CERTIFICATION TEST REPORT

Report Number. : 4789247757-E10V2

Applicant	:	SAMSUNG ELECTRONICS CO., LTD. 129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI, GYEONGGI-DO, 16677, KOREA
Model	:	SM-G985F/DS, SM-G985F
FCC ID	:	A3LSMG985F
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:
December 17, 2019

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

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	12/12/19	Initial issue	Sangyun Kim
V2	12/17/19	Updated to address TCB's question	Sangyun Kim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION:	GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, ANT+, NFC and WPT
MODEL NUMBER:	SM-G985F/DS, SM-G985F
SERIAL NUMBER:	R3CM90FSA4H (CONDUCTED, Original) R3CM90FS8HH (RADIATED, Original); R38MA0KHLER (Spot check);
DATE TESTED:	OCT 25, 2019 – NOV 27, 2019 (Original); NOV 15, 2019 – NOV 27, 2019 (Spot check);

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:

Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Sangyun Kim
Suwon Lab Engineer
UL Korea, Ltd.

1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMG986B DXX NFC(FCC CFR 47 Part 15C). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

1.2. DIFFERENCE

The FCC ID: A3LSMG985F shares the same enclosure and circuit board as FCC ID: A3LSMG986B. The NFC antennas and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMG986B remains representative of FCC ID: A3LSMG985F. The test data of FCC ID: A3LSMG986B being submitted for this application to cover NFC features.

1.3. SPOT CHECK VERIFICATION DATA

Mode	Test Item	Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
				SM-G986B/DS	SM-G985F/DS		
				FCC ID : A3LSMG986B	FCC ID : A3LSMG985F		
NFC	Fundamental	13.56 MHz	84.0 dBuV/m	18.28 dBuV/m	19.52 dBuV/m	1.24 dB	Loop antenna - Face on
	Emission	9.86705 MHz	29.5 dBuV/m	11.48 dBuV/m	13.34 dBuV/m	1.86 dB	Loop antenna - Face on Noise floor level

Comparison of two models, upper deviation is within 3dB range and all test results are under FCC Technical Limits.

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1.4. REFERENCE DETAIL

Reference application that contains the reused reference data in the individual test reports:

Equipment Class	Reference FCC ID (Parent)	Application Type	Reference Test report number	Exhibit Type	Variant Test Report Number	Data Re-used
PCE	A3LSMG986B	Original Grant	4789219881-E2	Test Report	4789247757-E2	All
DTS	A3LSMG986B	Original Grant	4789219881-E3 (802.11b/g/n)	Test Report	4789247757-E3 (802.11b/g/n)	All
			4789219881-E4 (802.11ax)	Test Report	4789247757-E4 (802.11ax)	All
			4789219881-E5 Bluetooth LE	Test Report	4789247757-E5 Bluetooth LE	All
DSS	A3LSMG986B	Original Grant	4789219881-E6 (Bluetooth)	Test Report	4789247757-E6 (Bluetooth)	All
NII	A3LSMG986B	Original Grant	4789219881-E7 (802.11a/n/ac)	Test Report	4789247757-E7 (802.11a/n/ac)	All
			4789219881-E8 (802.11ax)	Test Report	4789247757-E8 (802.11ax)	All
DXX	A3LSMG986B	Original Grant	4789219881-E9 (ANT+)	Test Report	4789247757-E9 (ANT+)	All
			4789219881-E10 (NFC)	Test Report	4789247757-E10 (NFC)	All
DCD	A3LSMG986B	Original Grant	4789219881-E11 (WPT)	Test Report	4789247757-E11 (WPT)	All

For this application the data reuse is summarized below for each equipment class:

Equipment Class	Reference FCC ID (Parent)	Application Type	Test Item	Data Re-used
PCE	A3LSMG986B	Original Grant	WWAN	All except SAR (full test), HAC (full test)
DTS	A3LSMG986B	Original Grant	BLE	All
			WLAN	All except SAR (full test), HAC (full test)
			WLAN 802.11ax	All except HAC (full test)
DSS	A3LSMG986B	Original Grant	BT	All except SAR (full test)
NII	A3LSMG986B	Original Grant	WLAN	All except SAR (full test), HAC (full test)
			WLAN 802.11ax	All except HAC (full test)
DXX	A3LSMG986B	Original Grant	ANT+	All
			NFC	All
DCD	A3LSMG986B	Original Grant	WPT	All except RF exposure

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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
☒ Chamber 1
☒ Chamber 2
☐ Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at http://www.iasonline.org/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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.35 dB
Radiated Disturbance, 9 kHz to 30 MHz	1.72 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.49 dB

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

4.4. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 1, Clause 4.4.2 in IEC Guide 115:2007.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

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-G985F/DS, SM-G985F.
These models are identical in hardware except SM-G985F has single SIM tray and model.
With some pre-scan, model SM-G985F/DS was set for spot check test.

5.2. MAXIMUM E-FIELD STRENGTH

The testing was performed at 3 meter. The transmitter maximum E-field at 30m distance is 18.28 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.

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5.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37M5DX86X1SE3	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.

