



# **CERTIFICATION TEST REPORT**

**Report Number.** : 4789230288-E10V1

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

**Model** : SM-G981B/DS, SM-G981B

**FCC ID** : A3LSMG981B

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

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

**Date Of Issue:**

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**TL-637**

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
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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-G981B/DS, SM-G981B  
**SERIAL NUMBER:** R3CMA0BVGQV (CONDUCTED);  
R3CM8106MBW (RADIATED);  
**DATE TESTED:** OCT 25, 2019 – DEC 17, 2019;

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  
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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.

## 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 <http://www.iasonline.org/wp-content/uploads/2017/05/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	2.35 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.

## 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. This test report addresses the DXX (NFC) operational mode.

This report covers the Samsung models SM-G981B/DS and SM-G981B. These models are identical in hardware except SM-G981B has single SIM tray. With some pre-scan, model SM-G981B/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 17.36 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 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	R37M5WSB411SE3	N/A
Data Cable	SAMSUNG	EP-DG977	N/A	N/A

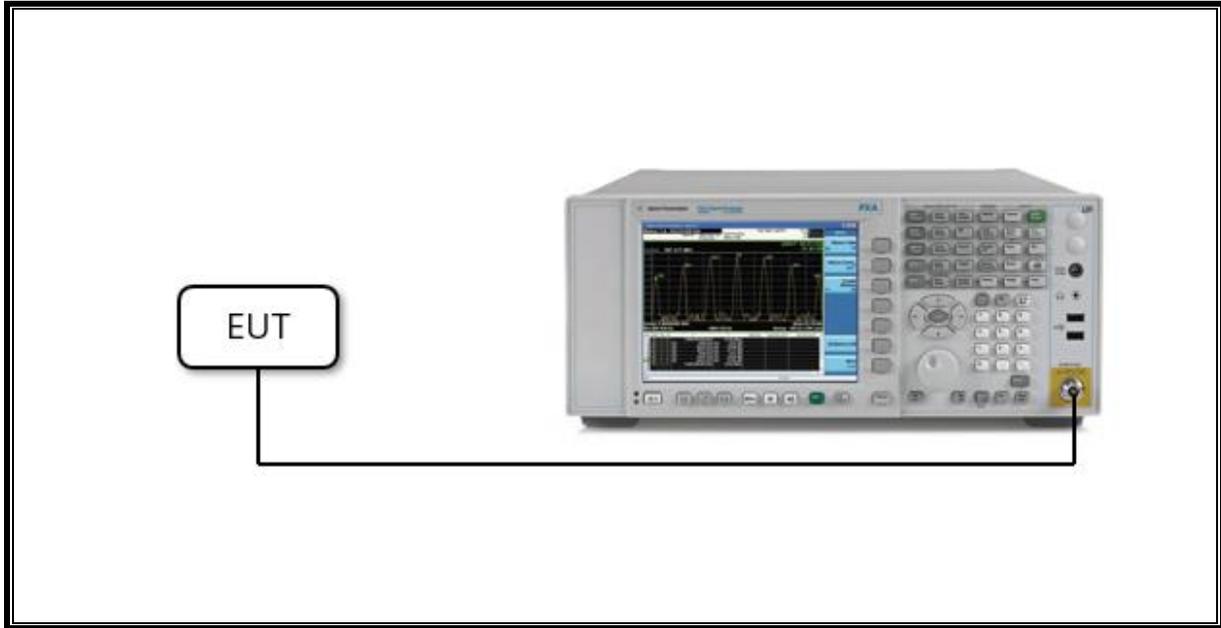
### I/O CABLE

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	1.0m	N/A

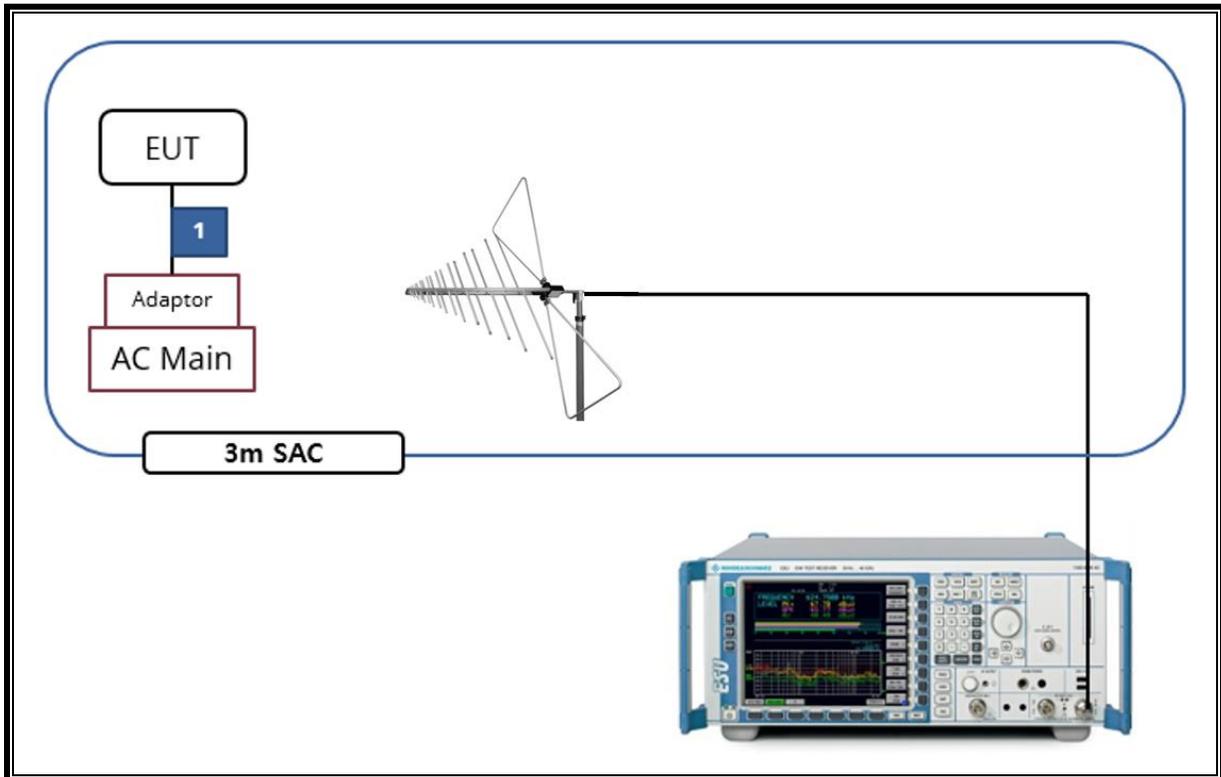
The EUT is a stand-alone device configured and tested in a worst-case setup.

