



# CERTIFICATION TEST REPORT

**Report Number.** : 4790558569-E7V1

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

**Model** : SM-A236V

**FCC ID** : A3LSMA236V

**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:**

2022-11-11

**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

FAX: (031) 213-5433



Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2022-11-11	Initial issue	Minju Cha

## 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. MEASURING INSTRUMENT CALIBRATION.....	6
4.2. SAMPLE CALCULATION.....	6
4.3. MEASUREMENT UNCERTAINTY .....	6
4.4. DECISION RULE .....	6
<b>5. EQUIPMENT UNDER TEST.....</b>	<b>7</b>
5.1. DESCRIPTION OF EUT.....	7
5.2. MAXIMUM E-FIELD STRENGTH.....	7
5.3. WORST-CASE CONFIGURATION AND MODE .....	7
5.4. DESCRIPTION OF TEST SETUP .....	8
<b>6. 20dB BANDWIDTH .....</b>	<b>10</b>
<b>7. RADIATED EMISSION TEST RESULTS.....</b>	<b>11</b>
7.1. LIMITS AND PROCEDURE .....	11
7.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz) .....	13
7.1.2. SPURIOUS EMISSION 0.009 TO 30 MHz.....	14
7.1.3. TX SPURIOUS EMISSION 30 TO 1000 MHz .....	15
7.1.4. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz) [EUT with passive TAG mode] .....	16
7.1.5. SPURIOUS EMISSION 0.09 TO 30 MHz [EUT with passive TAG mode].....	17
7.1.6. TX SPURIOUS EMISSION 30 TO 1000 MHz [EUT with passive TAG mode] .....	18
<b>8. AC MAINS LINE CONDUCTED EMISSIONS.....</b>	<b>19</b>
<b>9. FREQUENCY STABILITY .....</b>	<b>24</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-A236V  
**SERIAL NUMBER:** 664a1250e6347ece, 664a124c06347ece (RADIATED);  
**DATE TESTED:** 2022-09-06 ~ 2022-11-11;

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

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.

Approved & Released For  
UL Korea, Ltd. By:



Seokhwan Hong  
Suwon Lab Engineer  
UL Korea, Ltd.

Tested By:



Minju Cha  
Suwon Lab Technician  
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. KDB 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(3m semi-anechoic chamber)
<input checked="" type="checkbox"/>	Chamber 2(3m semi-anechoic chamber)
<input type="checkbox"/>	Chamber 3(3m semi-anechoic chamber)
<input type="checkbox"/>	Chamber 4(3m Full-anechoic chamber)
<input type="checkbox"/>	Chamber 5(3m Full-anechoic chamber)

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:

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

$$\begin{aligned} \text{AC Corrected Reading (dBuV)} &= \text{Measured Voltage (dBuV)} + \text{Extension Cord} \\ &\text{Loss (dB)} + \text{Cable Loss (dB)} \\ 44.72 \text{ dBuV} &= 34.72 \text{ dBuV} + 9.9 \text{ dB} + 0.1 \text{ dB} \end{aligned}$$

### 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 115:2021.

## 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.

### 5.2. MAXIMUM E-FIELD STRENGTH

The testing was performed at 3 meter. The transmitter maximum E-field at 30m distance is 13.53 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 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 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	R37MANQ1E72SE3	N/A
Data Cable	SAMSUNG	EP-DN980	GH39-02115A BWE	N/A
Earphone	SAMSUNG	GH59-15055A	EHS64AVFWE	N/A

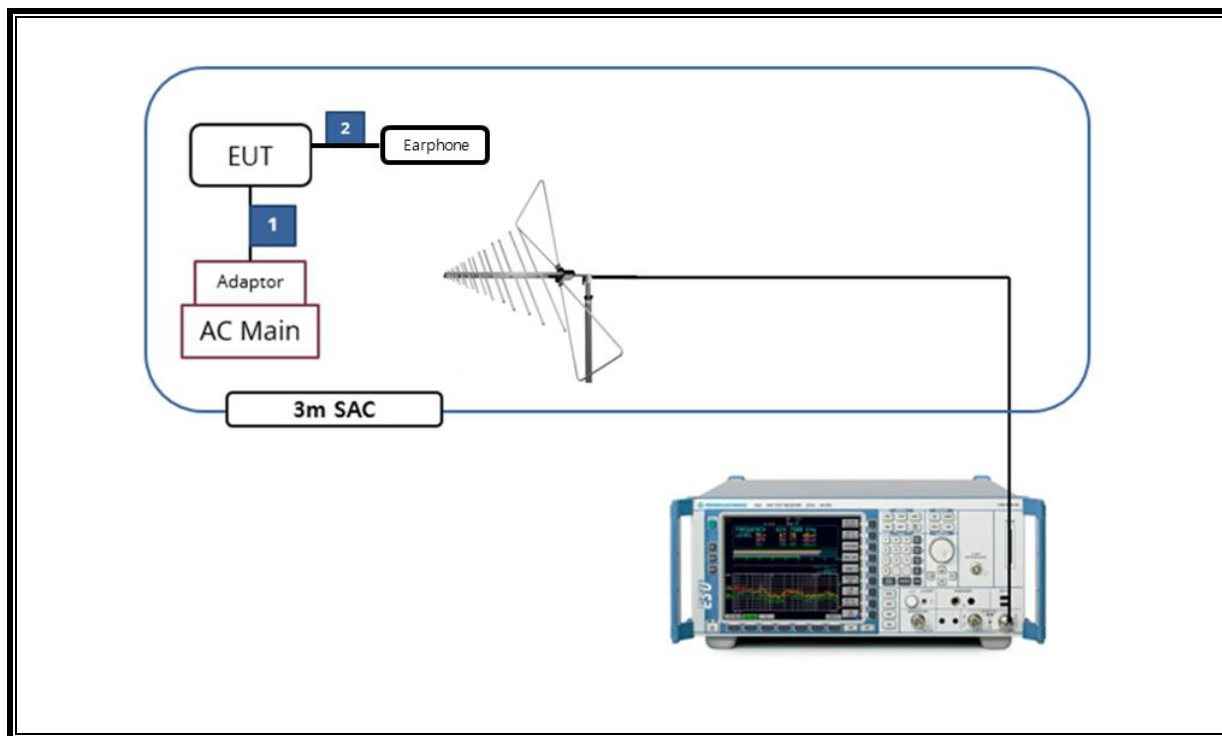
### I/O CABLE

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C to C Type	Shielded	1.0 m	N/A
2	Audio	2	Mini-jack	Unshielded	0.7m	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)





