



FCC CFR47 PART 15 SUBPART C

NFC

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER : SM-N970F/DS, SM-N970F, SM-N970X

FCC ID: A3LSMN970F

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TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	06/26/19	Initial issue	Junwhan Lee
V2	06/28/19	Updated to address TCB's question	Junwhan Lee
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TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	4
2. TEST METHODOLOGY	5
3. FACILITIES AND ACCREDITATION	5
4. CALIBRATION AND UNCERTAINTY	5
4.1. MEASURING INSTRUMENT CALIBRATION.....	5
4.2. SAMPLE CALCULATION.....	5
4.3. MEASUREMENT UNCERTAINTY	5
5. EQUIPMENT UNDER TEST	6
5.1. DESCRIPTION OF EUT.....	6
5.2. MAXIMUM E-FIELD STRENGTH.....	6
5.3. WORST-CASE CONFIGURATION AND MODE	6
5.4. DESCRIPTION OF TEST SETUP	7
6. TEST AND MEASUREMENT EQUIPMENT	10
7. 20dB BANDWIDTH	11
8. RADIATED EMISSION TEST RESULTS.....	12
8.1. LIMITS AND PROCEDURE	12
8.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz) [EUT without passive TAG mode]	14
8.1.2. SPURIOUS EMISSION 0.09 TO 30 MHz [EUT without passive TAG mode].....	16
8.1.3. TX SPURIOUS EMISSION 30 TO 1000 MHz [EUT without passive TAG mode]	18
8.1.4. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz) [EUT with passive TAG mode]	20
8.1.5. SPURIOUS EMISSION 0.09 TO 30 MHz [EUT with passive TAG mode].....	22
9. AC MAINS LINE CONDUCTED EMISSIONS.....	24
10. FREQUENCY STABILITY	29
11. SETUP PHOTOS	30

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-N970F/DS, SM-N970F, SM-N970X

SERIAL NUMBER: R38M502PWTW, R38M6037F5L

DATE TESTED: MAY 31, 2019 – JUN 28, 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
UL Korea, Ltd. By:



SungGil Park
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Junwhan Lee
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	
☒	Chamber 1
☒	Chamber 2
☐	Chamber 3

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.32 dB
Radiated Disturbance, Below 1GHz	3.86 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

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

This report covers the Samsung models SM-N970F/DS, SM-N970F and SM-N970X. These models are identical in hardware except SM-N970F has single SIM tray and model SM-N970X has been disabled all cellular bands by software. With some pre-scan, model SM-N970F/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 14.87 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 Z orientation was the worst-case orientation; therefore all final radiated testing was performed with the EUT in the Z orientation while generating continuous emissions.

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

Radiated(fundamental level and spurious emissions below 30MHz) 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	R37M4PW4FW1SE3	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

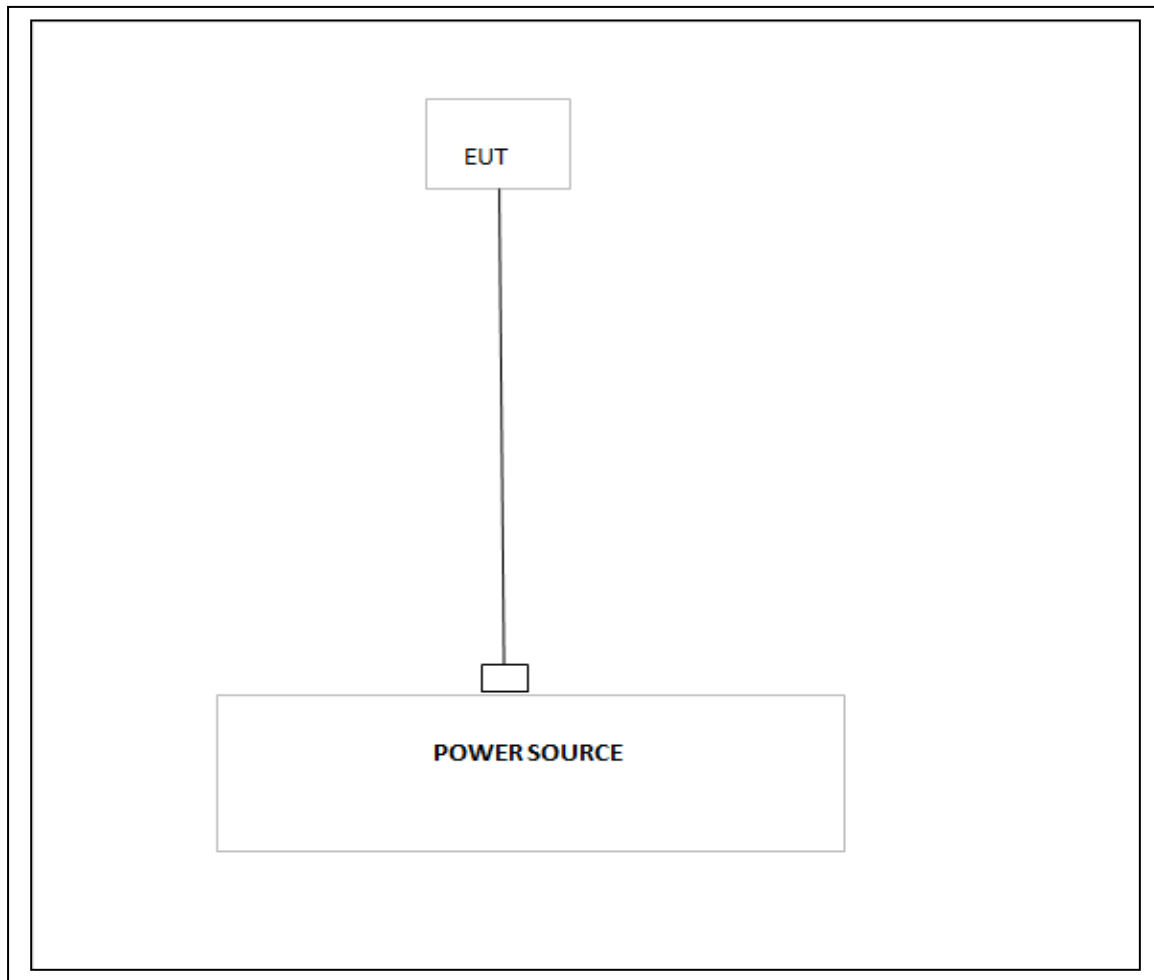
The EUT is a stand-alone device configured and tested in a worst-case setup.