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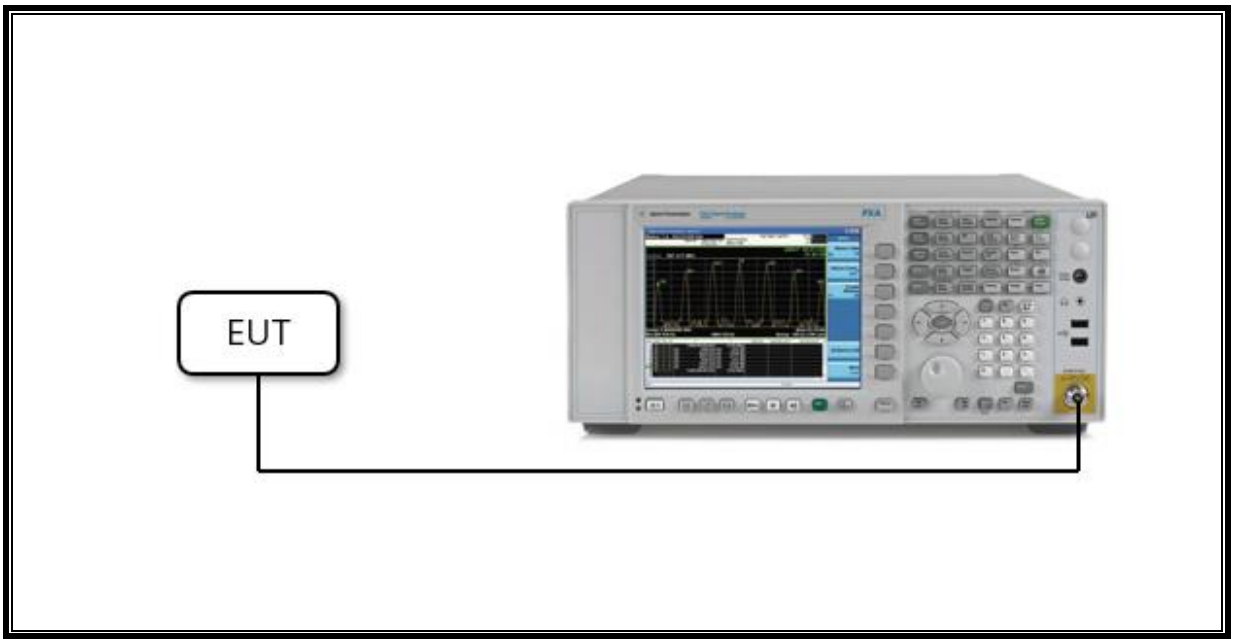
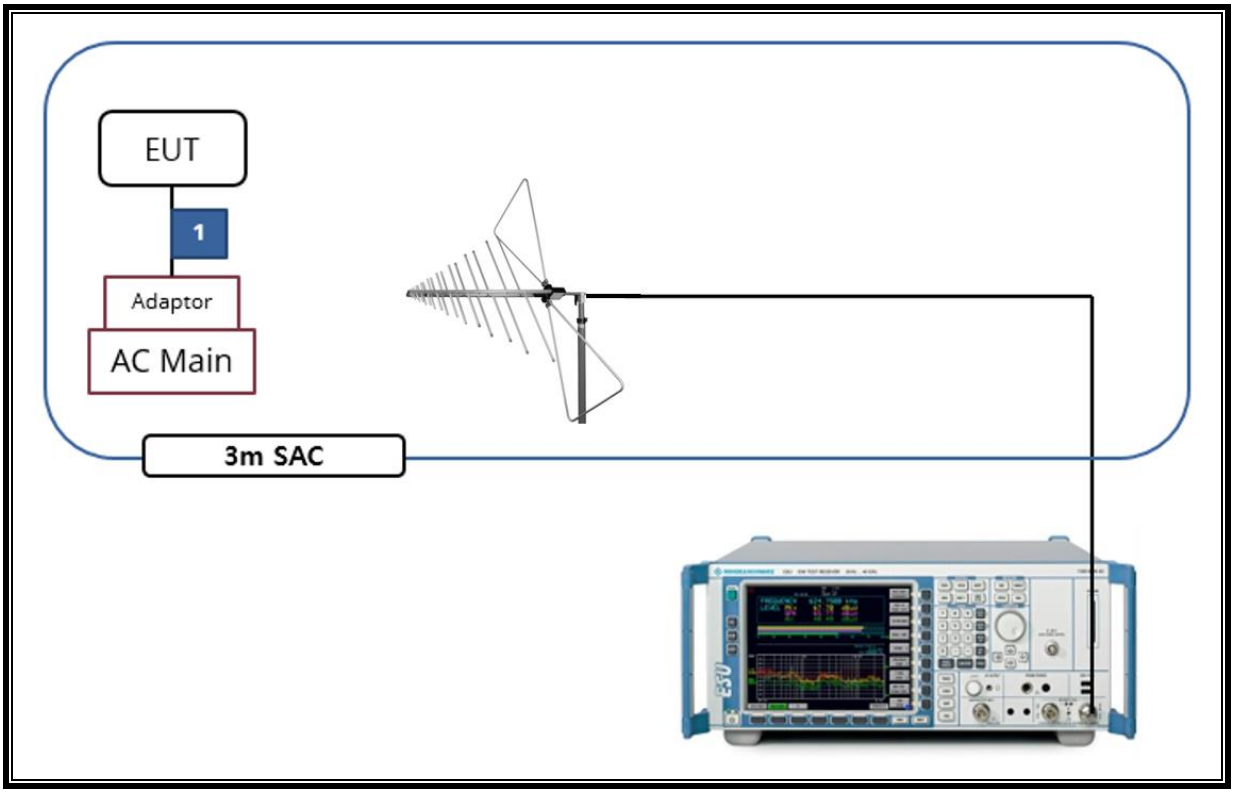
SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



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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	PASTERNACK	PE7087-10	A001	08-08-20
Attenuator	PASTERNACK	PE7087-10	A008	08-08-20
Attenuator	PASTERNACK	PE7004-10	2	08-06-20
Attenuator	PASTERNACK	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

Antenna, Loop, 9kHz-30MHz			
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

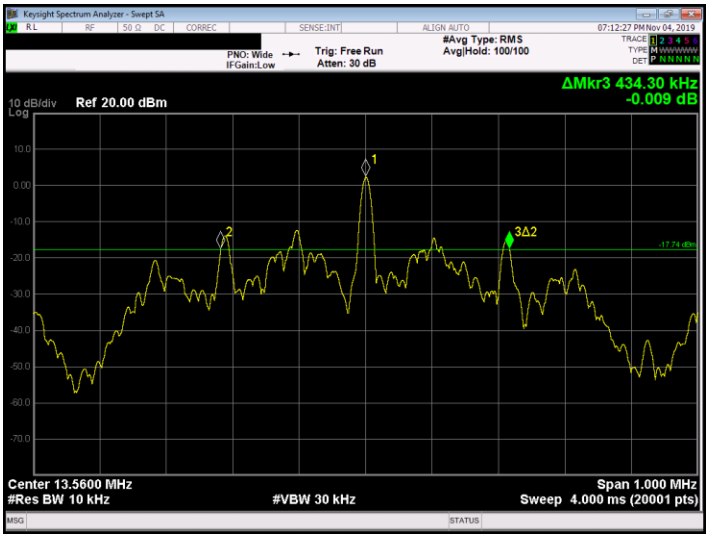
TEST PROCEDURE

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]	20dB Bandwidth [KHz]
13.56	434.30