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	2024-08-15
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2024-08-15
Preamplifier, 1000 MHz	Sonoma	310N	341282	2023-08-02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2023-08-02
Spectrum Analyzer, 7 GHz	Agilent / HP	N9010A	MY54200580	2023-08-01
EMI Test Receive, 3 GHz	R&S	ESR3	101832	2023-08-01
DC Power Supply	Agilent / HP	E3640A	MY54226395	2023-08-02
Temperature Chamber	ESPEC	SH-642	93001109	2023-08-01
LISN	R&S	ENV216	101837	2023-08-04
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2023-10-06
Spectrum Analyzer	R&S	FSW50	101538	2023-01-18
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

## 6. 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	435.70

### 20dB Bandwidth Plot



## 7. RADIATED EMISSION TEST RESULTS

### 7.1. 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**

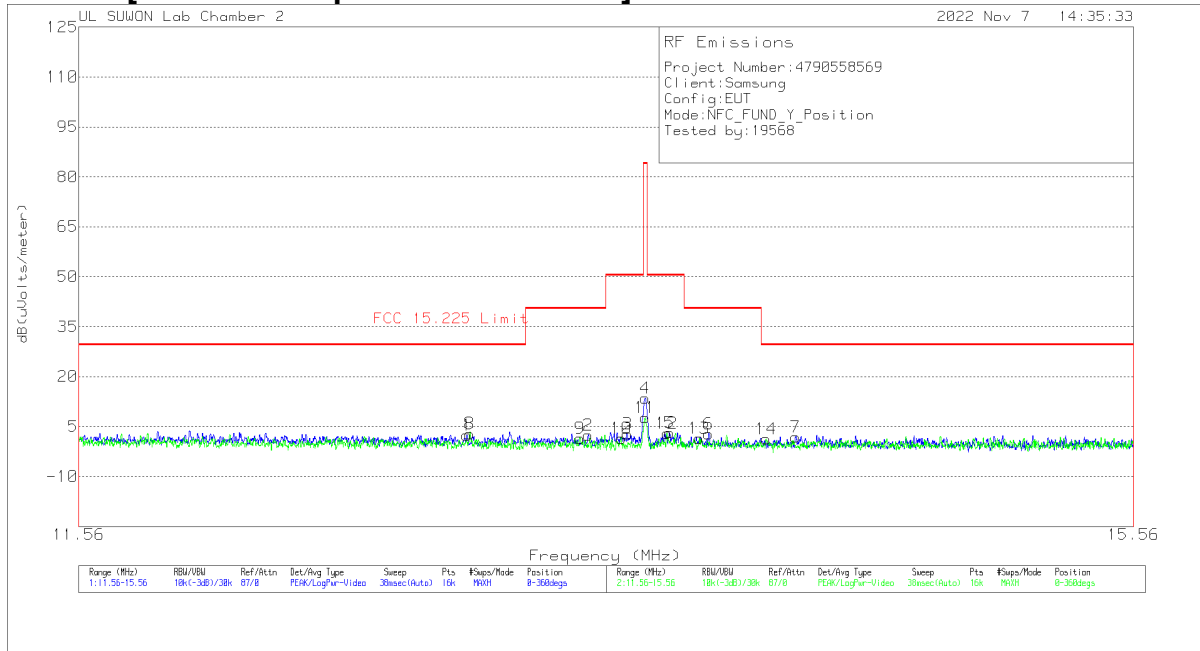
ANSI C63.10-2013

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:

### 7.1.1. 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	12.896	21.88	Pk	20	-40	.5	2.38	29.54	-27.16	0-360
2	13.34375	21.92	Pk	20	-40	.5	2.42	40.51	-38.09	0-360
3	13.49225	22.22	Pk	20	-40	.5	2.72	50.5	-47.78	0-360
**4	13.5605	33.03	Pk	20	-40	.5	13.53	84	-70.47	0-360
5	13.65325	22.61	Pk	20	-40	.6	3.21	50.5	-47.29	0-360
6	13.80525	22.27	Pk	20	-40	.6	2.87	40.51	-37.64	0-360
7	14.14775	21.23	Pk	20	-40	.6	1.83	29.54	-27.71	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	12.90525	22.38	Pk	20	-40	.5	2.88	29.54	-26.66	0-360
9	13.3145	21.04	Pk	20	-40	.5	1.54	40.51	-38.97	0-360
10	13.46875	21.01	Pk	20	-40	.5	1.51	50.5	-48.99	0-360
**11	13.56	27.16	Pk	20	-40	.5	7.66	84	-76.34	0-360
12	13.64325	22.41	Pk	20	-40	.6	3.01	50.5	-47.49	0-360
13	13.76875	20.9	Pk	20	-40	.6	1.5	40.51	-39.01	0-360
14	14.0295	20.64	Pk	20	-40	.6	1.24	29.54	-28.3	0-360

Pk - Peak detector  
 \*\*Fundamental

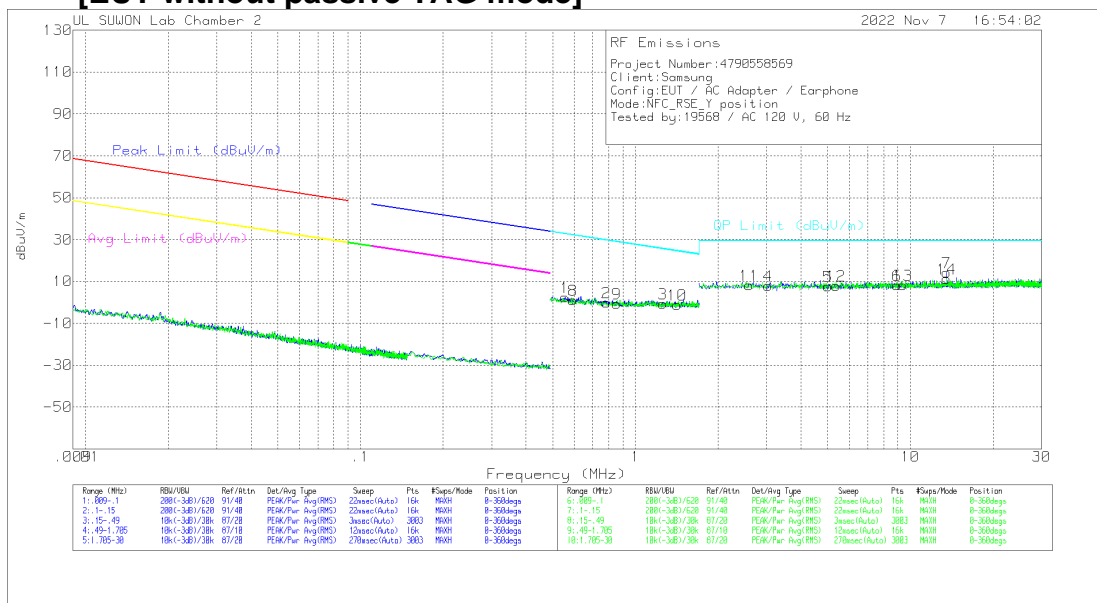
Note 1 : Although these tests were performed other than open filed test site, adequate comparison measurements were confirmed against 30 m open are test site.