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

**SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)**



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



## 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**

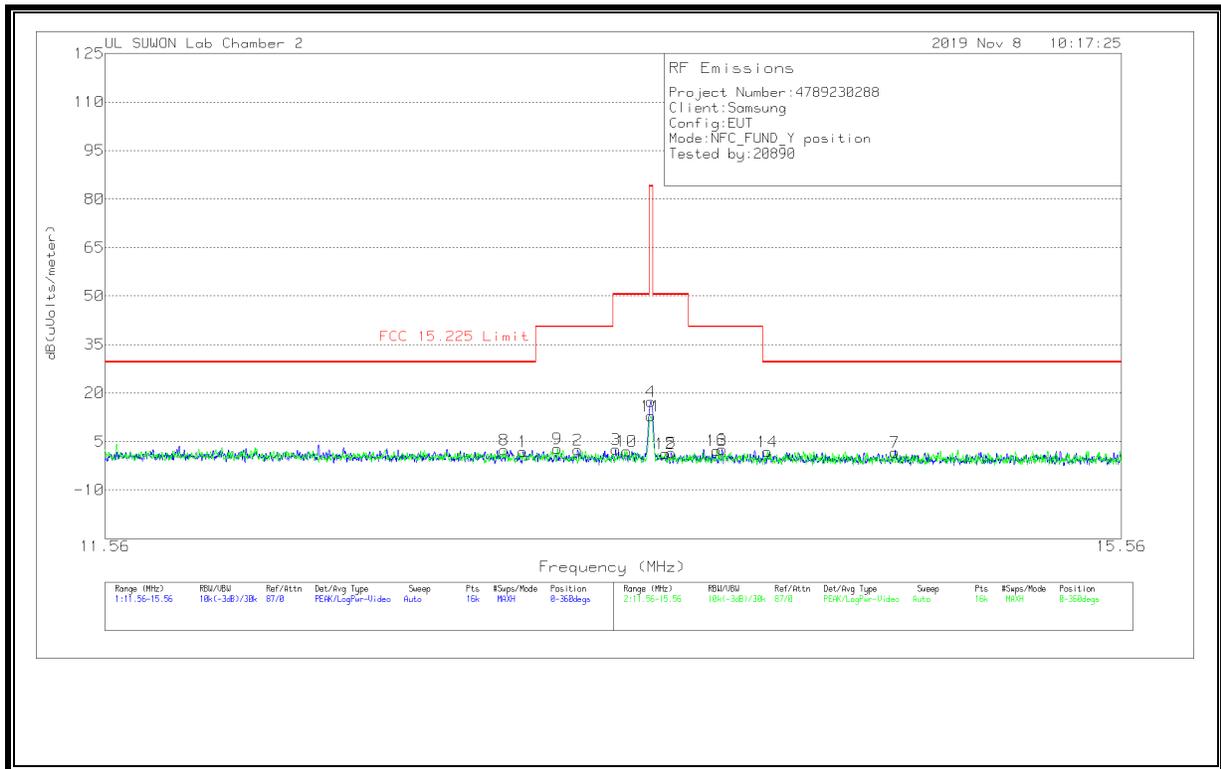
ANSI C63.10-2013

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)



Trace Markers

[Face On]

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
1	13.06313	21.44	Pk	20	-40	.5	1.94	29.54	-27.6	0-360
2	13.2735	21.94	Pk	20	-40	.5	2.44	40.51	-38.07	0-360
3	13.42125	22.04	Pk	20	-40	.5	2.54	50.5	-47.96	0-360
**4	13.56025	36.86	Pk	20	-40	.5	17.36	84	-66.64	0-360
5	13.64163	20.84	Pk	20	-40	.6	1.44	50.5	-49.06	0-360
6	13.84563	21.97	Pk	20	-40	.6	2.57	40.51	-37.94	0-360
7	14.56275	20.99	Pk	20	-40	.6	1.59	29.54	-27.95	0-360

[Face Off]

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
8	12.99113	21.96	Pk	20	-40	.5	2.46	29.54	-27.08	0-360
9	13.19513	22.34	Pk	20	-40	.5	2.84	40.51	-37.67	0-360
10	13.465	21.47	Pk	20	-40	.5	1.97	50.5	-48.53	0-360
**11	13.56025	32.37	Pk	20	-40	.5	12.87	84	-71.13	0-360
12	13.61713	20.68	Pk	20	-40	.6	1.28	50.5	-49.22	0-360
13	13.82488	21.61	Pk	20	-40	.6	2.21	40.51	-38.3	0-360
14	14.03088	21.3	Pk	20	-40	.6	1.9	29.54	-27.64	0-360