20dB Bandwidth Plot



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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

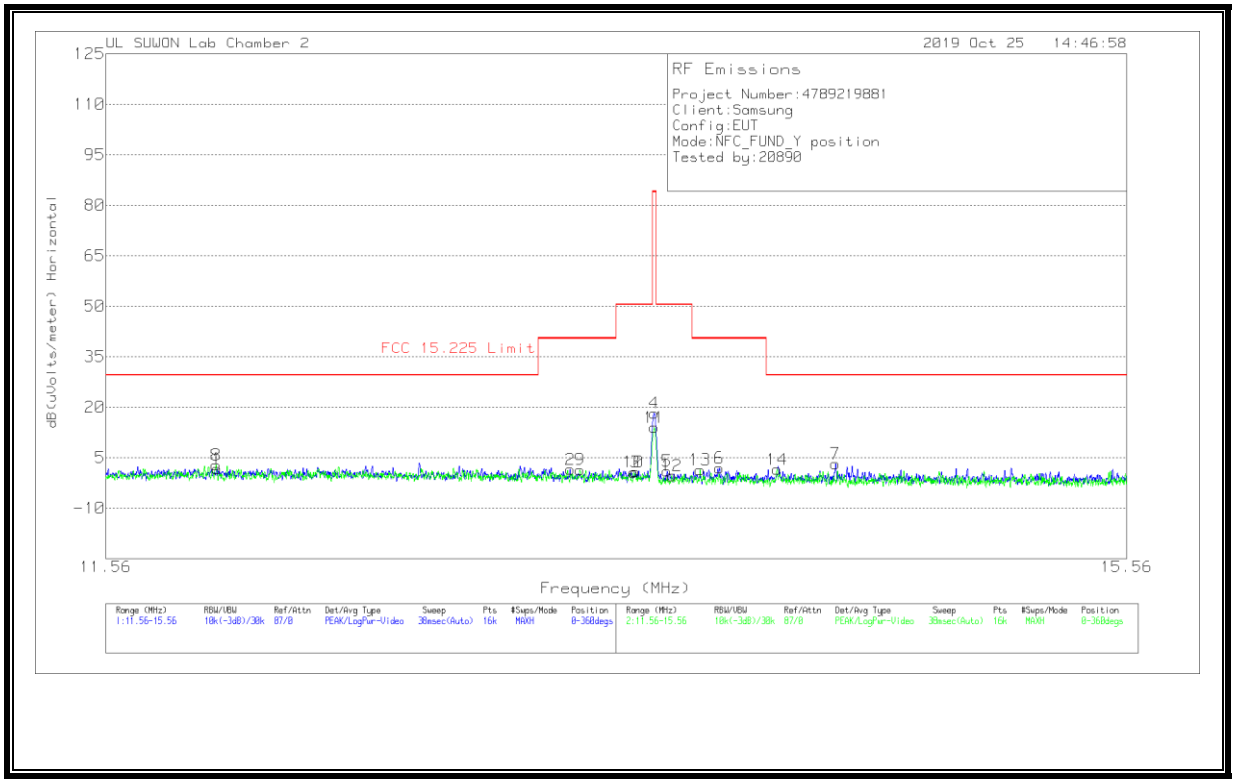
ANSI C63.10-2013

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 10th 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	11.93988	21.26	Pk	20	-40	.5	1.76	29.54	-27.78	0-360
2	13.23263	21.03	Pk	20	-40	.5	1.53	40.51	-38.98	0-360
3	13.48638	20.34	Pk	20	-40	.5	.84	50.5	-49.66	0-360
**4	13.56025	37.78	Pk	20	-40	.5	18.28	84	-65.72	0-360
5	13.6115	20.45	Pk	20	-40	.6	1.05	50.5	-49.45	0-360
6	13.82013	21.35	Pk	20	-40	.6	1.95	40.51	-38.56	0-360
7	14.29588	22.65	Pk	20	-40	.6	3.25	29.54	-26.29	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	11.93713	22.35	Pk	20	-40	.5	2.85	29.54	-26.69	0-360
9	13.27038	20.98	Pk	20	-40	.5	1.48	40.51	-39.03	0-360
10	13.479	20.25	Pk	20	-40	.5	.75	50.5	-49.75	0-360
**11	13.56025	33.54	Pk	20	-40	.5	14.04	84	-69.96	0-360
12	13.62963	19.09	Pk	20	-40	.6	-.31	50.5	-50.81	0-360
13	13.74288	20.83	Pk	20	-40	.6	1.43	40.51	-39.08	0-360
14	14.05463	20.93	Pk	20	-40	.6	1.53	29.54	-28.01	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.