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.

### 7.1.2. 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	.55422	22.67	Pk	19.7	.1	-40	2.47	32.73	-30.26	0-360
2	.78442	20.02	Pk	19.8	.2	-40	.02	29.72	-29.7	0-360
3	1.25798	19.52	Pk	19.8	.2	-40	-.48	25.63	-26.11	0-360
4	3.04335	27.89	Pk	19.9	.3	-40	8.09	29.5	-21.41	0-360
5	5.01318	27.72	Pk	19.8	.3	-40	7.82	29.5	-21.68	0-360
6	8.9434	27.81	Pk	20	.5	-40	8.31	29.5	-21.19	0-360
**7	13.56165	33.76	Pk	20	.5	-40	14.26	29.5	-15.24	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	.59366	21.38	Pk	19.7	.1	-40	1.18	32.14	-30.96	0-360
9	.85586	19.37	Pk	19.8	.2	-40	-.63	28.97	-29.6	0-360
10	1.41735	18.84	Pk	19.8	.2	-40	-1.16	24.6	-25.76	0-360
11	2.59095	27.98	Pk	19.9	.3	-40	8.18	29.5	-21.32	0-360
12	5.3619	27.91	Pk	19.8	.4	-40	8.11	29.5	-21.39	0-360
13	9.3958	27.65	Pk	20	.5	-40	8.15	29.5	-21.35	0-360
**14	13.56165	30.74	Pk	20	.5	-40	11.24	29.5	-18.26	0-360

Pk - Peak detector

\*\*Fundamental

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

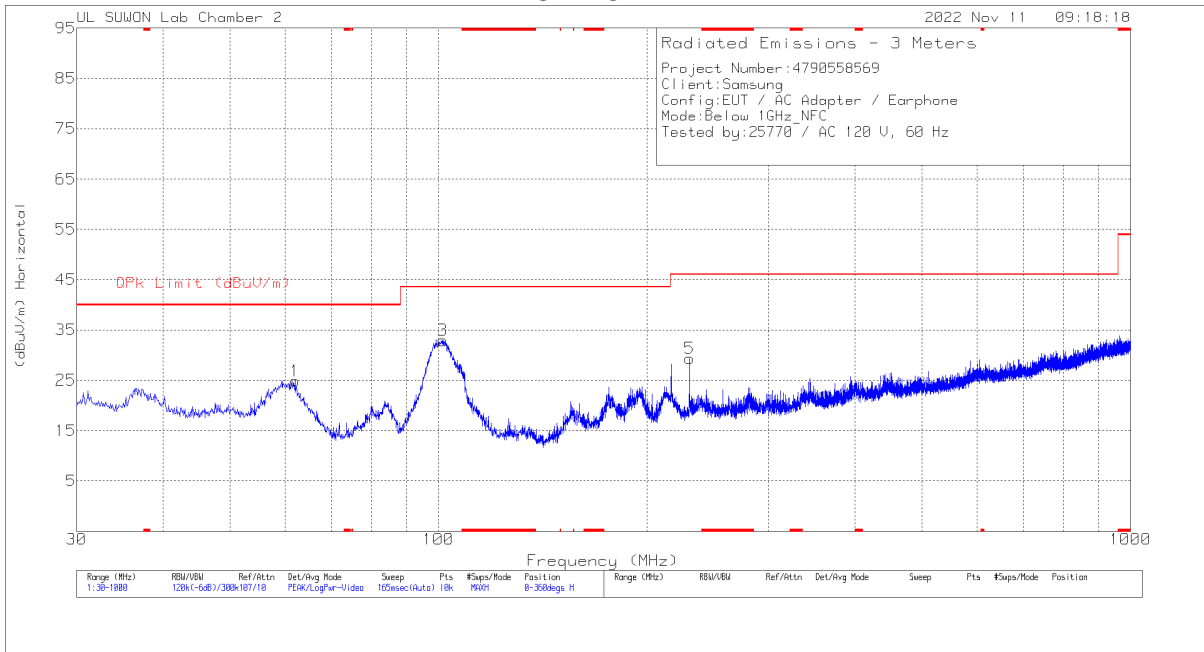
Please refer to section 8.1.1 about the fundamental level.

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

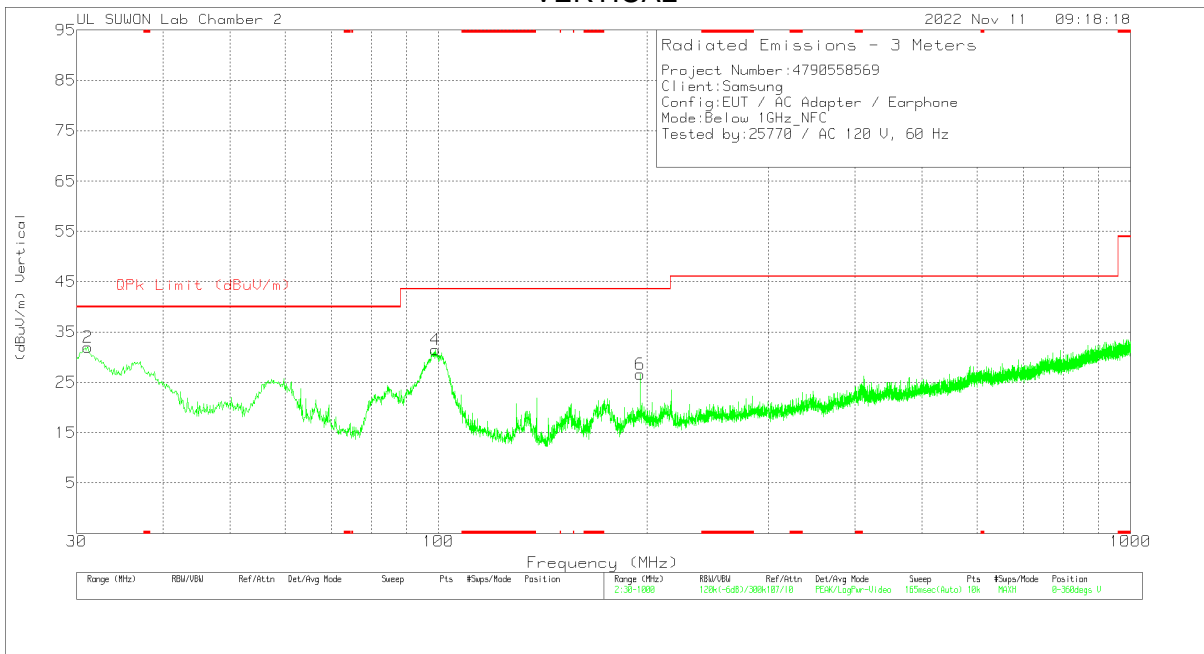
Note 2: Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.

