



# CERTIFICATION TEST REPORT

**Report Number.** : 4790160849-E7V1

**Applicant** : SAMSUNG ELECTRONICS CO., LTD.  
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,  
GYEONGGI-DO, 16677, KOREA

**Model** : SM-A536E/DS, SM-A536E

**FCC ID** : A3LSMA536E

**EUT Description** : GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac and  
NFC

**Test Standard(s)** : FCC 47 CFR PART 15 SUBPART C

**Date Of Issue:**

2021-12-29

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ACCREDITED

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**TL-637**

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2021-12-29	Initial issue	Hyunsik Yun

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>4</b>
<b>2. TEST METHODOLOGY .....</b>	<b>5</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>5</b>
<b>4. CALIBRATION AND UNCERTAINTY .....</b>	<b>6</b>
4.1. <i>MEASURING INSTRUMENT CALIBRATION.....</i>	6
4.2. <i>SAMPLE CALCULATION.....</i>	6
4.3. <i>MEASUREMENT UNCERTAINTY .....</i>	6
4.4. <i>DECISION RULE .....</i>	6
<b>5. EQUIPMENT UNDER TEST.....</b>	<b>7</b>
5.1. <i>DESCRIPTION OF EUT.....</i>	7
5.2. <i>MAXIMUM E-FIELD STRENGTH.....</i>	7
5.3. <i>WORST-CASE CONFIGURATION AND MODE .....</i>	7
5.4. <i>DESCRIPTION OF TEST SETUP .....</i>	8
<b>6. TEST AND MEASUREMENT EQUIPMENT .....</b>	<b>9</b>
<b>7. 20dB BANDWIDTH .....</b>	<b>10</b>
<b>8. RADIATED EMISSION TEST RESULTS.....</b>	<b>11</b>
8.1. <i>LIMITS AND PROCEDURE .....</i>	11
8.1.1. <i>FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz) .....</i>	13
8.1.2. <i>SPURIOUS EMISSION 0.009 TO 30 MHz.....</i>	14
8.1.3. <i>TX SPURIOUS EMISSION 30 TO 1000 MHz .....</i>	15
8.1.4. <i>FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz) [EUT with passive TAG mode] .....</i>	16
8.1.5. <i>SPURIOUS EMISSION 0.09 TO 30 MHz [EUT with passive TAG mode].....</i>	17
8.1.6. <i>TX SPURIOUS EMISSION 30 TO 1000 MHz [EUT with passive TAG mode] .....</i>	18
<b>9. AC MAINS LINE CONDUCTED EMISSIONS.....</b>	<b>19</b>
<b>10. FREQUENCY STABILITY .....</b>	<b>22</b>

# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.  
**EUT DESCRIPTION:** GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac and NFC  
**MODEL NUMBER:** SM-A536E/DS, SM-A536E  
**SERIAL NUMBER:** R3CRA0RNSVK (RADIATED);  
**DATE TESTED:** 2021-12-13 ~ 2021-12-29

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

UL Korea, Ltd. 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 Korea, Ltd. 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 Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. 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 IAS, any agency of the Federal Government, or any agency of any government.

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UL Korea, Ltd.

Tested By:



Dexter(Hyunsik) Yun  
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. 414788 D01 Radiated Test Site v01r01

## 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	
<input checked="" type="checkbox"/>	Chamber 1
<input checked="" type="checkbox"/>	Chamber 2
<input type="checkbox"/>	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:

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

### 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	3.02 dB
Radiated Disturbance, 9 kHz to 30 MHz	1.72 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.05 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 2, Clause 4.4.3 in IEC Guide 115:2007.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac and NFC. This test report addresses the DXX (NFC) operational mode.

This report covers the Samsung models SM-A536E/DS and SM-A536E. These models are identical in hardware except SM-A536E has single SIM tray. With some pre-scan, model SM-A536E/DS was set for final test.

### 5.2. MAXIMUM E-FIELD STRENGTH

The testing was performed at 3 meter. The transmitter maximum E-field at 30m distance is 13.60 dBuV/m which convert from 3 meter data.

### 5.3. WORST-CASE CONFIGURATION AND MODE

The NFC function was tested at its' fundamental and only operational frequency of 13.56 MHz.

The NFC with tag mode's fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that the Y orientation was the worst-case orientation; therefore all final radiated testing was performed with the EUT in the Y orientation while generating continuous emissions.

The NFC without tag mode's fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that the Z orientation was the worst-case orientation; therefore all final radiated testing was performed with the EUT in the Z orientation while generating continuous emissions.

The fundamental level of the EUT was investigated each type and bitrate. All test was performed worst case condition(type A and bit rate 106 kbps).

Radiated(fundamental level and spurious emissions) tests were performed both without reading a passive tag condition[test mode] and with reading a passive tag condition.