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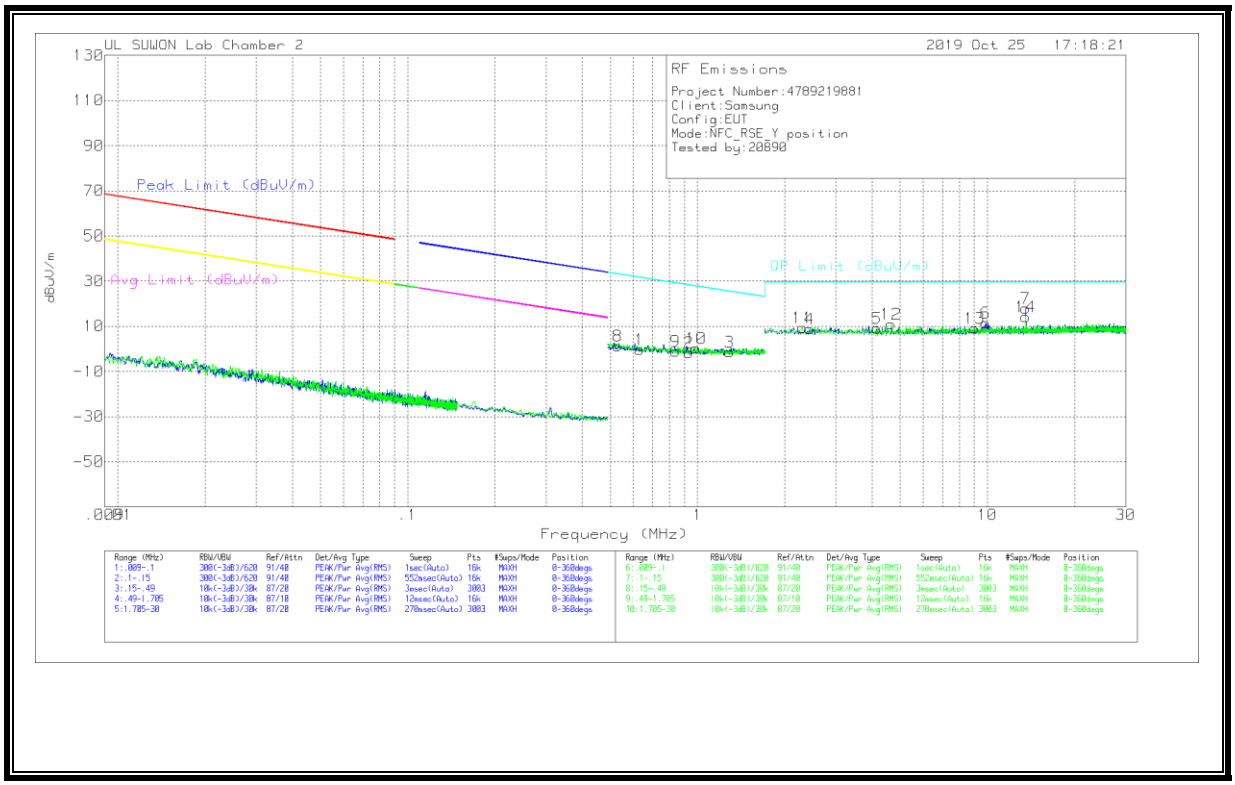
8.1.2. SPURIOUS EMISSION 0.009 TO 30 MHz



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	.63258	19.94	Pk	19.7	.1	-40	-.26	31.59	-31.85	0-360
2	.93414	18.42	Pk	19.8	.2	-40	-1.58	28.21	-29.79	0-360
3	1.28754	18.75	Pk	19.8	.2	-40	-1.25	25.43	-26.68	0-360
4	2.43073	28.78	Pk	19.9	.2	-40	8.88	29.5	-20.62	0-360
5	4.16493	29	Pk	19.8	.3	-40	9.1	29.5	-20.4	0-360
6	9.86705	30.98	Pk	20	.5	-40	11.48	29.5	-18.02	0-360
**7	13.56165	37.46	Pk	20	.5	-40	17.96	29.5	-11.54	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	.53203	21.5	Pk	19.7	.1	-40	1.3	33.09	-31.79	0-360
9	.83873	18.93	Pk	19.8	.2	-40	-1.07	29.14	-30.21	0-360
10	.98753	20.3	Pk	19.8	.2	-40	.3	27.73	-27.43	0-360
11	2.29878	29.32	Pk	19.9	.2	-40	9.42	29.5	-20.08	0-360
12	4.65503	30.89	Pk	19.8	.3	-40	10.99	29.5	-18.51	0-360
13	9.04708	28.66	Pk	20	.5	-40	9.16	29.5	-20.34	0-360
**14	13.56165	33.78	Pk	20	.5	-40	14.28	29.5	-15.22	0-360

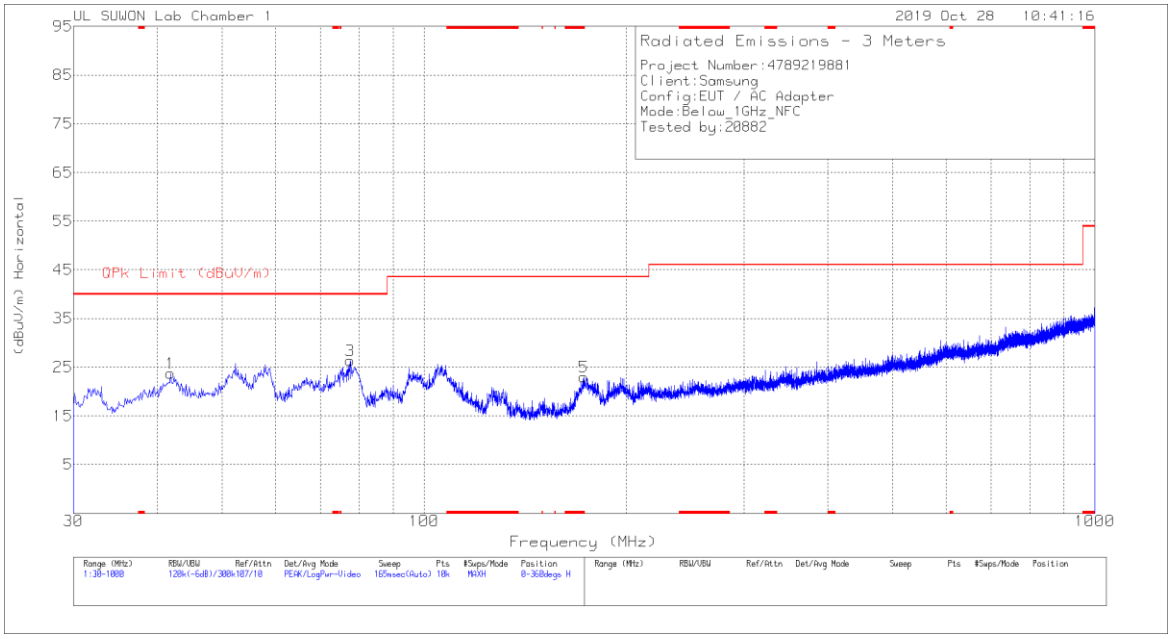
Pk - Peak detector
**Fundamental

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.