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

#### HORIZONTAL



#### VERTICAL

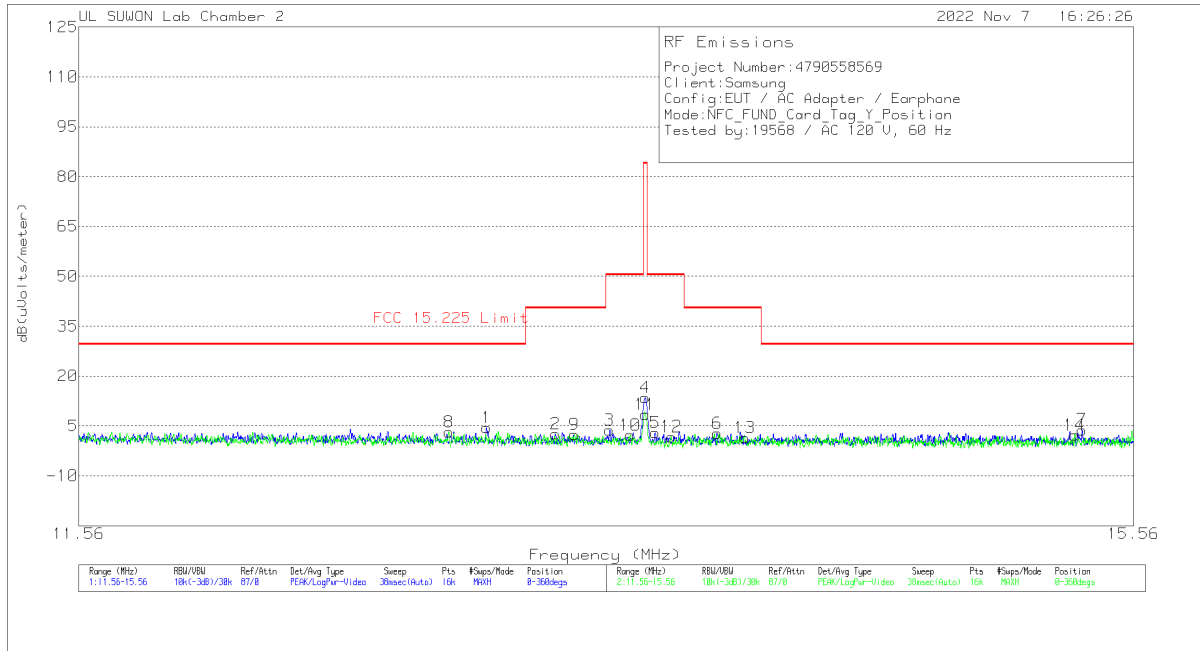


#### Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Below 1G[dB]	Corrected Reading (dBuV/m)	QPK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	62.01	37.82	Pk	18.2	-31.1	24.92	40	-15.08	0-360	300	H
3	101.489	46.01	Pk	17.5	-30.6	32.91	43.52	-10.61	0-360	200	H
5	230.499	41.16	Pk	17.7	-29.5	29.36	46.02	-16.66	0-360	100	H
2	31.164	47.57	Pk	15.6	-31.2	31.97	40	-8.03	0-360	100	V
4	99.064	44.72	Pk	17.3	-30.6	31.42	43.52	-12.1	0-360	100	V
6	195.579	38.71	Pk	17.6	-29.7	26.61	43.52	-16.91	0-360	300	V

Pk - Peak detector

### 7.1.4. 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	12.96738	23.91	Pk	20	-40	.5	4.41	29.54	-25.13	0-360
2	13.22188	22.06	Pk	20	-40	.5	2.56	40.51	-37.95	0-360
3	13.42563	23.15	Pk	20	-40	.5	3.65	50.5	-46.85	0-360
**4	13.56025	33.01	Pk	20	-40	.5	13.51	84	-70.49	0-360
5	13.59838	22.39	Pk	20	-40	.6	2.99	50.5	-47.51	0-360
6	13.83763	22.24	Pk	20	-40	.6	2.84	40.51	-37.67	0-360
7	15.33663	23.23	Pk	20	-40	.6	3.83	29.54	-25.71	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	12.83063	22.71	Pk	20	-40	.5	3.21	29.54	-26.33	0-360
9	13.29263	21.9	Pk	20	-40	.5	2.4	40.51	-38.11	0-360
10	13.50388	21.77	Pk	20	-40	.5	2.27	50.5	-48.23	0-360
**11	13.56075	27.93	Pk	20	-40	.5	8.43	84	-75.57	0-360
12	13.66025	21.15	Pk	20	-40	.6	1.75	50.5	-48.75	0-360
13	13.94575	20.8	Pk	20	-40	.6	1.4	40.51	-39.11	0-360
14	15.30425	21.66	Pk	20	-40	.6	2.26	29.54	-27.28	0-360

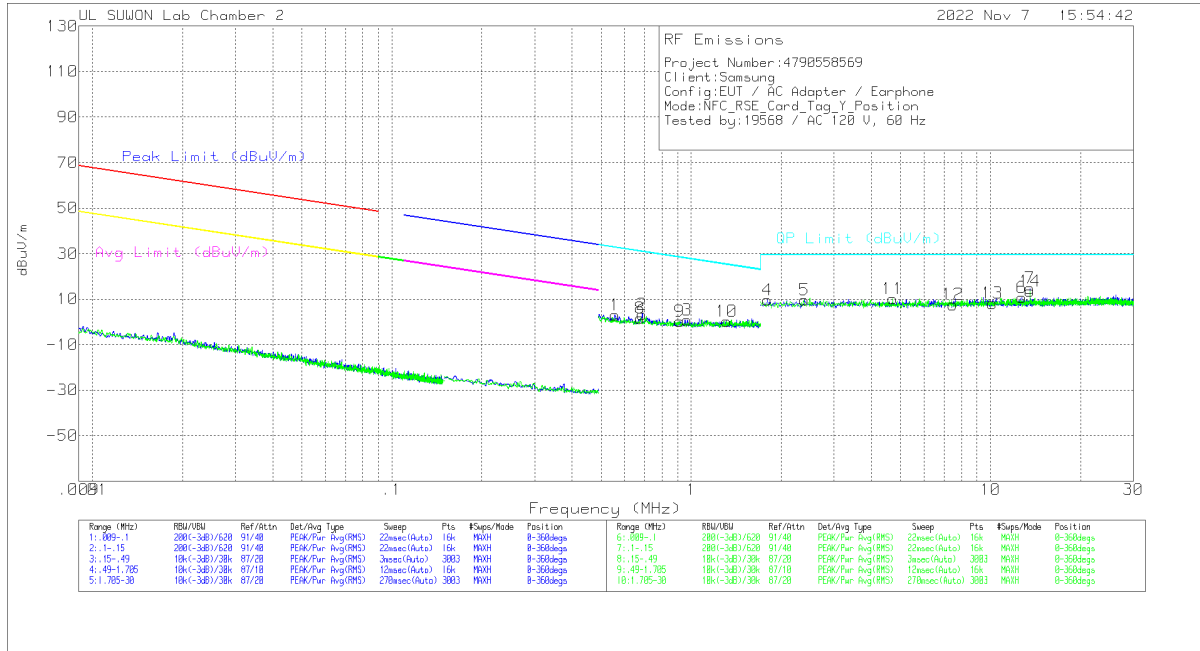
Pk - Peak detector  
 \*\*Fundamental

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.