## 5.4. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37N3MAH988DK3	N/A
Data Cable	SAMSUNG	EP-DN980	N/A	N/A

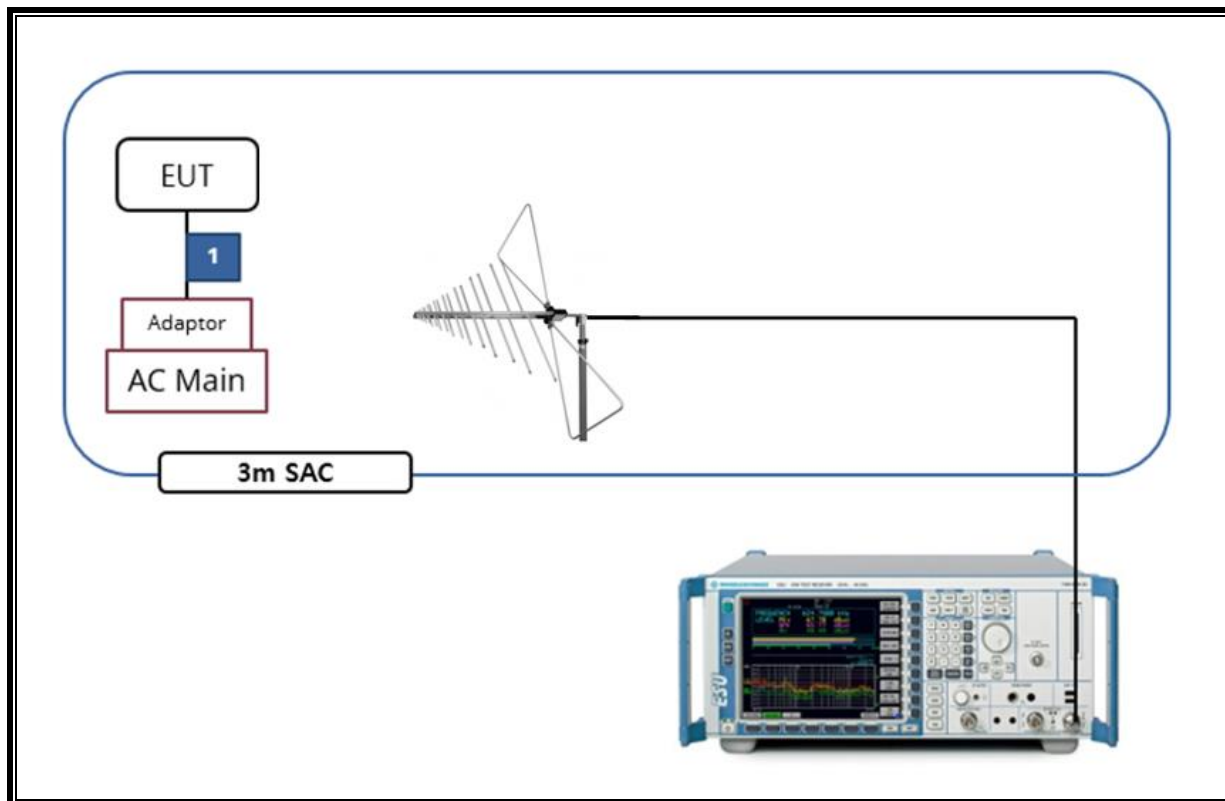
### I/O CABLE

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	1.0 m	N/A

The EUT is a stand-alone device configured and tested in a worst-case setup.

Note: Worst case is using worst case orientation with AC charger attached to the EUT with NFC signal continuously transmitting.

### SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)





## 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	845	2022-08-13
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2022-08-13
Preamplifier, 1000 MHz	Sonoma	310N	341282	2022-08-02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2022-08-02
Spectrum Analyzer, 7 GHz	Agilent / HP	N9010A	MY542200580	2022-08-02
EMI Test Receive, 3 GHz	R&S	ESR3	101832	2022-08-02
DC Power Supply	Agilent / HP	E3640A	MY54226395	2022-08-02
Temperature Chamber	ESPEC	SH-642	93001109	2022-08-02
LISN	R&S	ENV216	101837	2022-08-05
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2023-10-06
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. 20dB BANDWIDTH

### LIMITS

§15.215

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated

§15.225

Operation within the band 13.110 – 14.010MHz

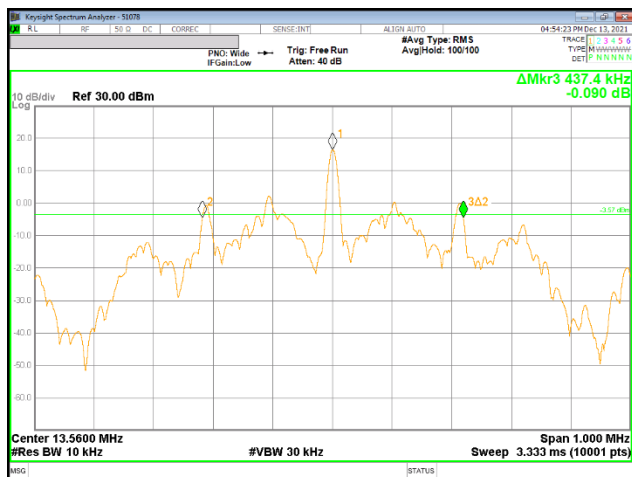
### TEST PROCEDURE

The spectrum analyzer connected receive antenna and the EUT placed on near the receive antenna. The RBW is set to 10kHz. The VBW is set to 3 times the RBW. The sweep time is coupled.

### RESULTS

Frequency [MHz]	20 dB Bandwidth [kHz]
13.56	437.4

### 20dB Bandwidth Plot



## 8. RADIATED EMISSION TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMIT

§15.225

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	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 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the filed strength from uV/m to dBuV/m is:

Limit (dBuV/m) = 20 log limit (uV/m)

In addition:

§15.209 (d) The emission limits shown the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