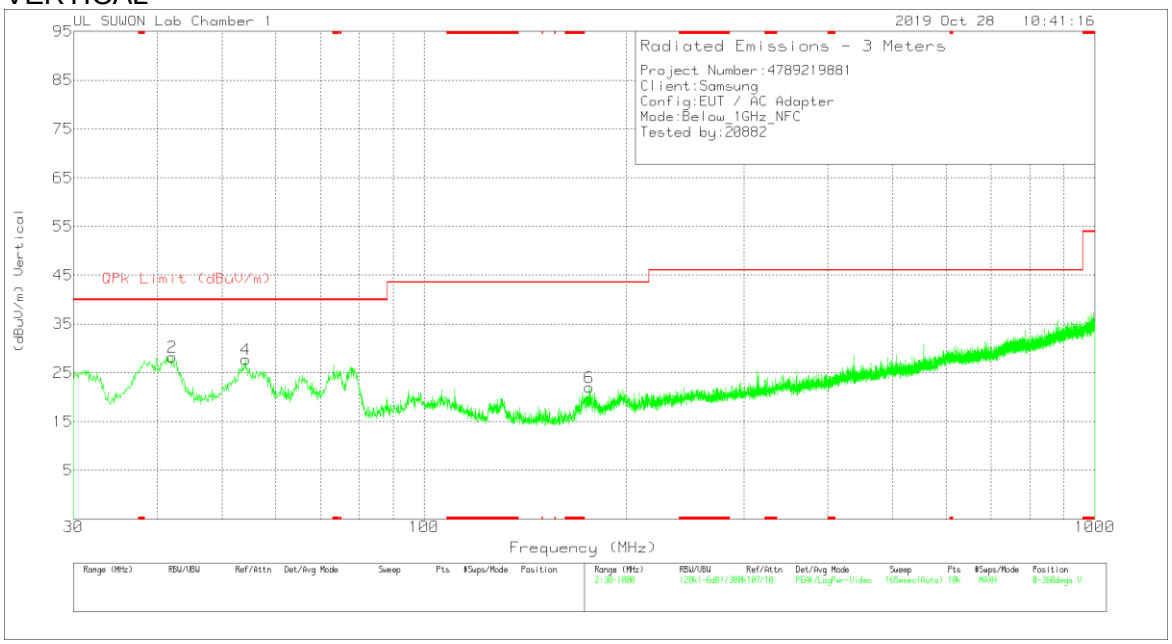
Note 2: Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.

8.1.3. TX SPURIOUS EMISSION 30 TO 1000 MHz

HORIZONTAL



VERTICAL



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	41.834	34.36	Pk	19.1	-29.7	23.76	40	-16.24	0-360	300	H
3	77.627	42.67	Pk	12.8	-29.1	26.37	40	-13.63	0-360	200	H
5	* 172.881	35.87	Pk	14.9	-27.8	22.97	43.52	-20.55	0-360	100	H
2	42.125	38.91	Pk	19.1	-29.8	28.21	40	-11.79	0-360	100	V
4	54.153	37.68	Pk	19.5	-29.4	27.78	40	-12.22	0-360	100	V
6	176.179	34.66	Pk	15.1	-27.8	21.96	43.52	-21.56	0-360	200	V

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

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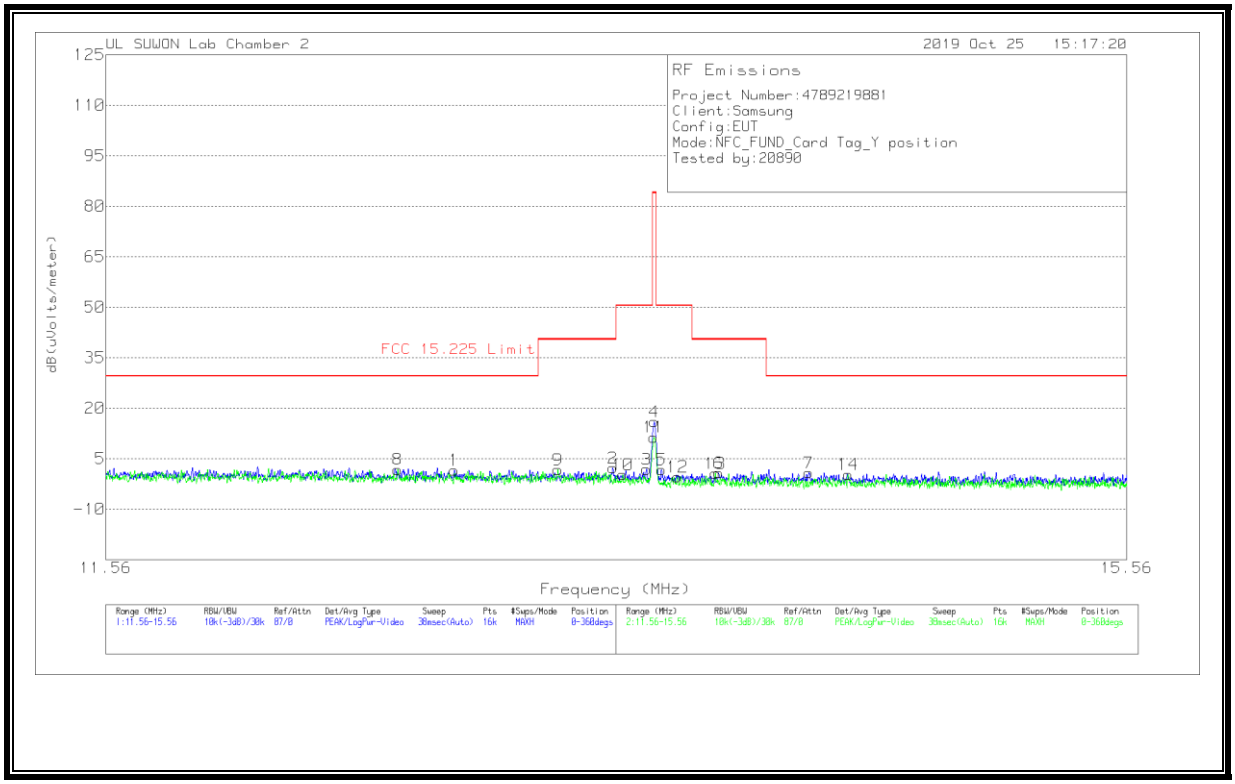
8.1.4. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz) [EUT with passive TAG mode]



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	12.79413	21.12	Pk	20	-40	.5	1.62	29.54	-27.92	0-360
2	13.39788	21.77	Pk	20	-40	.5	2.27	40.51	-38.24	0-360
3	13.53038	21.38	Pk	20	-40	.5	1.88	50.5	-48.62	0-360
**4	13.56025	35.5	Pk	20	-40	.5	16	84	-68	0-360
5	13.58913	21.2	Pk	20	-40	.6	1.8	50.5	-48.7	0-360
6	13.81688	20.21	Pk	20	-40	.6	.81	40.51	-39.7	0-360
7	14.18488	20.25	Pk	20	-40	.6	.85	29.54	-28.69	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	12.58538	21.33	Pk	20	-40	.5	1.83	29.54	-27.71	0-360
9	13.1855	21.24	Pk	20	-40	.5	1.74	40.51	-38.77	0-360
10	13.43688	19.78	Pk	20	-40	.5	.28	50.5	-50.22	0-360
**11	13.55888	30.92	Pk	20	-40	.5	11.42	84	-72.58	0-360
12	13.65275	19	Pk	20	-40	.6	-.4	50.5	-50.9	0-360
13	13.80363	20.02	Pk	20	-40	.6	.62	40.51	-39.89	0-360
14	14.34763	19.76	Pk	20	-40	.6	.36	29.54	-29.18	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.