### 7.1.5. 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	.5565	23.32	Pk	19.7	.1	-40	3.12	32.7	-29.58	0-360
2	.68486	23.63	Pk	19.7	.1	-40	3.43	30.9	-27.47	0-360
3	.97176	20.75	Pk	19.8	.2	-40	.75	27.87	-27.12	0-360
4	1.79925	29.7	Pk	19.8	.2	-40	9.7	29.5	-19.8	0-360
5	2.39303	29.46	Pk	19.9	.2	-40	9.56	29.5	-19.94	0-360
6	12.70398	30.33	Pk	20	.5	-40	10.83	29.5	-18.67	0-360
**7	13.56165	34.25	Pk	20	.5	-40	14.75	29.5	-14.75	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	.67521	21.88	Pk	19.7	.1	-40	1.68	31.02	-29.34	0-360
9	.91454	20.33	Pk	19.8	.2	-40	.33	28.4	-28.07	0-360
10	1.31103	20.2	Pk	19.8	.2	-40	.2	25.28	-25.08	0-360
11	4.71158	30	Pk	19.8	.3	-40	10.1	29.5	-19.4	0-360
12	7.48253	27.29	Pk	19.9	.4	-40	7.59	29.5	-21.91	0-360
13	10.14038	27.64	Pk	20	.5	-40	8.14	29.5	-21.36	0-360
**14	13.56165	32.88	Pk	20	.5	-40	13.38	29.5	-16.12	0-360

Pk - Peak detector

\*\*Fundamental

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

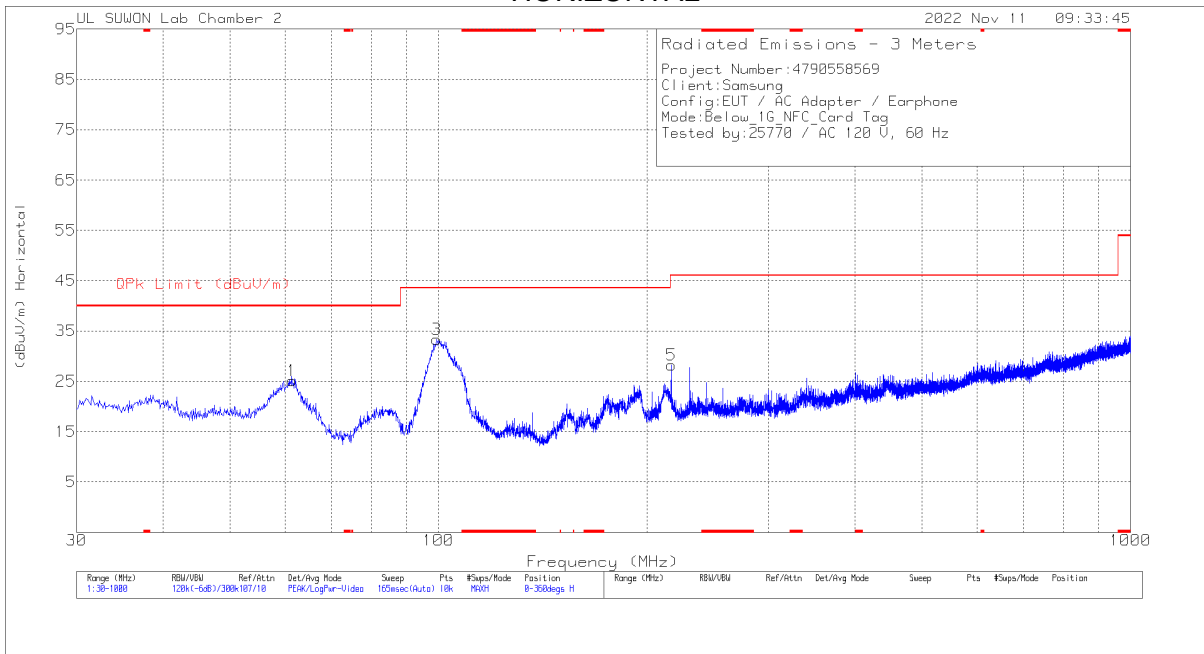
Please refer to section 8.1.4 about the fundamental level.

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

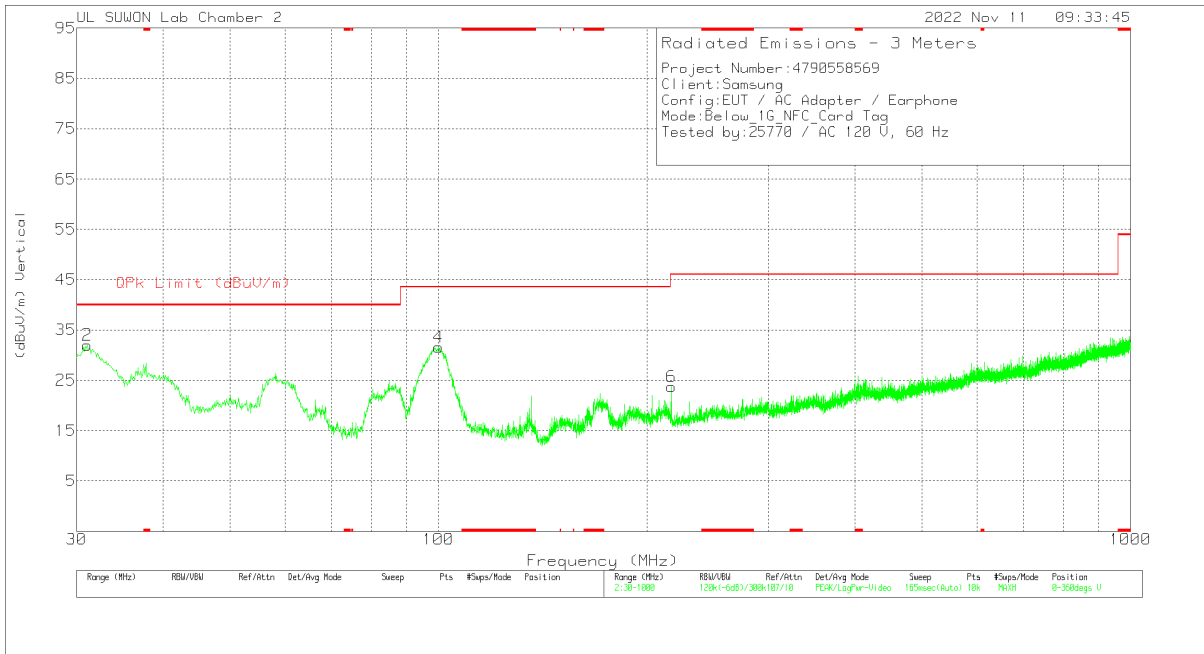
Note 2: Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.