Pk - Peak detector

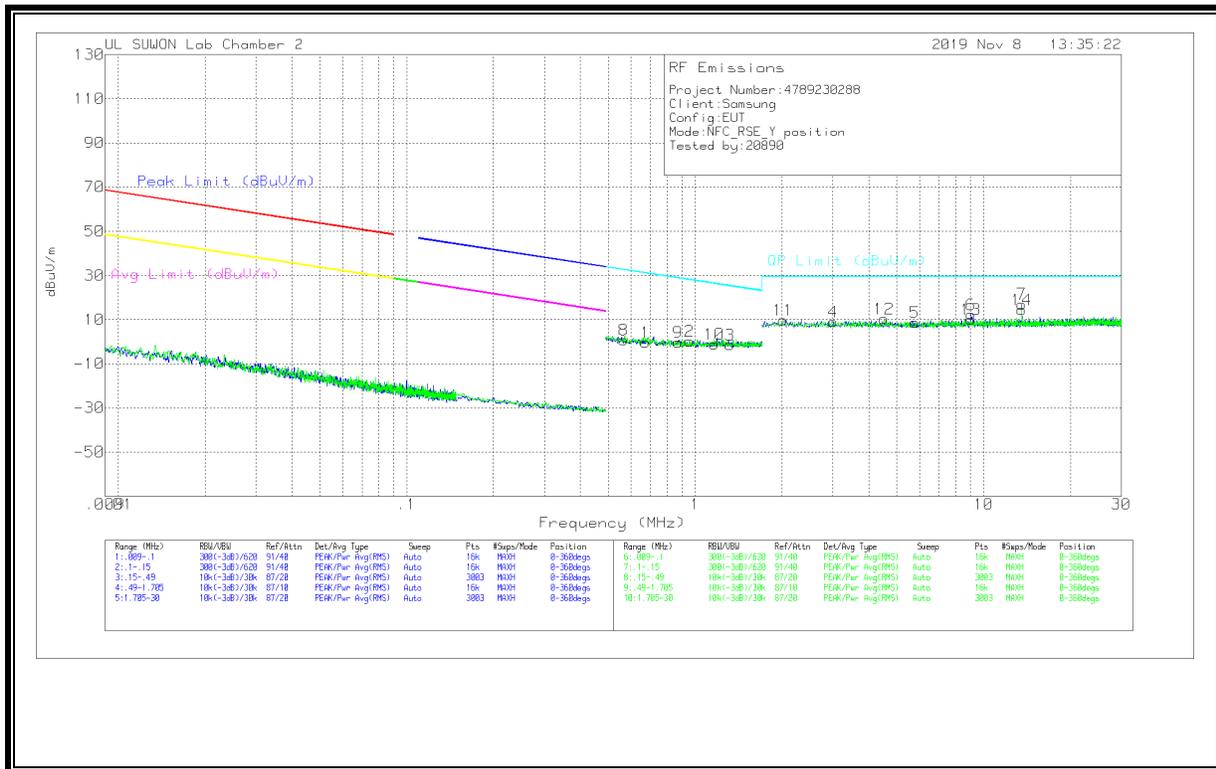
\*\*Fundamental

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



Trace Markers

[Face On]

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.67115	19.85	Pk	19.7	.1	-40	-.35	31.08	-31.43	0-360
2	.95622	20.27	Pk	19.8	.2	-40	.27	28.01	-27.74	0-360
3	1.31912	18.61	Pk	19.8	.2	-40	-1.39	25.22	-26.61	0-360
4	3.01508	28.81	Pk	19.9	.3	-40	9.01	29.5	-20.49	0-360
5	5.75775	28.42	Pk	19.8	.4	-40	8.62	29.5	-20.88	0-360
6	9.03765	31.74	Pk	20	.5	-40	12.24	29.5	-17.26	0-360
**7	13.56165	36.57	Pk	20	.5	-40	17.07	29.5	-12.43	0-360

[Face Off]

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
8	.56402	21.05	Pk	19.7	.1	-40	.85	32.58	-31.73	0-360
9	.87171	19.8	Pk	19.8	.2	-40	-.2	28.81	-29.01	0-360
10	1.1656	18.96	Pk	19.8	.2	-40	-1.04	26.29	-27.33	0-360
11	2.01603	29.62	Pk	19.9	.2	-40	9.72	29.5	-19.78	0-360
12	4.51365	30.34	Pk	19.8	.3	-40	10.44	29.5	-19.06	0-360
13	9.02823	29.62	Pk	20	.5	-40	10.12	29.5	-19.38	0-360
**14	13.56165	33.92	Pk	20	.5	-40	14.42	29.5	-15.08	0-360