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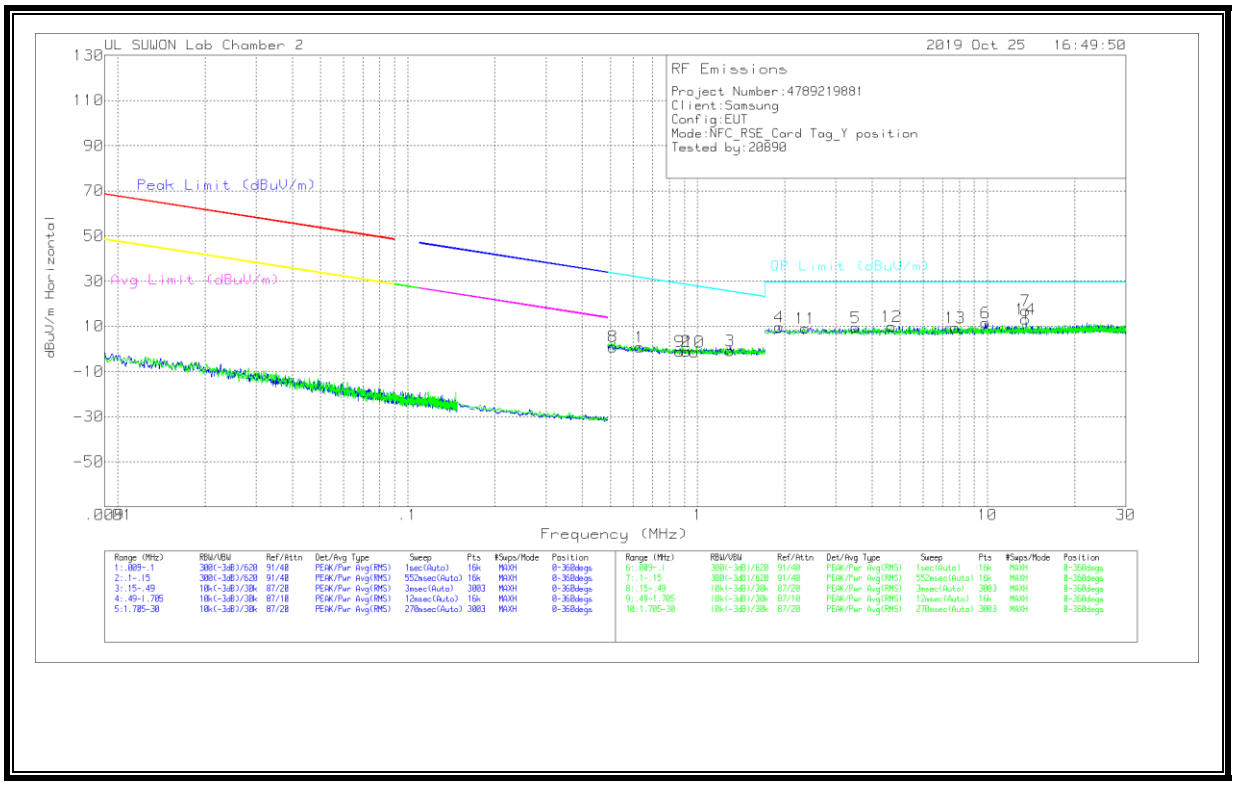
8.1.5. SPURIOUS EMISSION 0.09 TO 30 MHz [EUT with passive TAG mode]



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	.63083	20.91	Pk	19.7	.1	-40	.71	31.61	-30.9	0-360
2	.91579	18.97	Pk	19.8	.2	-40	-1.03	28.38	-29.41	0-360
3	1.29651	19.24	Pk	19.8	.2	-40	-.76	25.37	-26.13	0-360
4	1.91235	29.7	Pk	19.8	.2	-40	9.7	29.5	-19.8	0-360
5	3.5146	29.09	Pk	19.9	.3	-40	9.29	29.5	-20.21	0-360
6	9.8482	31.08	Pk	20	.5	-40	11.58	29.5	-17.92	0-360
**7	13.56165	36.5	Pk	20	.5	-40	17	29.5	-12.5	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	.51189	21.13	Pk	19.7	.1	-40	.93	33.42	-32.49	0-360
9	.86905	18.98	Pk	19.8	.2	-40	-1.02	28.84	-29.86	0-360
10	.97454	18.75	Pk	19.8	.2	-40	-1.25	27.84	-29.09	0-360
11	2.35533	28.99	Pk	19.9	.2	-40	9.09	29.5	-20.41	0-360
12	4.66445	29.78	Pk	19.8	.3	-40	9.88	29.5	-19.62	0-360
13	7.737	29.08	Pk	19.9	.4	-40	9.38	29.5	-20.12	0-360
**14	13.56165	32.69	Pk	20	.5	-40	13.19	29.5	-16.31	0-360