### 7.1.6. 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]	Corrected Reading (dBuV/m)	QPK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	61.428	37.92	Pk	18.3	-31.1	25.12	40	-14.88	0-360	300	H
3	99.452	46.67	Pk	17.3	-30.6	33.37	43.52	-10.15	0-360	200	H
5	216.919	40.9	Pk	17	-29.7	28.2	46.02	-17.82	0-360	100	H
2	31.067	47.53	Pk	15.6	-31.1	32.03	40	-7.97	0-360	100	V
4	99.937	44.77	Pk	17.4	-30.6	31.57	43.52	-11.95	0-360	100	V
6	216.919	36.45	Pk	17	-29.7	23.75	46.02	-22.27	0-360	100	V

Pk - Peak detector

## 8. 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.

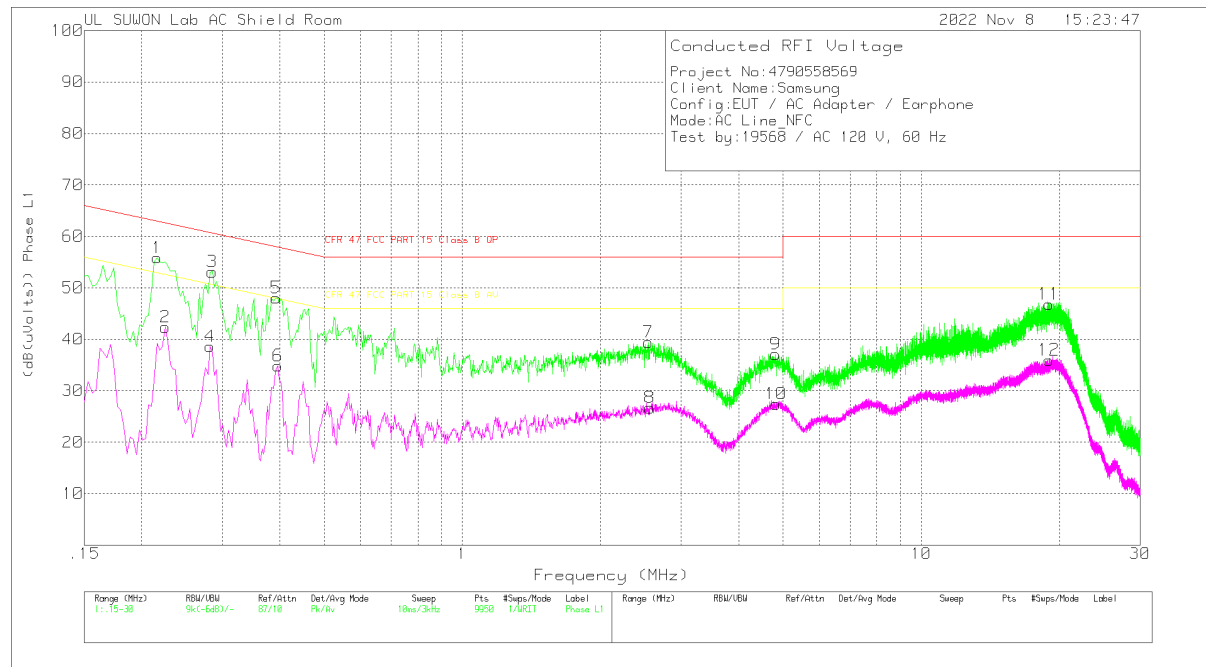
Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

No non-compliance noted:

**WORST EMISSIONS(Terminated EUT's loop antenna)**

**LINE 1 PLOT**



**LINE 1 RESULTS**

**Trace Markers**

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	.216	45.84	Pk	9.8	.2	55.84	62.97	-7.13	-	-
2	.225	32.45	Av	9.7	.2	42.35	-	-	52.63	-10.28
3	.285	43.21	Pk	9.7	.2	53.11	60.67	-7.56	-	-
4	.282	28.7	Av	9.7	.2	38.6	-	-	50.76	-12.16
5	.393	38.04	Pk	9.8	.2	48.04	58	-9.96	-	-
6	.396	24.83	Av	9.8	.2	34.83	-	-	47.94	-13.11
7	2.544	29.41	Pk	9.7	.3	39.41	56	-16.59	-	-
8	2.562	16.71	Av	9.7	.3	26.71	-	-	46	-19.29
9	4.815	27.09	Pk	9.7	.3	37.09	56	-18.91	-	-
10	4.824	17.44	Av	9.7	.3	27.44	-	-	46	-18.56
11	18.963	36.32	Pk	10.1	.4	46.82	60	-13.18	-	-
12	18.978	25.47	Av	10.1	.4	35.97	-	-	50	-14.03

