	19.6	.1	-80	-15.63	43.87	-59.5	23.87	-39.5	0-360
3	.23588	35.7	Pk	19.6	.1	-80	-24.6	40.16	-64.76	20.16	-44.76	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
4	.62232	26.92	Pk	19.7	.1	-40	6.72	31.73	-25.01	0-360
5	.73882	25.56	Pk	19.7	.1	-40	5.36	30.24	-24.88	0-360
6	2.36475	26.88	Pk	19.8	.2	-40	6.88	29.5	-22.62	0-360

[Face-Off]

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
7	.14563	42.8	Pk	19.7	.1	-80	-17.4	44.36	-61.76	24.36	-41.76	0-360
8	.15316	42.09	Pk	19.6	.1	-80	-18.21	43.92	-62.13	23.92	-42.13	0-360
9	.23543	33.65	Pk	19.6	.1	-80	-26.65	40.18	-66.83	20.18	-46.83	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
10	.62205	24.61	Pk	19.7	.1	-40	4.41	31.73	-27.32	0-360
11	.73882	23.34	Pk	19.7	.1	-40	3.14	30.24	-27.1	0-360
12	2.36475	28.16	Pk	19.8	.2	-40	8.16	29.5	-21.34	0-360

Pk - Peak detector

[Remark]

Marker 1 and 7 is Fundamental Frequency.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 300 m open area 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.

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)

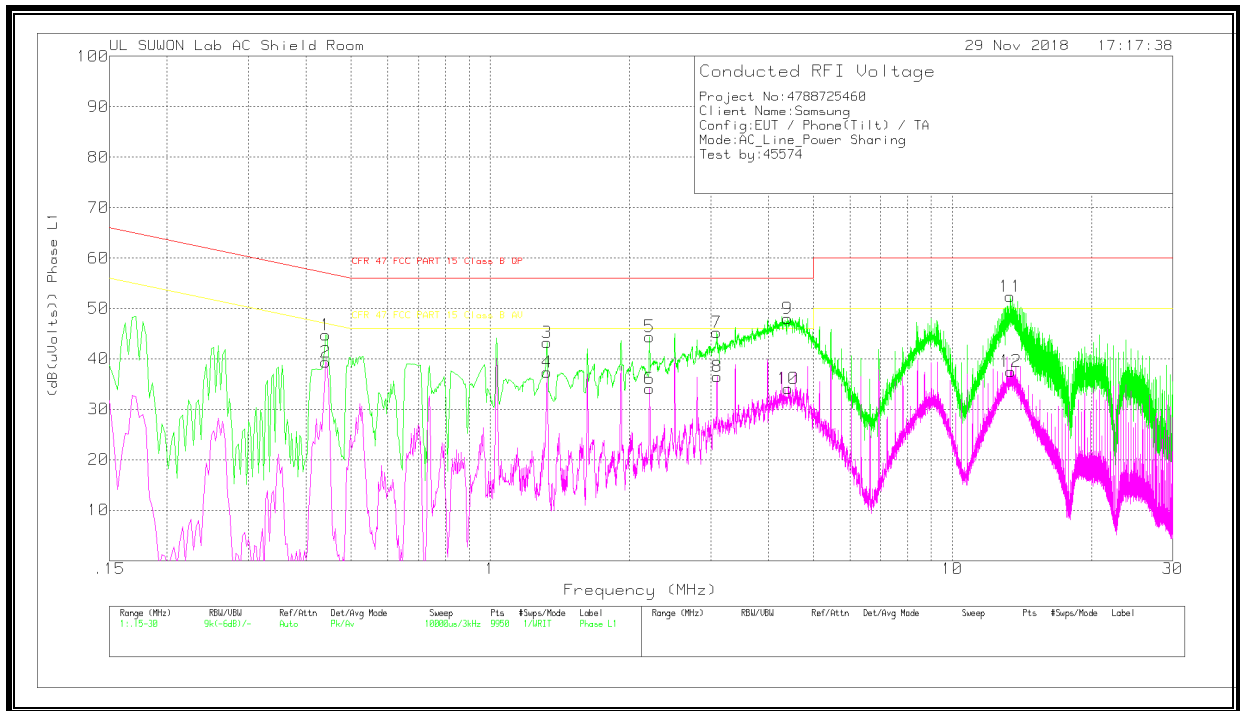
Frequency range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50
*Decreases with the logarithm of the frequency.		

RESULTS

The EUT belongs to Power Sharing Case 4.