Pk - Peak detector

\*\*Fundamental

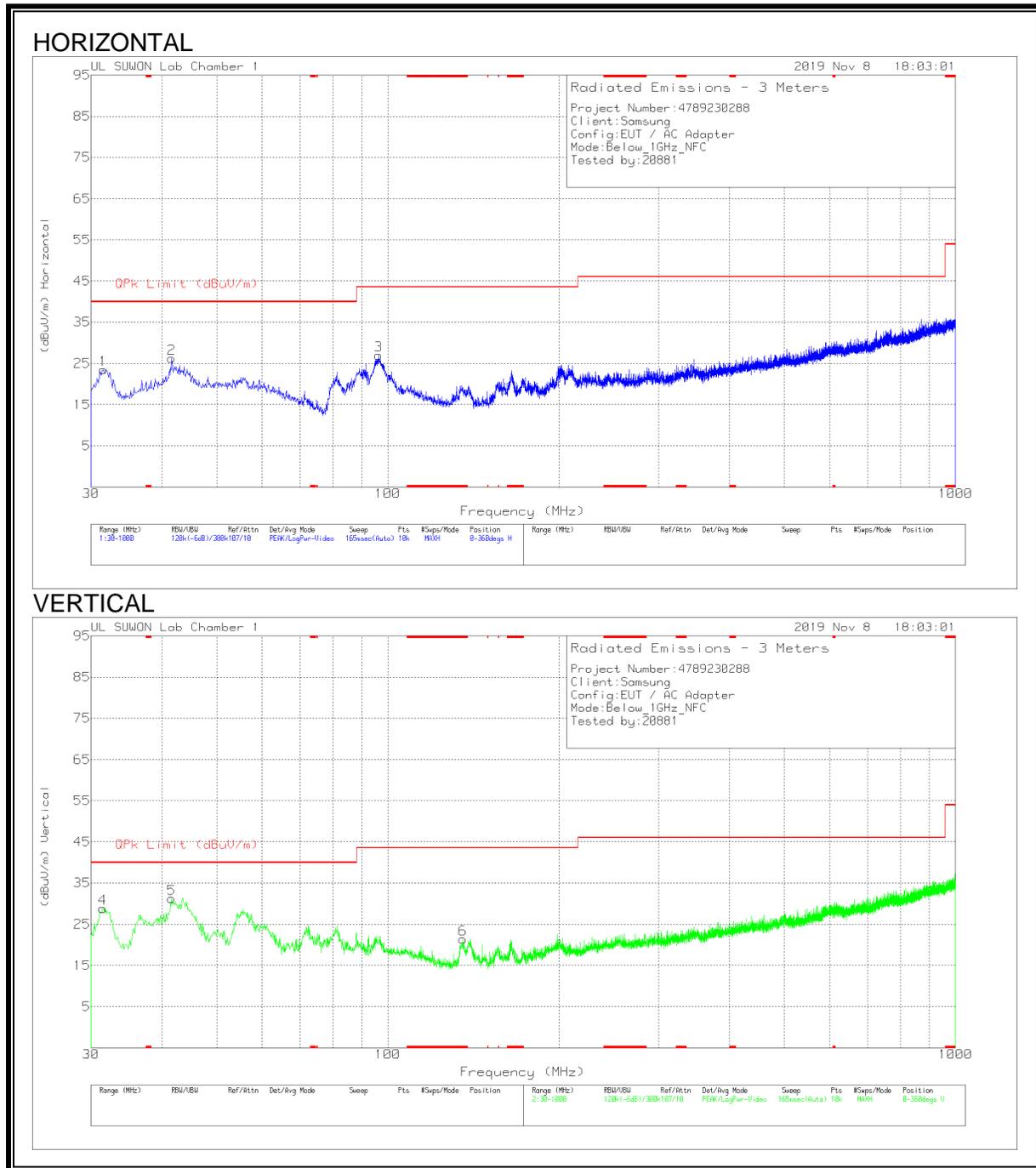
Note 1: The data for marker number 7 and 15 are the fundamental signal.