Pk - Peak detector

Av - Average detection

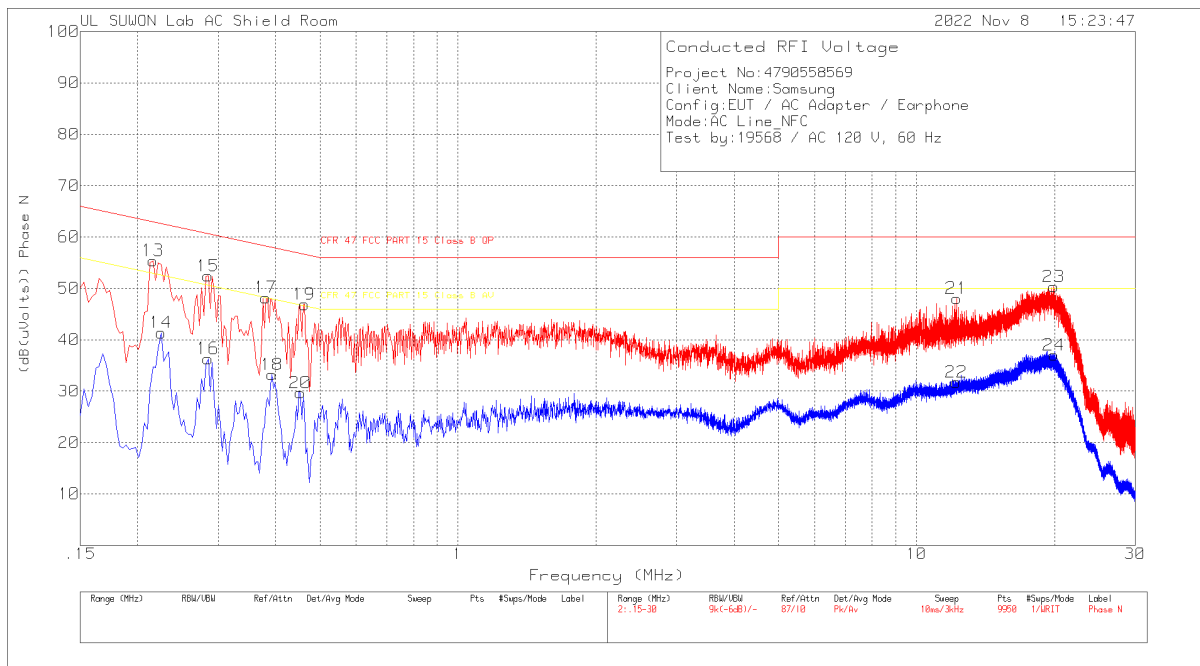
**Quasi-Peak Emissions**

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)
.21675	36.06	Qp	9.8	.2	46.06	62.94	-16.88	-	-
.28425	30.99	Qp	9.7	.2	40.89	60.69	-19.8	-	-
.39375	38.13	Qp	9.8	.2	48.13	57.98	-9.85	-	-

Qp - Quasi-Peak detector

### LINE 2 PLOT



### LINE 2 RESULTS

#### Trace Markers

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)
13	.216	45.39	Pk	9.8	.2	55.39	62.97	-7.58	-	-
14	.225	31.47	Av	9.7	.2	41.37	-	-	52.63	-11.26
15	.285	42.53	Pk	9.7	.2	52.43	60.67	-8.24	-	-
16	.285	26.43	Av	9.7	.2	36.33	-	-	50.67	-14.34
17	.381	38.21	Pk	9.8	.2	48.21	58.26	-10.05	-	-
18	.393	23.21	Av	9.8	.2	33.21	-	-	48	-14.79
19	.462	36.78	Pk	9.9	.2	46.88	56.66	-9.78	-	-
20	.453	19.58	Av	9.9	.2	29.68	-	-	46.82	-17.14
21	12.228	37.73	Pk	10	.3	48.03	60	-11.97	-	-
22	12.21	21.42	Av	10	.3	31.72	-	-	50	-18.28
23	19.923	39.74	Pk	10.2	.4	50.34	60	-9.66	-	-
24	19.944	26.41	Av	10.2	.4	37.01	-	-	50	-12.99

Pk - Peak detector

Av - Average detection

#### Quasi-Peak Emissions

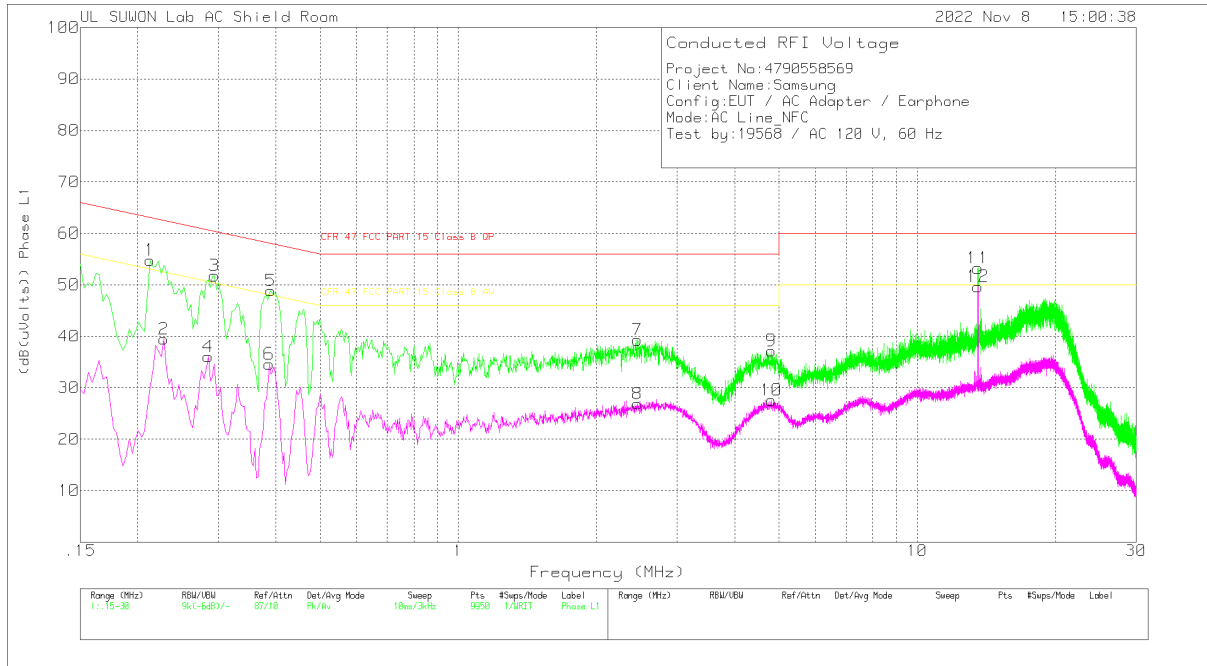
Range 2: Phase N .15 - 30MHz

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)
.21675	34.95	Qp	9.8	.2	44.95	62.94	-17.99	-	-
.28425	29.28	Qp	9.7	.2	39.18	60.69	-21.51	-	-
.46125	26.33	Qp	9.9	.2	36.43	56.67	-20.24	-	-
19.9232	30.68	Qp	10.2	.4	41.28	60	-18.72	-	-

Qp - Quasi-Peak detector

**WORST EMISSIONS(Not Terminated)**

**LINE 1 PLOT**



**LINE 1 RESULTS**

**Trace Markers**

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With 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	.213	44.77	Pk	9.8	.2	54.77	63.09	-8.32	-	-
2	.228	29.56	Av	9.7	.2	39.46	-	-	52.52	-13.06
3	.294	41.88	Pk	9.7	.2	51.78	60.41	-8.63	-	-
4	.285	26.12	Av	9.7	.2	36.02	-	-	50.67	-14.65
5	.39	38.86	Pk	9.8	.2	48.86	58.06	-9.2	-	-
6	.387	24.6	Av	9.8	.2	34.6	-	-	48.13	-13.53
7	2.454	29.31	Pk	9.7	.3	39.31	56	-16.69	-	-
8	2.454	16.87	Av	9.7	.3	26.87	-	-	46	-19.13
9	4.812	27.18	Pk	9.7	.3	37.18	56	-18.82	-	-
10	4.812	17.55	Av	9.7	.3	27.55	-	-	46	-18.45
11	13.56	42.83	Pk	10	.4	53.23	60	-6.77	-	-
12	13.56	39.25	Av	10	.4	49.65	-	-	50	-35