### **TEST PROCEDURE**

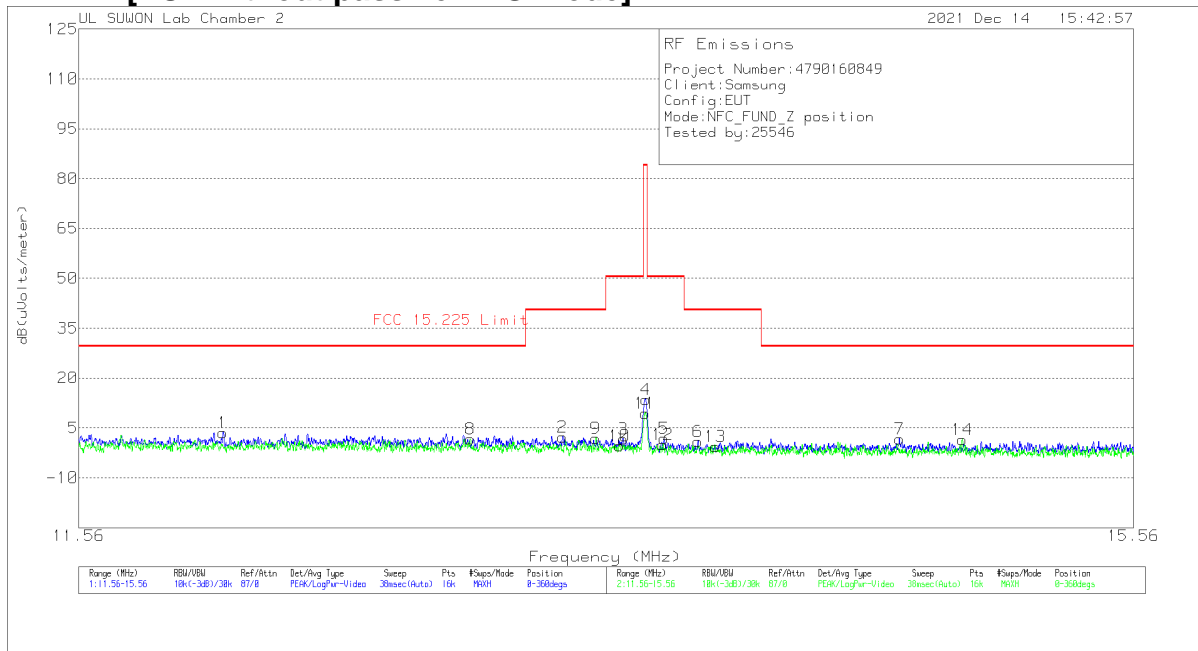
ANSI C63.10-2013

The EUT is an intentional radiator that incorporates a digital device. The highest fundamental frequency generated or used in the device is 13.56 MHz. The frequency range was investigated from 0.15 MHz to the 10<sup>th</sup> harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater (1000MHz)

### **RESULTS**

No non-compliance noted:

### 8.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz) [EUT without passive TAG mode]



#### Trace Markers

##### Face On

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
1	12.039	23.12	Pk	20	-40	.5	3.62	29.54	-25.92	0-360
2	13.248	21.75	Pk	20	-40	.5	2.25	40.51	-38.26	0-360
3	13.47675	21.09	Pk	20	-40	.5	1.59	50.5	-48.91	0-360
**4	13.56275	32.97	Pk	20	-40	.5	13.47	84	-70.53	0-360
5	13.6325	21.26	Pk	20	-40	.6	1.86	50.5	-48.64	0-360
6	13.763	20.35	Pk	20	-40	.6	.95	40.51	-39.56	0-360
7	14.568	20.99	Pk	20	-40	.6	1.59	29.54	-27.95	0-360

##### Face Off

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
8	12.908	21.23	Pk	20	-40	.5	1.73	29.54	-27.81	0-360
9	13.373	21.36	Pk	20	-40	.5	1.86	40.51	-38.65	0-360
10	13.4635	19.09	Pk	20	-40	.5	-4.1	50.5	-50.91	0-360
**11	13.55975	28.94	Pk	20	-40	.5	9.44	84	-74.56	0-360
12	13.627	19.35	Pk	20	-40	.6	-0.05	50.5	-50.55	0-360
13	13.83025	18.78	Pk	20	-40	.6	-6.2	40.51	-41.13	0-360
14	14.82825	20.79	Pk	20	-40	.6	1.39	29.54	-28.15	0-360

Pk - Peak detector

\*\*Fundamental

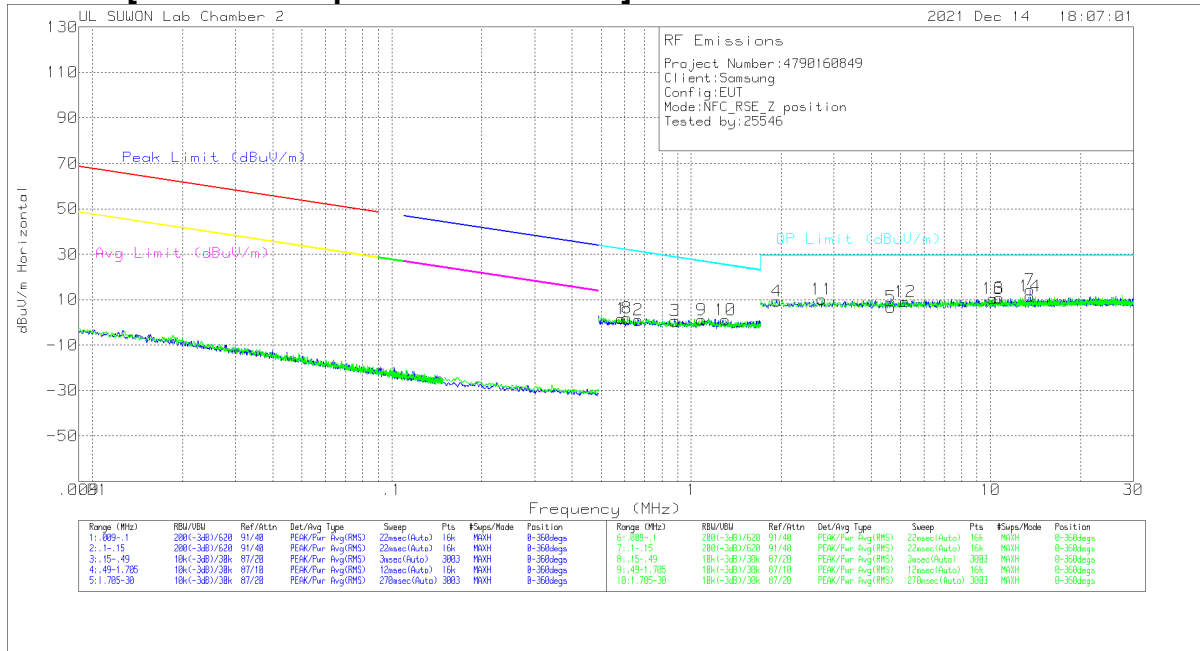
Note 1 : Although these tests were performed other than open filed test site, adequate comparison measurements were confirmed against 30 m open are test site.