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



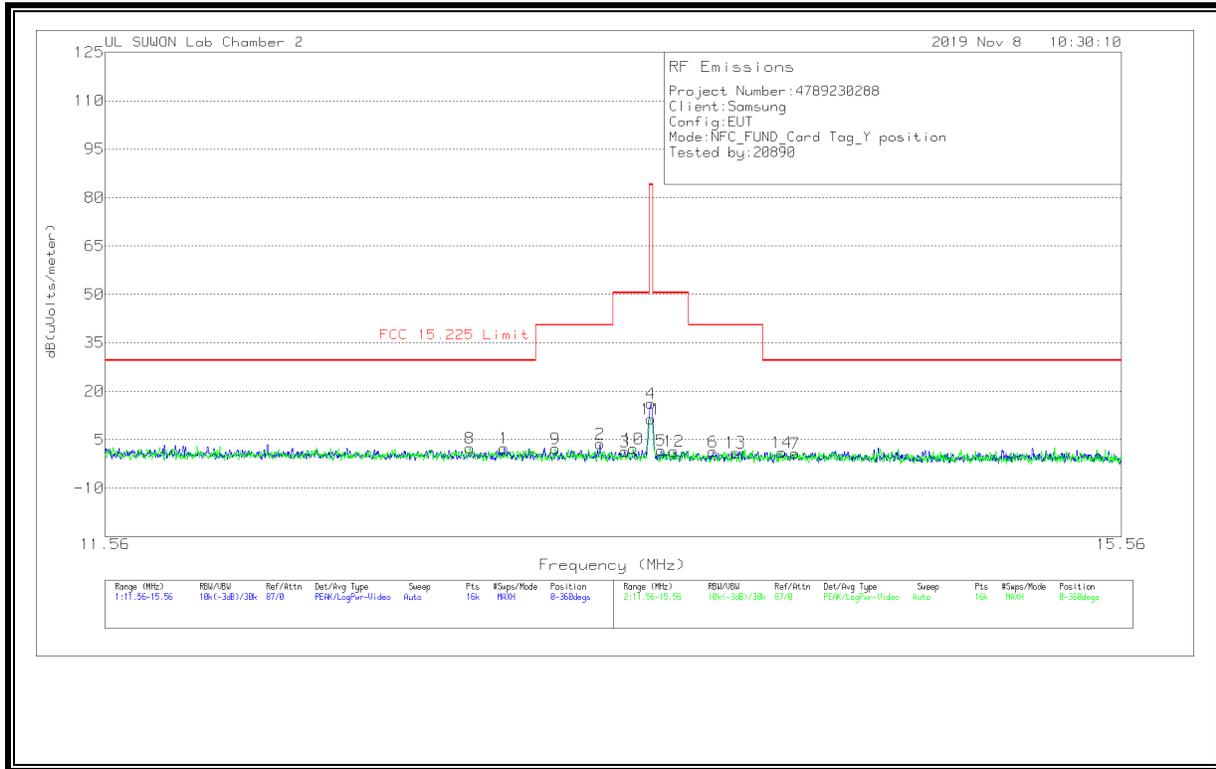
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_750	Below_1G[dB]	Corrected Reading (dBuV/m)	QPK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	31.552	37.65	Pk	15.7	-29.8	23.55	40	-16.45	0-360	200	H
2	41.64	36.84	Pk	19.1	-29.7	26.24	40	-13.76	0-360	400	H
3	96.348	38.13	Pk	17.5	-28.7	26.93	43.52	-16.59	0-360	300	H
4	31.455	43.02	Pk	15.7	-29.9	28.82	40	-11.18	0-360	100	V
5	41.64	41.85	Pk	19.1	-29.7	31.25	40	-8.75	0-360	100	V
6	* 135.536	35.51	Pk	14.1	-28.2	21.41	43.52	-22.11	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	Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
1	12.99113	21.9	Pk	20	-40	.5	2.4	29.54	-27.14	0-360
2	13.36063	23.17	Pk	20	-40	.5	3.67	40.51	-36.84	0-360
3	13.45688	20.73	Pk	20	-40	.5	1.23	50.5	-49.27	0-360
**4	13.56025	35.8	Pk	20	-40	.5	16.3	84	-67.7	0-360
5	13.60138	21.06	Pk	20	-40	.6	1.66	50.5	-48.84	0-360
6	13.81	20.61	Pk	20	-40	.6	1.21	40.51	-39.3	0-360
7	14.14538	20.21	Pk	20	-40	.6	.81	29.54	-28.73	0-360

[Face Off]

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
8	12.86138	21.98	Pk	20	-40	.5	2.48	29.54	-27.06	0-360
9	13.18688	21.74	Pk	20	-40	.5	2.24	40.51	-38.27	0-360
10	13.49088	21.75	Pk	20	-40	.5	2.25	50.5	-48.25	0-360
**11	13.56	30.95	Pk	20	-40	.5	11.45	84	-72.55	0-360
12	13.65113	20.79	Pk	20	-40	.6	1.39	50.5	-49.11	0-360
13	13.899	20.41	Pk	20	-40	.6	1.01	40.51	-39.5	0-360
14	14.08888	20.53	Pk	20	-40	.6	1.13	29.54	-28.41	0-360