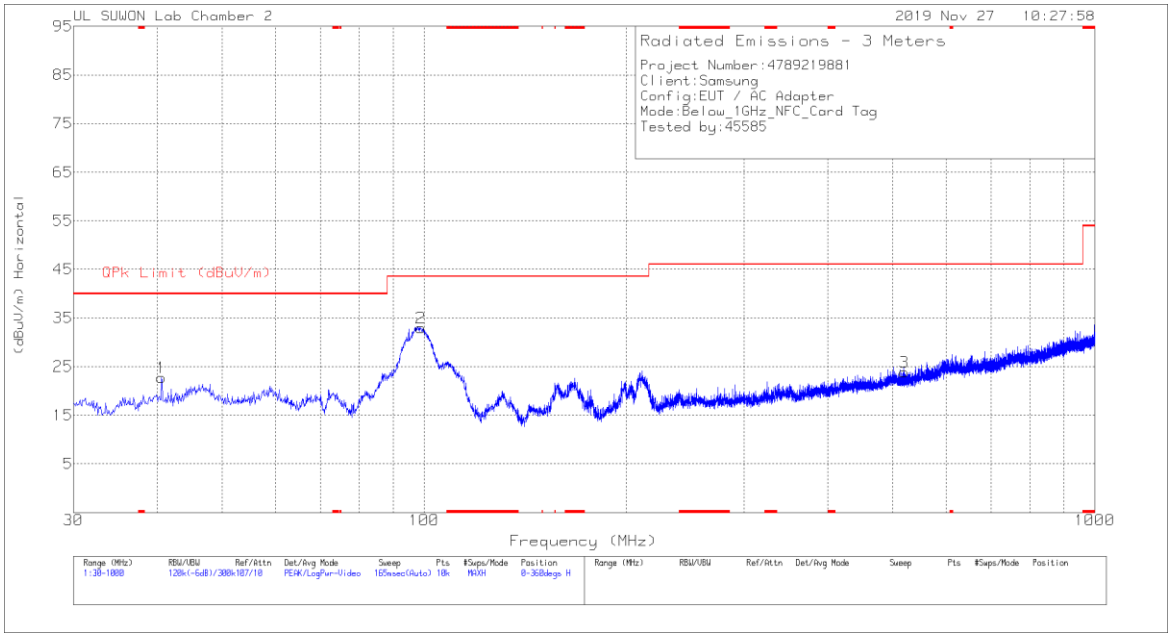
Pk - Peak detector
**Fundamental

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]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	40.573	35.79	Pk	18.9	-31.9	22.79	40	-17.21	0-360	400	H
2	98.87	46.58	Pk	17.7	-31.3	32.98	43.52	-10.54	0-360	300	H
3	519.753	30.41	Pk	23.2	-29.7	23.91	46.02	-22.11	0-360	400	H
4	40.67	43.14	Pk	18.9	-31.8	30.24	40	-9.76	0-360	100	V
5	95.96	44.46	Pk	17.4	-31.3	30.56	43.52	-12.96	0-360	100	V
6	495.697	30.04	Pk	23.3	-29.8	23.54	46.02	-22.48	0-360	300	V

Pk - Peak detector

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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 50µH/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 (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
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.

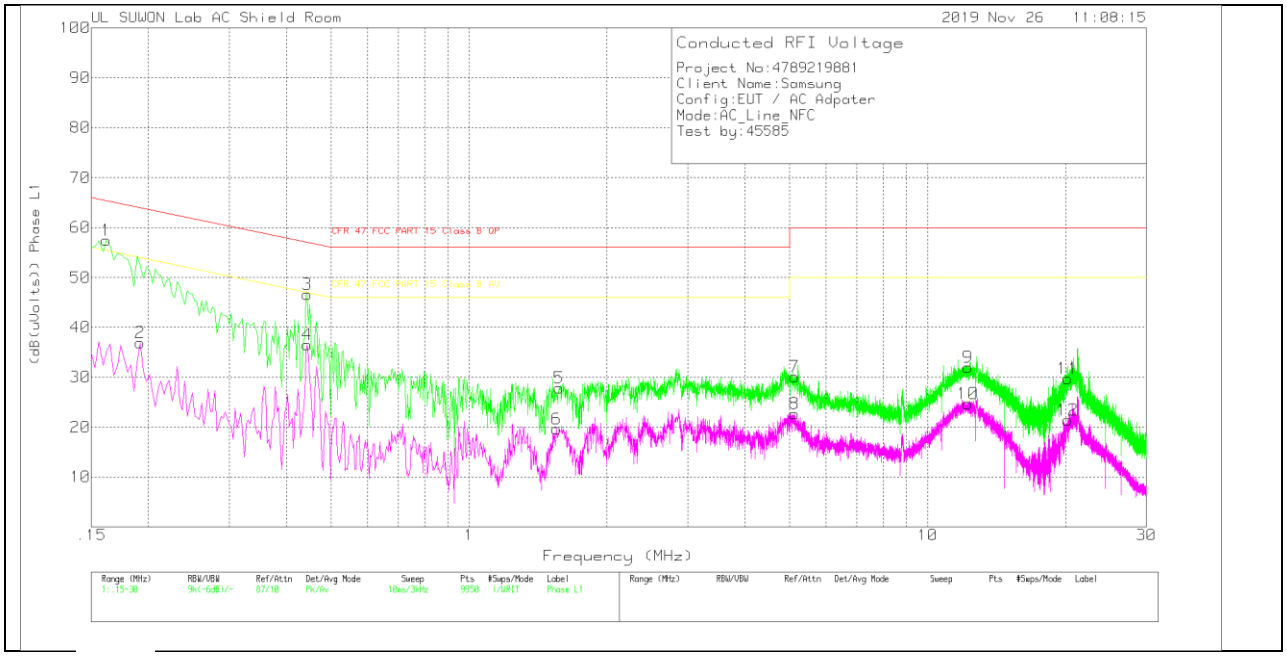
Line conducted data is recorded for both NEUTRAL and HOT lines.

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_With Ex_L1[dB]	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
1	.162	47.37	Pk	10	.1	57.47	65.36	-7.89	-	-
2	.192	26.68	Av	10	.2	36.88	-	-	53.95	-17.07
3	.444	36.52	Pk	9.9	.2	46.62	56.99	-10.37	-	-
4	.444	26.44	Av	9.9	.2	36.54	-	-	46.99	-10.45
5	1.572	17.8	Pk	9.8	.3	27.9	56	-28.1	-	-
6	1.551	9.52	Av	9.8	.3	19.62	-	-	46	-26.38
7	5.13	19.99	Pk	9.8	.3	30.09	60	-29.91	-	-
8	5.133	12.58	Av	9.8	.3	22.68	-	-	50	-27.32
9	12.255	21.67	Pk	10	.3	31.97	60	-28.03	-	-
10	12.255	14.41	Av	10	.3	24.71	-	-	50	-25.29
11	20.193	19.06	Pk	10.3	.4	29.76	60	-30.24	-	-
12	20.223	10.76	Av	10.3	.4	21.46	-	-	50	-28.54