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.

Note 2: 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.

### 8.1.2. SPURIOUS EMISSION 0.009 TO 30 MHz

[EUT without passive TAG mode]



#### Trace Markers

Face on

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)
1	.58568	21.73	Pk	19.7	.1	-40	1.53	32.26	-30.73	0-360
2	.66427	21.17	Pk	19.7	.1	-40	.97	31.16	-30.19	0-360
3	.88262	20.7	Pk	19.8	.2	-40	.7	28.7	-28	0-360
4	1.9312	29.49	Pk	19.8	.2	-40	9.49	29.5	-20.01	0-360
5	4.65503	26.66	Pk	19.8	.3	-40	6.76	29.5	-22.74	0-360
6	10.70588	30.3	Pk	20	.5	-40	10.8	29.5	-18.7	0-360
**7	13.56165	33.8	Pk	20	.5	-40	14.3	29.5	-15.2	0-360

Face off

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)
8	.61152	22.18	Pk	19.7	.1	-40	1.98	31.88	-29.9	0-360
9	1.08493	21.19	Pk	19.8	.2	-40	1.19	26.92	-25.73	0-360
10	1.30168	21.14	Pk	19.8	.2	-40	1.14	25.34	-24.2	0-360
11	2.73233	30.03	Pk	19.9	.3	-40	10.23	29.5	-19.27	0-360
12	5.18283	29.05	Pk	19.8	.3	-40	9.15	29.5	-20.35	0-360
13	10.1875	30.09	Pk	20	.5	-40	10.59	29.5	-18.91	0-360
**14	13.56165	31.13	Pk	20	.5	-40	11.63	29.5	-17.87	0-360

Pk - Peak detector

\*\*Fundamental

Note 1: The data for marker number 7 and 14 are the fundamental signal.

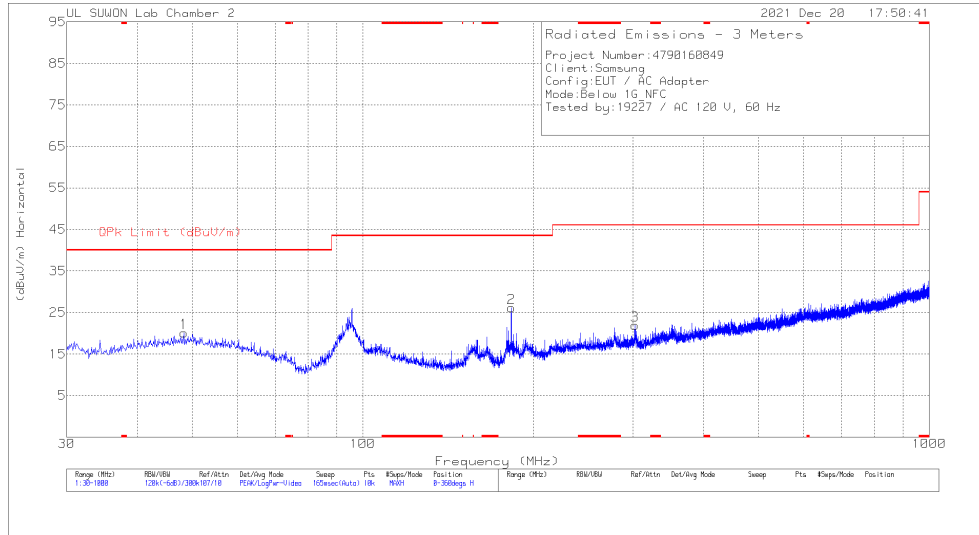
Please refer to section 8.1.1 about the fundamental level.

Frequency range 0.009MHz ~ 0.490MHz, only noise floor level and more than 20dB margin.

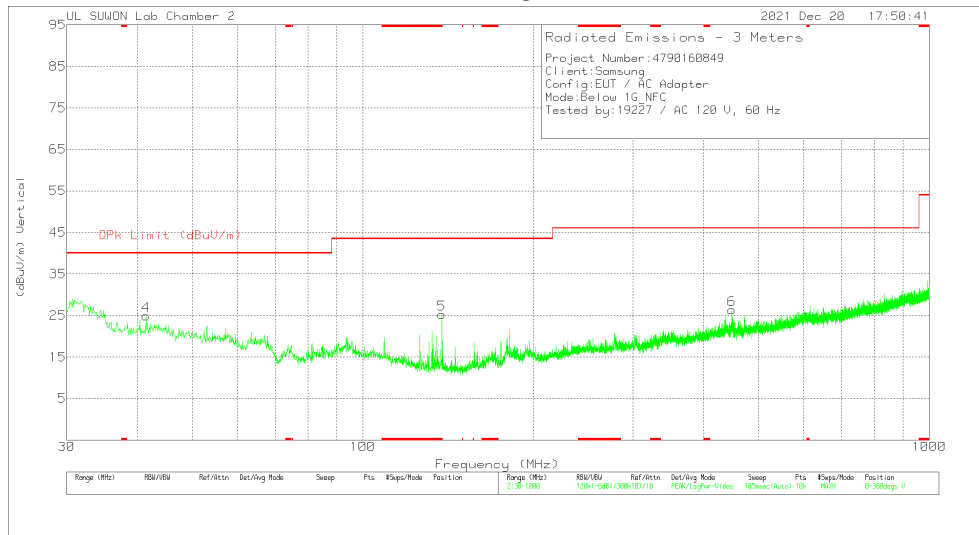
Note 2: Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.