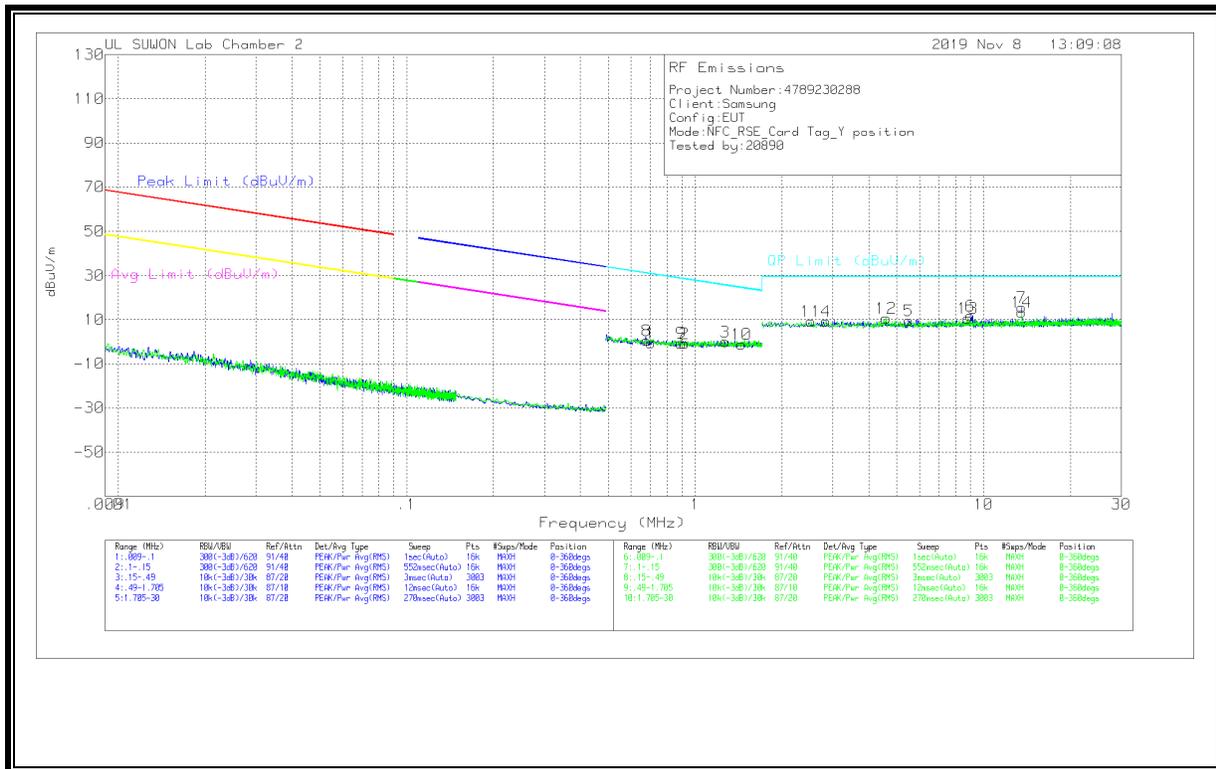
Pk - Peak detector

\*\*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	Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.70098	19.76	Pk	19.7	.1	-40	-.44	30.7	-31.14	0-360
2	.92058	19.26	Pk	19.8	.2	-40	-.74	28.34	-29.08	0-360
3	1.27033	20.04	Pk	19.8	.2	-40	.04	25.55	-25.51	0-360
4	2.84543	29.2	Pk	19.9	.3	-40	9.4	29.5	-20.1	0-360
5	5.50328	29.39	Pk	19.8	.4	-40	9.59	29.5	-19.91	0-360
6	9.00938	31.27	Pk	20	.5	-40	11.77	29.5	-17.73	0-360
**7	13.56165	35.04	Pk	20	.5	-40	15.54	29.5	-13.96	0-360

[Face Off]

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
8	.67799	20.69	Pk	19.7	.1	-40	.49	30.99	-30.5	0-360
9	.89546	19.32	Pk	19.8	.2	-40	-.68	28.58	-29.26	0-360
10	1.44897	18.96	Pk	19.8	.2	-40	-1.04	24.41	-25.45	0-360
11	2.51555	29.16	Pk	19.9	.3	-40	9.36	29.5	-20.14	0-360
12	4.58905	30.43	Pk	19.8	.3	-40	10.53	29.5	-18.97	0-360
13	8.82088	30.28	Pk	20	.4	-40	10.68	29.5	-18.82	0-360
**14	13.56165	32.89	Pk	20	.5	-40	13.39	29.5	-16.11	0-360

Pk - Peak detector

\*\*Fundamental

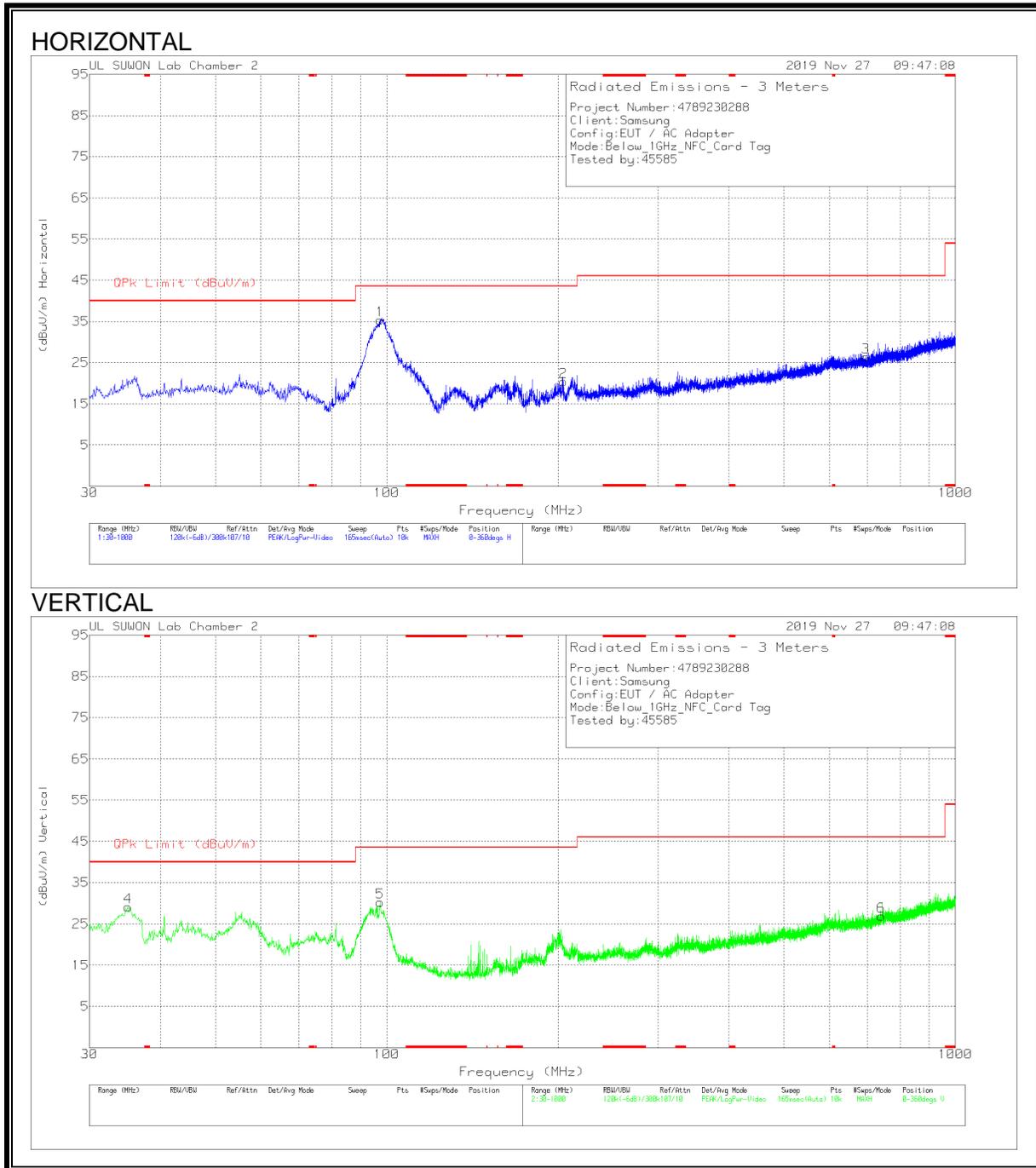
Note 1: The data for marker number 7 and 14 are the fundamental signal.