Pk - Peak detector
Av - Average detection

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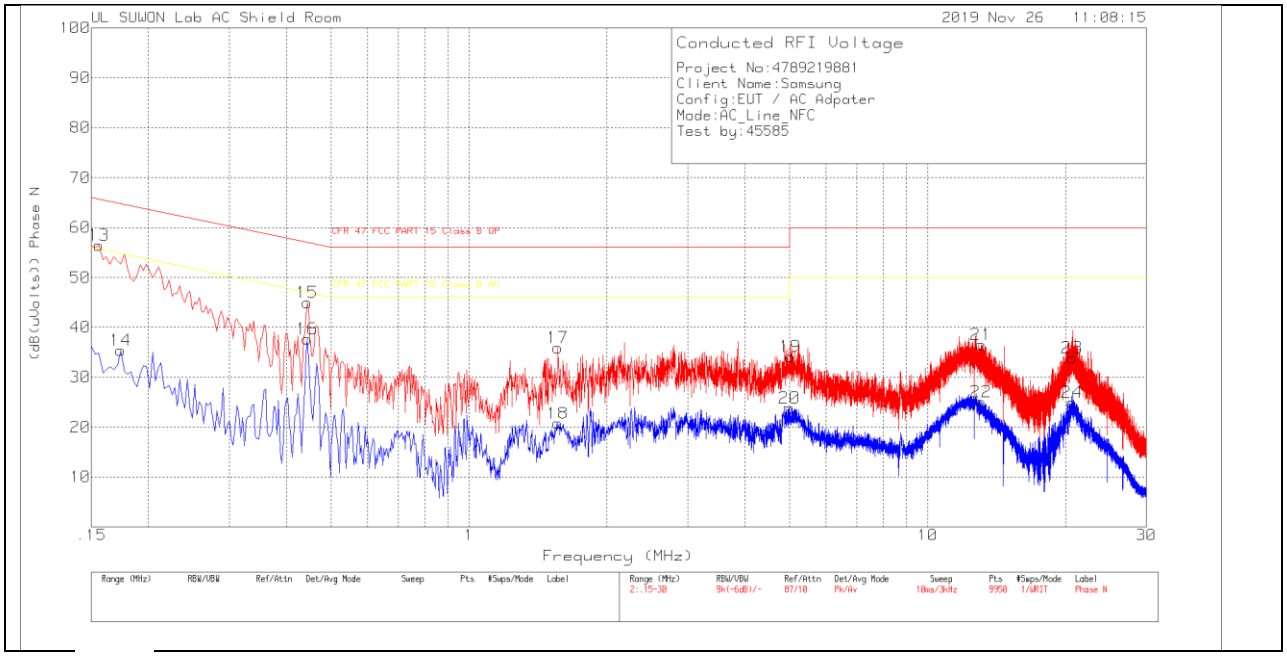
LINE 2 PLOT



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LINE 2 RESULTS

Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13	.156	46.45	Pk	9.9	.1	56.45	65.67	-9.22	-	-
14	.174	25.25	Av	10	.2	35.45	-	-	54.77	-19.32
15	.444	34.9	Pk	9.9	.2	45	56.99	-11.99	-	-
16	.444	27.6	Av	9.9	.2	37.7	-	-	46.99	-9.29
17	1.563	25.81	Pk	9.8	.3	35.91	56	-20.09	-	-
18	1.563	10.65	Av	9.8	.3	20.75	-	-	46	-25.25
19	5.013	24.03	Pk	9.8	.3	34.13	60	-25.87	-	-
20	4.995	13.76	Av	9.8	.3	23.86	-	-	46	-22.14
21	13.08	26.08	Pk	10.1	.4	36.58	60	-23.42	-	-
22	13.08	14.63	Av	10.1	.4	25.13	-	-	50	-24.87
23	20.643	23.09	Pk	10.4	.4	33.89	60	-26.11	-	-
24	20.643	14.17	Av	10.4	.4	24.97	-	-	50	-25.03

Pk - Peak detector
Av - Average detection

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10. FREQUENCY STABILITY

LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ±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 @ 20ºC Limit: ± 100 ppm = 1.356 kHz										
Power Supply	Envir.	Frequency Deviation Measureed with Time Elapse								
(Vdc)	Temp (ºC)	Start up (MHz)	Delta (ppm)	@ 2mins (MHz)	Delta (ppm)	@ 5mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
3.86	50	13.560005894	-0.008	13.560005794	0.000	13.560005732	0.004	13.560005685	0.008	100
3.86	40	13.560005769	0.002	13.560005847	-0.004	13.560005925	-0.010	13.560006024	-0.017	100
3.86	30	13.560005618	0.013	13.560005544	0.018	13.560005531	0.019	13.560005528	0.019	100
3.86	***20***	***13.560005791***	***0***	***13.560005769***	0.002	***13.560005766***	0.002	***13.560005760***	0.002	***100***
3.86	10	13.560007135	-0.099	13.560007424	-0.120	13.560007612	-0.134	13.560007713	-0.142	100
3.86	0	13.560008929	-0.231	13.560009228	-0.253	13.560009403	-0.266	13.560009575	-0.279	100
3.86	-10	13.560011290	-0.406	13.560011379	-0.412	13.560011405	-0.414	13.560011430	-0.416	100
3.86	-20	13.560010846	-0.373	13.560010486	-0.346	13.560010264	-0.330	13.560010063	-0.315	100
3.86	-30	13.560008844	-0.225	13.560008784	-0.221	13.560008761	-0.219	13.560008742	-0.218	100

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz										
Power Supply	Envir.	Frequency Deviation Measureed with Time Elapse								
(Vdc)	Temp (ºC)	Start up (MHz)	Delta (ppm)	@ 2mins (MHz)	Delta (ppm)	@ 5mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
3.86	***20***	***13.560005791***	***0***	***13.560005769***	0.002	***13.560005766***	0.002	***13.560005760***	0.002	***100***
4.43	20	13.560005784	0.001	***13.560005781***	0.001	***13.560005779***	-0.001	***13.560005776***	0.001	100
3.60	20	13.560005782	0.001	***13.560005780***	0.001	***13.560005778***	-0.001	***13.560005774***	0.001	100

No non-compliance noted.

END OF REPORT