### 8.1.3. TX SPURIOUS EMISSION 30 TO 1000 MHz [EUT without passive TAG mode]

#### HORIZONTAL



#### VERTICAL

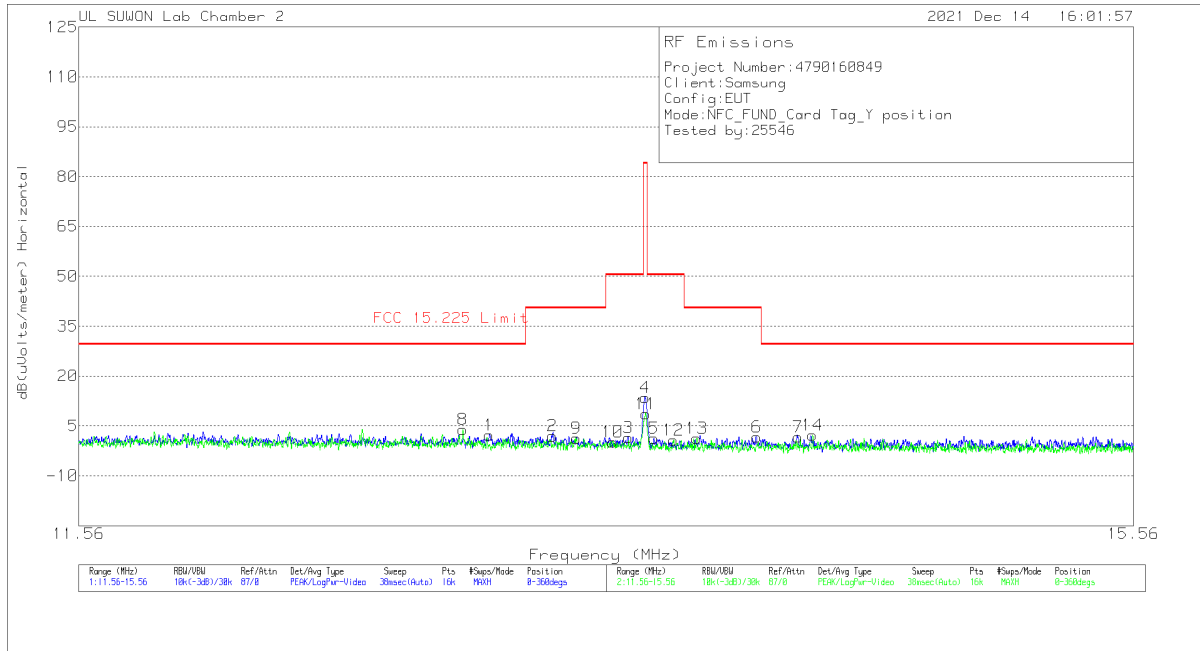


#### Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Below 1G[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	OPK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	48.333	31.94	PK	19.9	-31.7	0	20.14	40	-19.86	0-360	100	H
2	182.872	41.45	PK	15.6	-30.9	0	26.15	43.52	-17.37	0-360	100	H
3	302.57	32.99	PK	19.2	-30.3	0	21.89	46.02	-24.13	0-360	100	H
4	41.446	37.64	PK	19	-31.7	0	24.94	40	-15.06	0-360	100	V
5	* 137.961	42.56	PK	13.8	-31.1	0	25.26	43.52	-18.26	0-360	100	V
6	448.07	34.16	PK	22	-29.8	0	26.36	46.02	-19.66	0-360	100	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK - Peak detector

### 8.1.4. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz) [EUT with passive TAG mode]



#### Trace Markers

##### Face On

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
1	12.977	21.81	Pk	20	-40	.5	2.31	29.54	-27.23	0-360
2	13.2105	21.45	Pk	20	-40	.5	1.95	40.51	-38.56	0-360
3	13.495	20.98	Pk	20	-40	.5	1.48	50.5	-49.02	0-360
4	13.56025	33.1	Pk	20	-40	.5	13.6	84	-70.4	0-360
5	13.59375	20.73	Pk	20	-40	.6	1.33	50.5	-49.17	0-360
6	13.99225	21.13	Pk	20	-40	.6	1.73	40.51	-38.78	0-360
7	14.15725	21.06	Pk	20	-40	.6	1.66	29.54	-27.88	0-360

##### Face Off

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
8	12.88125	23.45	Pk	20	-40	.5	3.95	29.54	-25.59	0-360
9	13.2985	20.87	Pk	20	-40	.5	1.37	40.51	-39.14	0-360
10	13.43675	19.65	Pk	20	-40	.5	.15	50.5	-50.35	0-360
11	13.56325	28.07	Pk	20	-40	.5	8.57	84	-75.43	0-360
12	13.66925	20.05	Pk	20	-40	.6	.65	50.5	-49.85	0-360
13	13.75925	20.64	Pk	20	-40	.6	1.24	40.51	-39.27	0-360
14	14.21575	21.59	Pk	20	-40	.6	2.19	29.54	-27.35	0-360