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]



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	97.415	49.08	Pk	17.5	-31.3	35.28	43.52	-8.24	0-360	300	H
2	204.212	33.79	Pk	17.3	-30.7	20.39	43.52	-23.13	0-360	200	H
3	695.42	30.21	Pk	25.6	-29.4	26.41	46.02	-19.61	0-360	400	H
4	35.044	44.22	Pk	16.7	-31.8	29.12	40	-10.88	0-360	100	V
5	97.415	44.08	Pk	17.5	-31.3	30.28	43.52	-13.24	0-360	100	V
6	740.719	29.52	Pk	26.5	-29.2	26.82	46.02	-19.2	0-360	200	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.

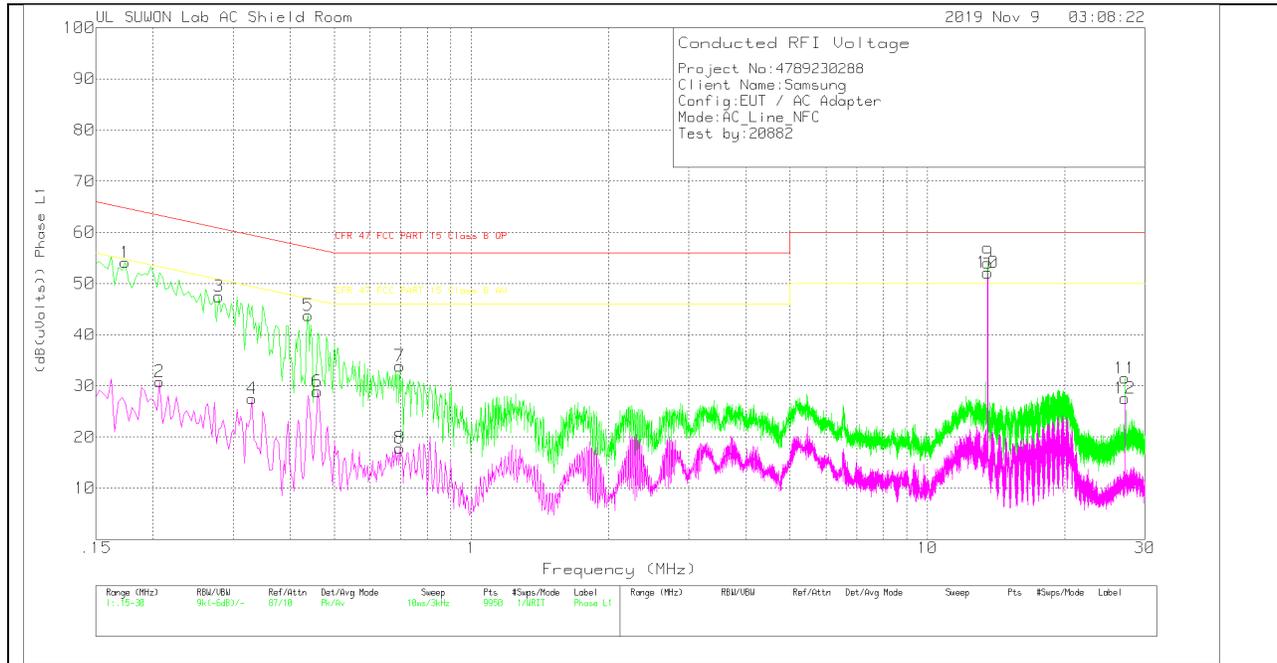
Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

No non-compliance noted:

**WORST EMISSIONS**

**LINE 1 PLOT**



**LINE 1 RESULTS**

Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_Wh 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	.174	43.84	Pk	10.1	.2	54.14	64.77	-10.63	-	-
2	.207	20.72	Av	9.9	.2	30.82	-	-	53.32	-22.5
3	.279	37.59	Pk	9.7	.2	47.49	60.85	-13.36	-	-
4	.33	17.49	Av	9.8	.2	27.49	-	-	49.45	-21.96
5	.438	33.69	Pk	9.9	.2	43.79	57.1	-13.31	-	-
6	.459	18.81	Av	9.9	.2	28.91	-	-	46.71	-17.8
7	.696	23.76	Pk	9.9	.2	33.86	56	-22.14	-	-
8	.696	7.77	Av	9.9	.2	17.87	-	-	46	-28.13
9	13.56	43.53	Pk	10.1	.4	54.03	60	-5.97	-	-
10	13.56	41.63	Av	10.1	.4	52.13	-	-	50	2.13
11	27.12	20.6	Pk	10.6	.3	31.5	60	-28.5	-	-
12	27.12	16.65	Av	10.6	.3	27.55	-	-	50	-22.45