Pk - Peak detector

Av - Average detection

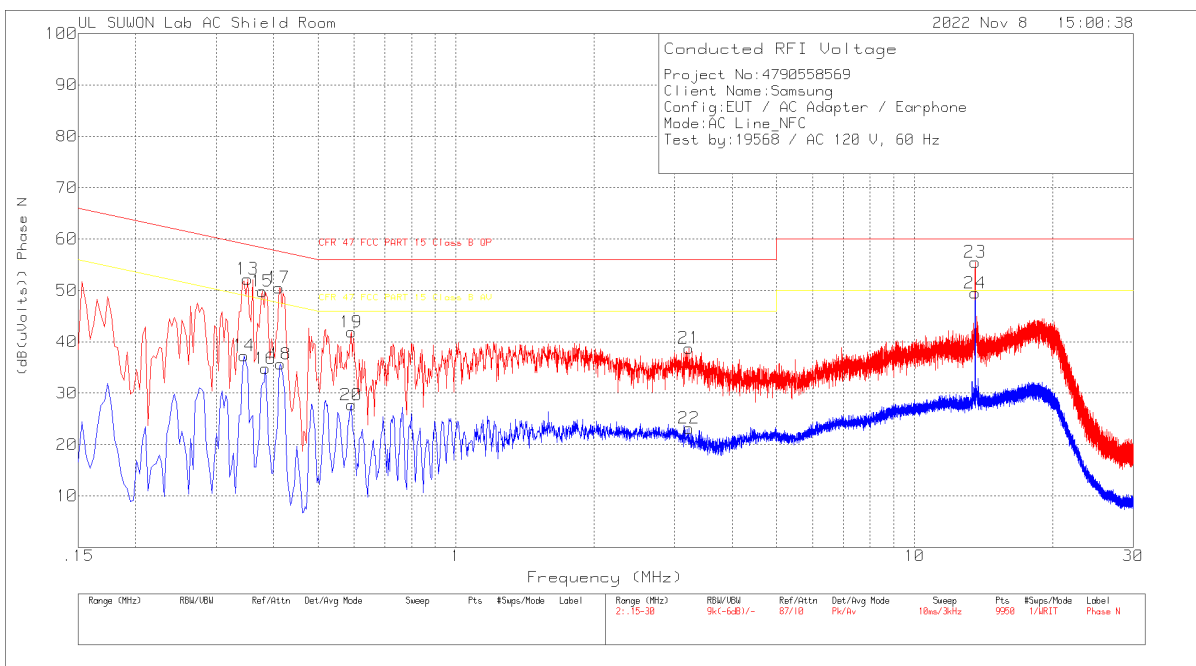
**Quasi-Peak Emissions**

Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With 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)
.21225	28.66	Qp	9.8	.2	38.66	63.12	-24.46	-	-
.29325	28.02	Qp	9.7	.2	37.92	60.43	-22.51	-	-
.38925	35.63	Qp	9.8	.2	45.63	58.08	-12.45	-	-
13.5602	42.53	Qp	10	.4	52.93	60	-7.07	-	-

Qp - Quasi-Peak detector

### LINE 2 PLOT



### LINE 2 RESULTS

#### Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	CABLELOSS 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)
13	.351	42.21	Pk	9.8	.2	52.21	58.94	-6.73	-	-
14	.345	27.28	Av	9.8	.2	37.28	-	-	49.08	-11.8
15	.378	39.81	Pk	9.8	.2	49.81	58.32	-8.51	-	-
16	.384	24.79	Av	9.8	.2	34.79	-	-	48.19	-13.4
17	.411	40.53	Pk	9.8	.2	50.53	57.63	-7.1	-	-
18	.414	25.65	Av	9.8	.2	35.65	-	-	47.57	-11.92
19	.591	31.79	Pk	9.9	.2	41.89	56	-14.11	-	-
20	.591	17.61	Av	9.9	.2	27.71	-	-	46	-18.29
21	3.222	28.78	Pk	9.7	.3	38.78	56	-17.22	-	-
22	3.222	13.16	Av	9.7	.3	23.16	-	-	46	-22.84
23	13.56	45.11	Pk	10	.4	55.51	60	-4.49	-	-
24	13.56	39.07	Av	10	.4	49.47	-	-	50	-5.53

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)
.35025	40.68	Qp	9.8	.2	50.68	58.96	-8.28	-	-
.37875	37.31	Qp	9.8	.2	47.31	58.31	-11	-	-
.41175	38.63	Qp	9.8	.2	48.63	57.61	-8.98	-	-
13.5602	44.47	Qp	10	.4	54.87	60	-5.13	-	-

Qp - Quasi-Peak detector

## 9. 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

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)
3.88	50	13.559946670	-3.564	13.559946010	-3.613	13.559945765	-3.631	13.559945739	-3.633	100
3.88	40	13.559964041	-2.283	13.559964041	-2.283	13.559953745	-3.042	13.559950699	-3.267	100
3.88	30	13.559984508	-0.773	13.559977918	-1.259	13.559972116	-1.687	13.559975125	-1.465	100
<b>3.88</b>	<b>20</b>	<b>13.559994996</b>	<b>0</b>	<b>13.559995001</b>	0.000	<b>13.559995015</b>	0.001	<b>13.559995013</b>	0.001	<b>100</b>
3.88	10	13.559971088	-1.763	13.559998917	0.289	13.560003957	0.661	13.560018944	1.766	100
3.88	0	13.560034006	2.877	13.560039176	3.258	13.560044295	3.636	13.560048937	3.978	100
3.88	-10	13.560059110	4.728	13.560066207	5.252	13.560067471	5.345	13.560069524	5.496	100
3.88	-20	13.560071062	5.610	13.560071121	5.614	13.560071083	5.611	13.560071045	5.608	100
3.88	-30	13.560070074	5.537	13.560069895	5.524	13.560069761	5.514	13.560069318	5.481	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>3.88</b>	<b>20</b>	<b>13.559959623</b>	<b>0</b>	<b>13.559946656</b>	-0.956	<b>13.559946387</b>	-0.976	<b>13.559918156</b>	-3.058	<b>100</b>
4.47	20	13.559966198	0.485	13.559961934	0.170	13.559956055	-0.263	13.559957618	-0.148	100
3.65	20	13.559920778	-2.865	13.559965362	0.423	13.559995640	2.656	13.559967765	0.600	100

ANSI C63.10 §6.8

### RESULTS

No non-compliance noted.

**END OF TEST REPORT**