Pk - Peak detector

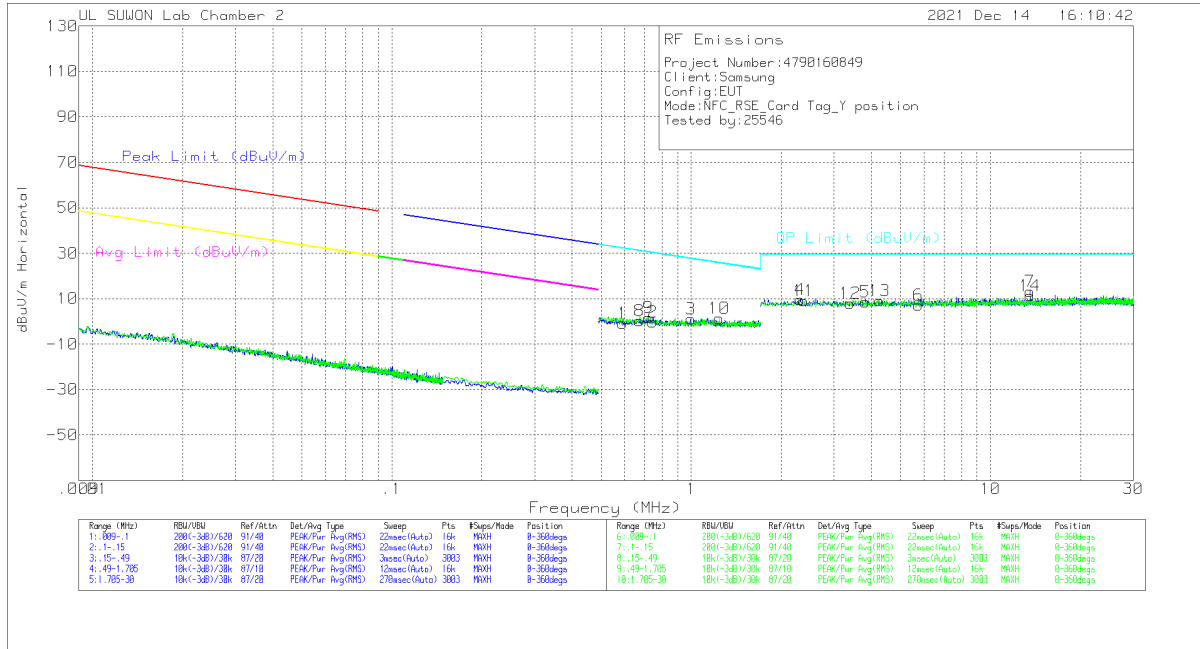
\*\*Fundamental

Note 1: Although these tests were performed other than open filed test site, adequate comparison measurements were confirmed against 30 m open are 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.

Note 2: 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.



### 8.1.5. SPURIOUS EMISSION 0.09 TO 30 MHz [EUT with passive TAG mode]



#### Trace Markers

Face on

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)
1	.58964	19.35	Pk	19.7	.1	-40	-85	32.2	-33.05	0-360
2	.74217	19.82	Pk	19.7	.1	-40	-38	30.2	-30.58	0-360
3	.99722	21.11	Pk	19.8	.2	-40	1.11	27.65	-26.54	0-360
4	2.3082	29.54	Pk	19.9	.2	-40	9.64	29.5	-19.86	0-360
5	3.80678	28.38	Pk	19.9	.3	-40	8.58	29.5	-20.92	0-360
6	5.7389	27.05	Pk	19.8	.4	-40	7.25	29.5	-22.25	0-360
**7	13.57108	32.82	Pk	20	.5	-40	13.32	29.5	-16.18	0-360

Face off

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)
8	.67179	20.39	Pk	19.7	.1	-40	.19	31.07	-30.88	0-360
9	.72013	21.91	Pk	19.7	.1	-40	1.71	30.47	-28.76	0-360
10	1.2405	21.45	Pk	19.8	.2	-40	1.45	25.75	-24.3	0-360
11	2.37418	29.09	Pk	19.9	.2	-40	9.19	29.5	-20.31	0-360
12	3.4015	27.81	Pk	19.9	.3	-40	8.01	29.5	-21.49	0-360
13	4.24975	28.92	Pk	19.8	.3	-40	9.02	29.5	-20.48	0-360
**14	13.56165	30.87	Pk	20	.5	-40	11.37	29.5	-18.13	0-360

Pk - Peak detector

\*\*Fundamental

Note 1: The data for marker number 7 and 14 are the fundamental signal.

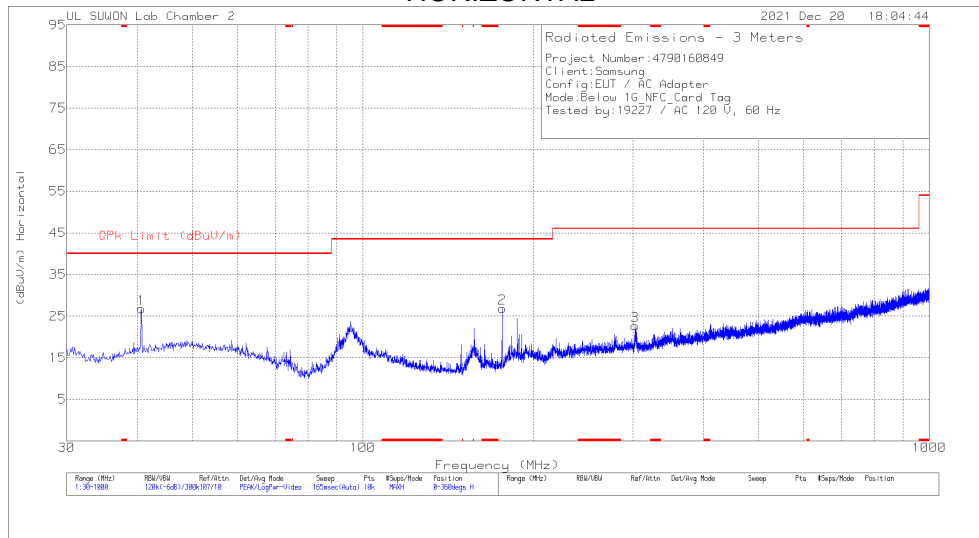
Please refer to section 8.1.4 about the fundamental level.

Frequency range 0.009MHz ~ 0.490MHz, only noise floor level and more than 20dB margin.

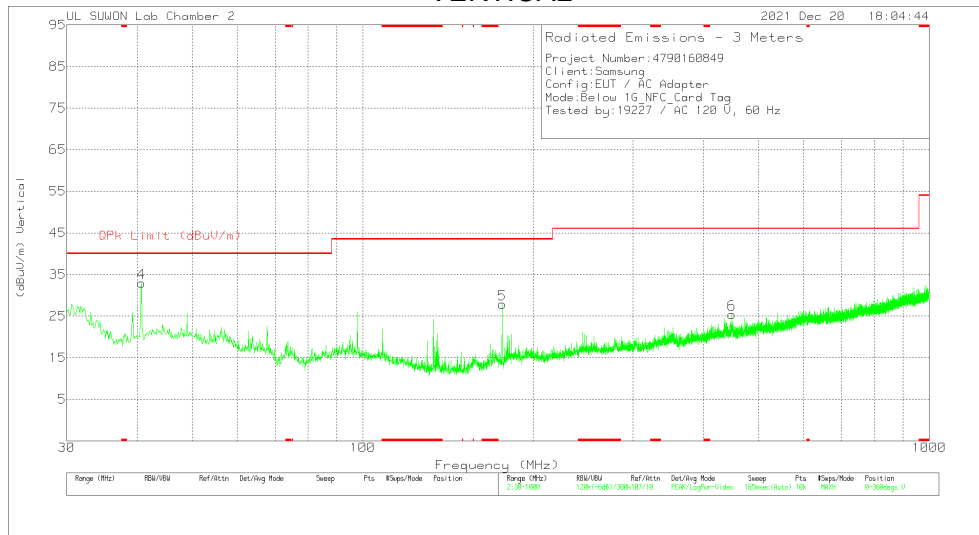
Note 2: Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.