Pk - Peak detector

Av - Average detection

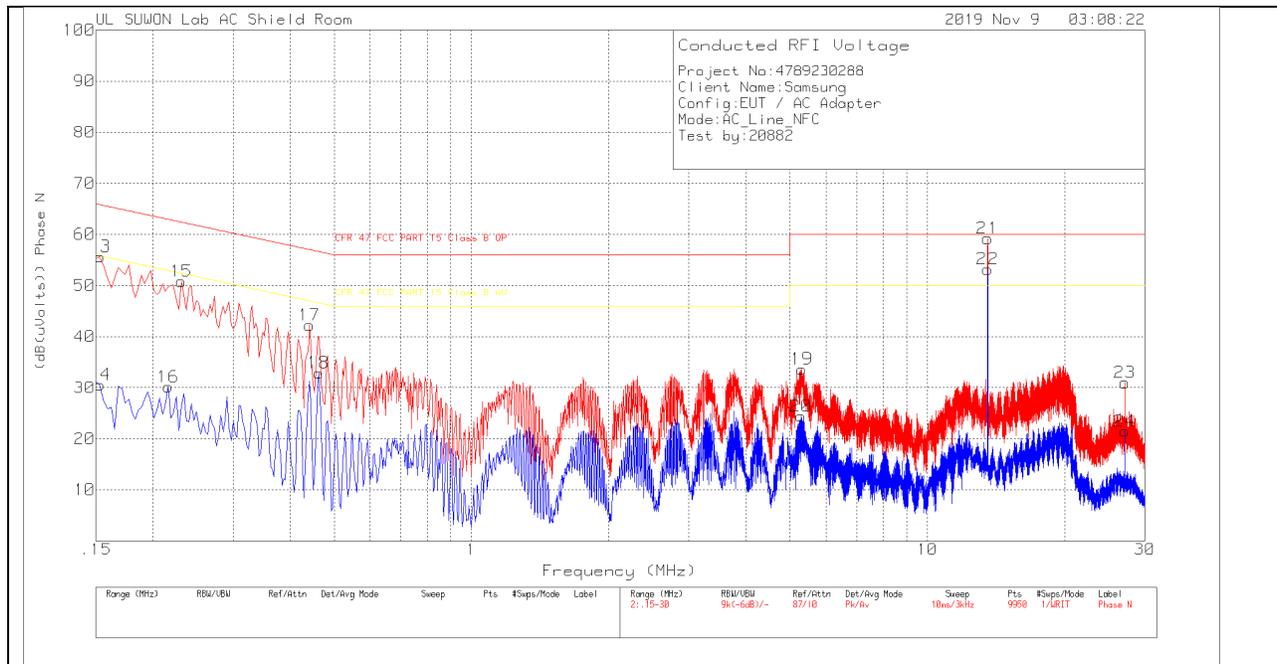
Quasi-Peak Emissions

Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_Wh 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)
13.5602	43.05	Qp	10.1	.4	53.55	60	-6.45	-	-

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	.153	45.75	Pk	9.8	.1	55.65	65.84	-10.19	-	-
14	.153	20.68	Av	9.8	.1	30.58	-	-	55.84	-25.26
15	.231	40.78	Pk	9.8	.2	50.78	62.41	-11.63	-	-
16	.216	20.15	Av	9.8	.2	30.15	-	-	52.97	-22.82
17	.441	32.14	Pk	9.9	.2	42.24	57.04	-14.8	-	-
18	.462	22.79	Av	9.9	.2	32.89	-	-	46.66	-13.77
19	5.307	23.53	Pk	9.8	.3	33.63	60	-26.37	-	-
20	5.28	14.31	Av	9.8	.3	24.41	-	-	50	-25.59
21	13.56	48.72	Pk	10.1	.4	59.22	60	-.78	-	-
22	13.56	42.71	Av	10.1	.4	53.21	-	-	50	3.21
23	27.12	19.99	Pk	10.7	.3	30.99	60	-29.01	-	-
24	27.12	10.49	Av	10.7	.3	21.49	-	-	50	-28.51

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)
13.5602	46.93	Qp	10.1	.4	57.43	60	-2.57	-	-

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

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)
3.86	50	13.560005315	0.066	13.560005285	0.068	13.560005212	0.074	13.560005198	0.075	100
3.86	40	13.560005507	0.052	13.560005475	0.054	13.560005439	0.057	13.560005411	0.059	100
3.86	30	13.560005826	0.028	13.560005799	0.030	13.560005714	0.037	13.560005639	0.042	100
<b>3.86</b>	<b>20</b>	<b>13.560006212</b>	<b>0</b>	<b>13.560006204</b>	0.001	<b>13.560006133</b>	0.006	<b>13.560006107</b>	0.008	<b>100</b>
3.86	10	13.560006251	-0.003	13.560006276	-0.005	13.560006322	-0.008	13.560006303	-0.007	100
3.86	0	13.560007303	-0.080	13.560007380	-0.086	13.560007584	-0.101	13.560008173	-0.145	100
3.86	-10	13.560009375	-0.233	13.560009467	-0.240	13.560009698	-0.257	13.560010396	-0.309	100
3.86	-20	13.560011108	-0.361	13.560011236	-0.371	13.560011183	-0.367	13.560011139	-0.363	100
3.86	-30	13.560009339	-0.231	13.560009366	-0.233	13.560009224	-0.222	13.560009017	-0.207	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>3.86</b>	<b>20</b>	<b>13.560006212</b>	<b>0</b>	<b>13.560006204</b>	0.001	<b>13.560006133</b>	0.006	<b>13.560006107</b>	0.008	<b>100</b>
4.43	20	13.560005784	0.032	<b>13.560005781</b>	0.032	<b>13.560005779</b>	0.026	<b>13.560005776</b>	0.032	100
3.60	20	13.560005782	0.032	<b>13.560005780</b>	0.032	<b>13.560005778</b>	0.026	<b>13.560005774</b>	0.032	100

No non-compliance noted.

**END OF REPORT**