6 WORST EMISSIONS

Line-L1 .15 - 30MHz



LINE 1 RESULTS

Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_10183 6_With ex-cord_L1	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	.441	34.63	Pk	9.9	.2	44.73	57.04	-12.31	-	-
2	.441	29.28	Av	9.9	.2	39.38	-	-	47.04	-7.66
3	1.326	33.15	Pk	9.8	.3	43.25	56	-12.75	-	-
4	1.326	27.28	Av	9.8	.3	37.38	-	-	46	-8.62
5	2.211	34.22	Pk	9.9	.3	44.42	56	-11.58	-	-
6	2.214	23.85	Av	9.9	.3	34.05	-	-	46	-11.95
7	3.093	34.98	Pk	10	.3	45.28	56	-10.72	-	-
8	3.099	26.23	Av	10	.3	36.53	-	-	46	-9.47
9	4.401	37.85	Pk	9.8	.3	47.95	56	-8.05	-	-
10	4.413	24	Av	9.8	.3	34.1	-	-	46	-11.9
11	13.359	41.84	Pk	10.1	.4	52.34	60	-7.66	-	-
12	13.389	27.04	Av	10.1	.4	37.54	-	-	50	-12.46

Pk - Peak detector

Av - Average detection

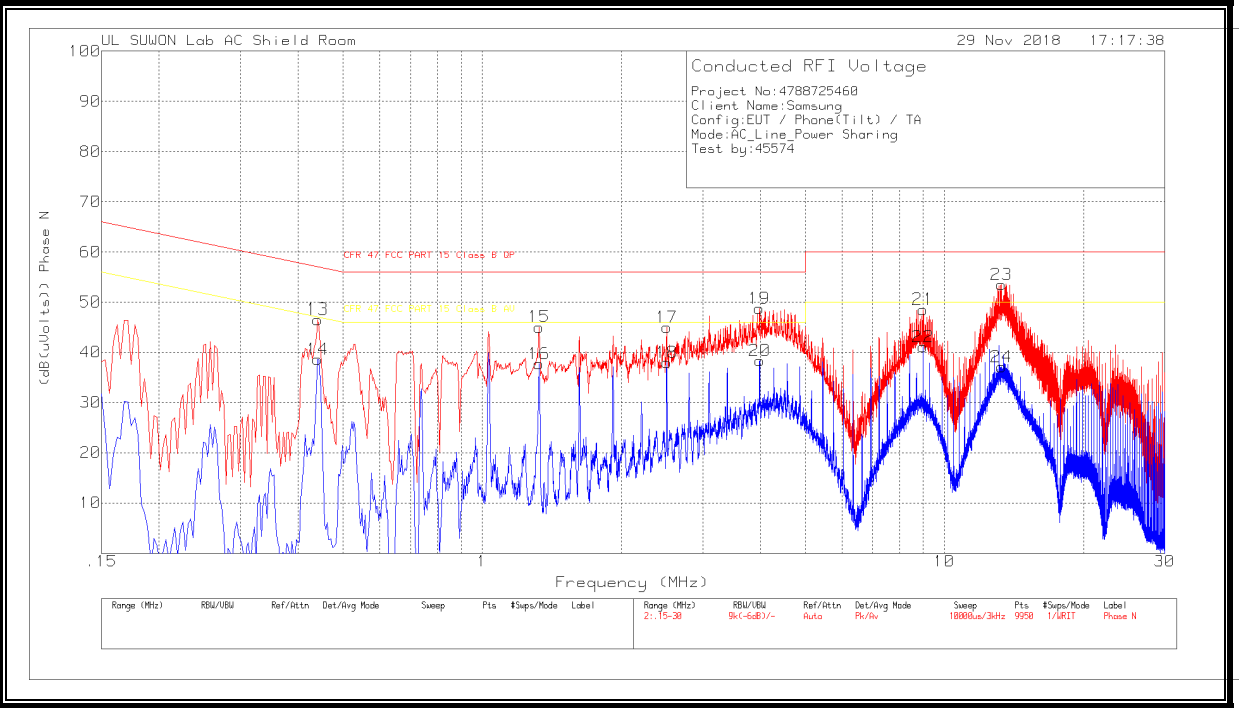
Quasi-Peak Emissions

Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_101836 _With ex-cord_L1	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)
4.40115	34.12	Qp	9.8	.3	44.22	56	-11.78	-	-
13.3598	34.73	Qp	10.1	.4	45.23	60	-14.77	-	-

Qp - Quasi-Peak detector

Line-L2 .15 - 30MHz



LINE 2 RESULTS

Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_10183 6_With ex- cord_N	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	.441	36.95	Pk	9.4	.2	46.55	57.04	-10.49	-	-
14	.441	28.97	Av	9.4	.2	38.57	-	-	47.04	-8.47
15	1.329	34.95	Pk	9.8	.3	45.05	56	-10.95	-	-
16	1.326	27.61	Av	9.8	.3	37.71	-	-	46	-8.29
17	2.508	35.01	Pk	9.7	.3	45.01	56	-10.99	-	-
18	2.508	28.02	Av	9.7	.3	38.02	-	-	46	-7.98
19	3.981	38.68	Pk	9.8	.3	48.78	56	-7.22	-	-
20	3.984	28.21	Av	9.8	.3	38.31	-	-	46	-7.69
21	8.997	38.15	Pk	10	.4	48.55	60	-11.45	-	-
22	8.997	30.74	Av	10	.4	41.14	-	-	50	-8.86
23	13.284	42.95	Pk	10.2	.4	53.55	60	-6.45	-	-
24	13.278	26.54	Av	10.2	.4	37.14	-	-	50	-12.86

Pk - Peak detector

Av - Average detection

Quasi-Peak Emissions

Range 2: Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_101836 _With ex- cord_N	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)
3.98175	34.9	Qp	9.8	.3	45	56	-11	-	-
13.2848	35.4	Qp	10.2	.4	46	60	-14	-	-

Qp - Quasi-Peak detector