### 8.1.6. TX SPURIOUS EMISSION 30 TO 1000 MHz [EUT with passive TAG mode]

#### HORIZONTAL



#### VERTICAL



#### Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Below 1G[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	OPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	40.67	39.75	Pk	18.8	-31.8	0	26.75	40	-13.25	0-360	300	H
2	176.276	42.87	Pk	14.9	-30.9	0	26.87	43.52	-16.65	0-360	100	H
3	302.279	33.95	Pk	19.1	-30.4	0	22.65	46.02	-23.37	0-360	100	H
4	40.67	46	Pk	18.8	-31.8	0	33	40	-7	0-360	100	V
5	176.276	43.88	Pk	14.9	-30.9	0	27.88	43.52	-15.64	0-360	100	V
6	448.07	33.26	Pk	22	-29.8	0	25.46	46.02	-20.56	0-360	100	V

Pk - Peak detector

## 9. AC MAINS LINE CONDUCTED EMISSIONS

### LIMITS

§15.207

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dB $\mu$ V)	
	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

Notes:  
 1. The lower limit shall apply at the transition frequencies  
 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### TEST PROCEDURE

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.

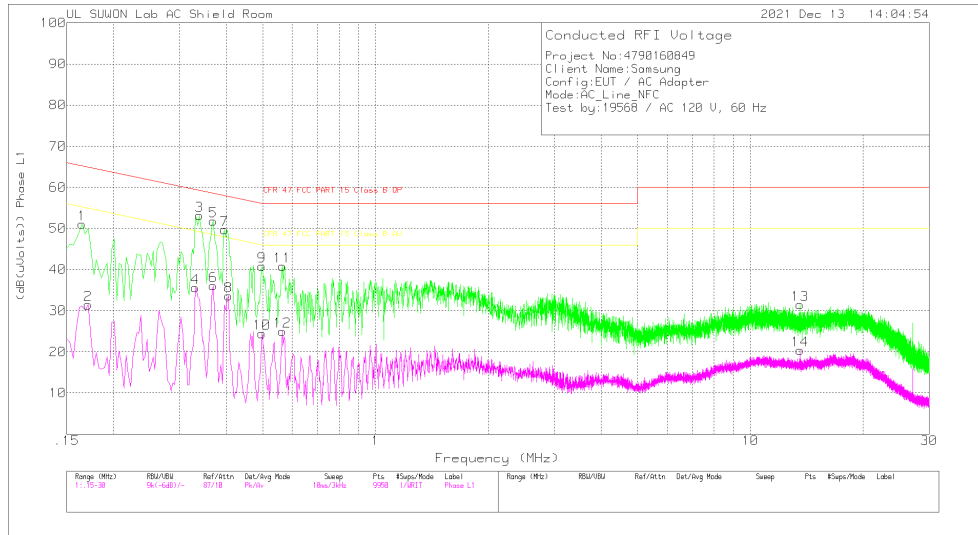
Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

No non-compliance noted:

**WORST EMISSIONS**

**LINE 1 PLOT**



**LINE 1 RESULTS**

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_Wit h EX_L1[dB]	CABLELOS S(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	.165	41.01	Pk	9.9	.1	51.01	65.21	-14.2	-	-
2	.171	21.23	Av	10	.2	31.43	-	-	54.91	-23.48
3	.339	43.21	Pk	9.8	.2	53.21	59.23	-6.02	-	-
4	.33	25.62	Av	9.8	.2	35.62	-	-	49.45	-13.83
5	.369	41.79	Pk	9.8	.2	51.79	58.52	-6.73	-	-
6	.369	26.09	Av	9.8	.2	36.09	-	-	48.52	-12.43
7	.396	39.68	Pk	9.8	.2	49.68	57.94	-8.26	-	-
8	.405	23.64	Av	9.8	.2	33.64	-	-	47.75	-14.11
9	.498	30.76	Pk	9.9	.2	40.86	56.03	-15.17	-	-
10	.498	14.35	Av	9.9	.2	24.45	-	-	46.03	-21.58
11	.564	30.78	Pk	9.8	.2	40.78	56	-15.22	-	-
12	.564	15	Av	9.8	.2	25	-	-	46	-21
13	13.563	21.11	Pk	10	.4	31.51	60	-28.49	-	-
14	13.56	9.99	Av	10	.4	20.39	-	-	50	-29.61

Pk - Peak detector

Av - Average detection

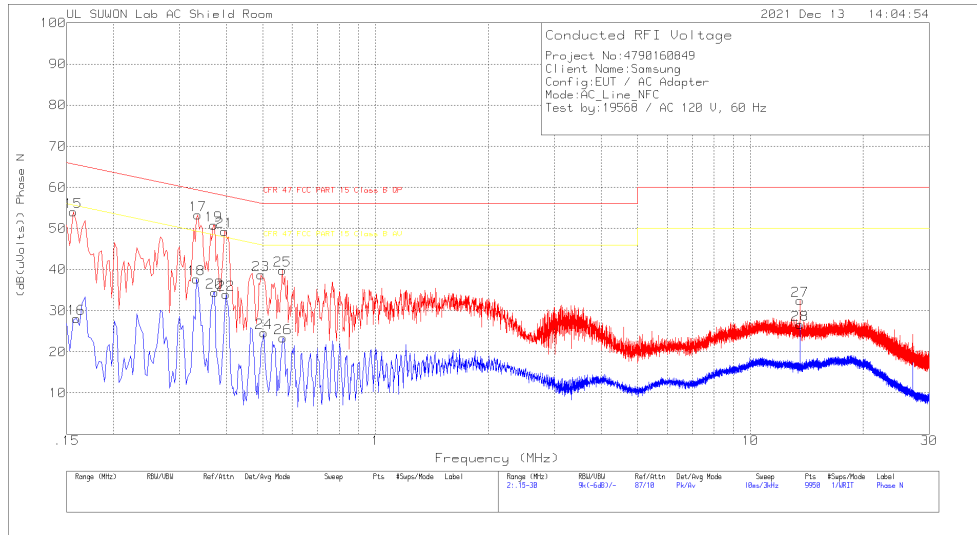
**Quasi-Peak Emissions**

Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_Wit h EX_L1[dB]	CABLELOS S(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)
.33825	41.42	Qp	9.8	.2	51.42	59.25	-7.83	-	-
.36915	39.93	Qp	9.8	.2	49.93	58.52	-8.59	-	-
.40425	37.47	Qp	9.8	.2	47.47	57.77	-10.3	-	-

Qp - Quasi-Peak detector

### LINE 2 PLOT



### LINE 2 RESULTS

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_Wit h EX_N[dB]	CABLELOS S(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)
15	.156	44.15	Pk	9.8	.1	54.05	65.67	-11.62	-	-
16	.159	18.27	Av	9.8	.1	28.17	-	-	55.52	-27.35
17	.336	43.32	Pk	9.8	.2	53.32	59.3	-5.98	-	-
18	.333	27.71	Av	9.8	.2	37.71	-	-	49.38	-11.67
19	.3705	40.79	Pk	9.8	.2	50.79	58.49	-7.7	-	-
20	.372	24.48	Av	9.8	.2	34.48	-	-	48.46	-13.98
21	.396	39.36	Pk	9.8	.2	49.36	57.94	-8.58	-	-
22	.399	23.93	Av	9.8	.2	33.93	-	-	47.87	-13.94
23	.495	28.67	Pk	9.9	.2	38.77	56.08	-17.31	-	-
24	.504	14.59	Av	9.9	.2	24.69	-	-	46	-21.31
25	.564	29.77	Pk	9.9	.2	39.87	56	-16.13	-	-
26	.567	13.29	Av	9.9	.2	23.39	-	-	46	-22.61
27	13.56	22.09	Pk	10	.4	32.49	60	-27.51	-	-
28	13.56	16.24	Av	10	.4	26.64	-	-	50	-23.36

Pk - Peak detector

Av - Average detection

### Quasi-Peak Emissions

Range 2: Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_Wit h EX_N[dB]	CABLELOS S(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)
.33615	41.78	Qp	9.8	.2	51.78	59.3	-7.52	-	-
.36975	39.18	Qp	9.8	.2	49.18	58.51	-9.33	-	-
.39675	37.28	Qp	9.8	.2	47.28	57.92	-10.64	-	-

Qp - Quasi-Peak detector

## 10. FREQUENCY STABILITY

### LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency, over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

### TEST PROCEDURE

ANSI C63.10 §6.8

### RESULTS

No non-compliance noted.

Reference Frequency: EUT Channel 13.56 MHz @ 20°C Limit: $\pm 100$ ppm = 1.356 kHz										
Power Supply (Vdc)	Envir. Temp (°C)	Frequency Deviation Measured with Time Elapse								
		Start up (MHz)	Delta (ppm)	@ 2mins (MHz)	Delta (ppm)	@ 5mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
4.20	50	13.560005581	0.162	13.560005563	0.160	13.560005381	0.147	13.560005098	0.125	100
4.20	40	13.560004469	0.080	13.560004786	0.103	13.560005094	0.125	13.560005360	0.144	100
4.20	30	13.560003500	0.009	13.560003710	0.024	13.560003997	0.045	13.560004239	0.062	100
<b>4.20</b>	<b>20</b>	<b>13.560003382</b>	<b>0</b>	<b>13.560003388</b>	0.000	<b>13.560003393</b>	0.000	<b>13.560003401</b>	0.000	<b>100</b>
4.20	10	13.560004154	0.057	13.560003210	-0.013	13.560003024	-0.027	13.560002854	-0.040	100
4.20	0	13.560002665	-0.053	13.560002512	-0.065	13.560002526	-0.064	13.560002736	-0.049	100
4.20	-10	13.560003157	-0.017	13.560003495	0.008	13.560003656	0.019	13.560003978	0.043	100
4.20	-20	13.560003133	-0.018	13.560002948	-0.032	13.560002852	-0.040	13.560002820	-0.043	100
4.20	-30	13.560002271	-0.082	13.560001914	-0.109	13.560001567	-0.135	13.560001322	-0.153	100

Reference Frequency: EUT Channel 13.56 MHz @ 20°C Limit: $\pm 100$ ppm = 1.356 kHz										
Power Supply (Vdc)	Envir. Temp (°C)	Frequency Deviation Measured with Time Elapse								
		Start up (MHz)	Delta (ppm)	@ 2mins (MHz)	Delta (ppm)	@ 5mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
<b>4.20</b>	<b>20</b>	<b>13.560003382</b>	<b>0</b>	<b>13.560003388</b>	0.000	<b>13.560003393</b>	0.001	<b>13.560003401</b>	0.001	<b>100</b>
4.40	20	13.560003389	0.001	13.560003389	0.001	13.560003396	0.001	13.560003402	0.001	100
3.80	20	13.560003386	0.000	13.560003393	0.001	13.560003398	0.001	13.560003405	0.002	100

## END OF TEST REPORT