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

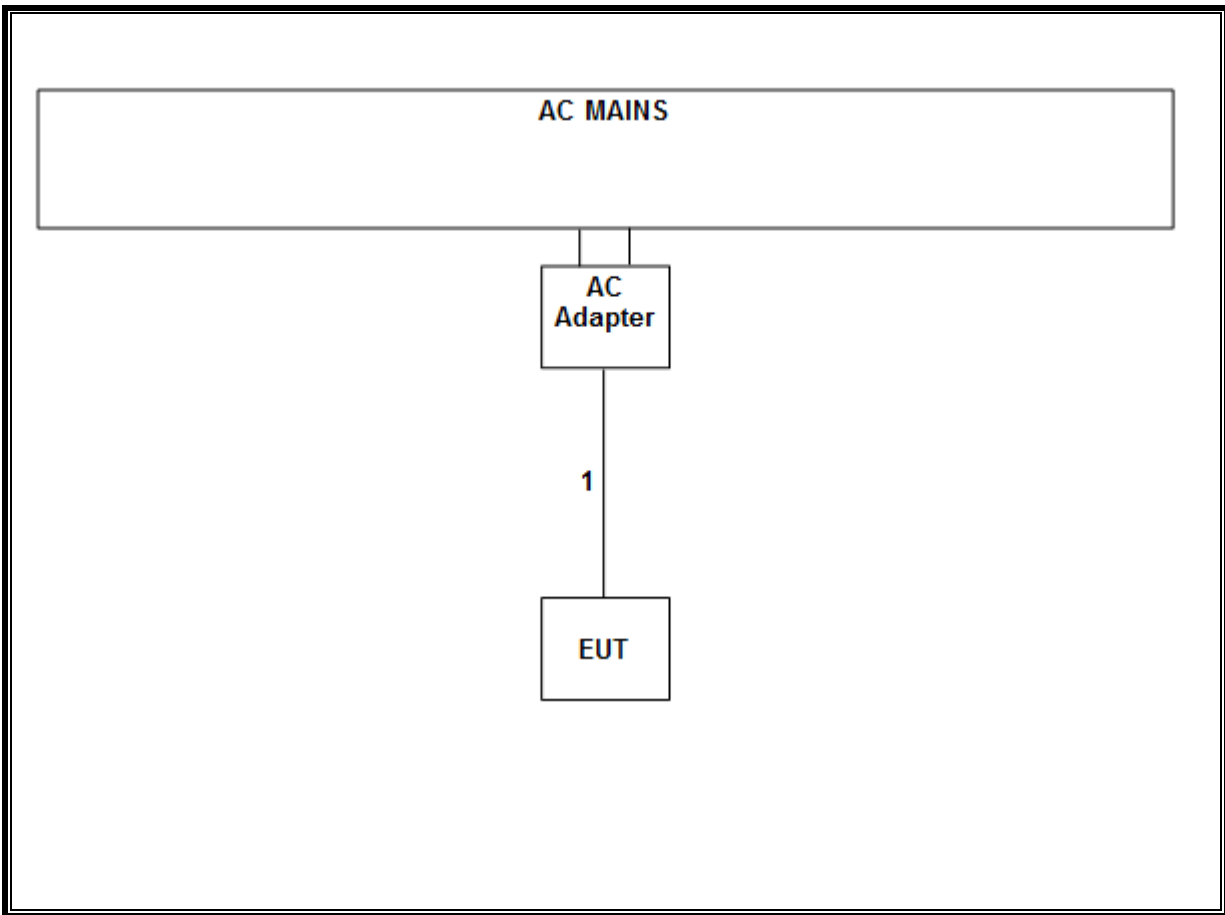
This EUT is able to equipped with S-pen on the inside. Spot check were performed both inserted and removed condition. Because there is no deviation between the two data, all tests were performed under equipped with the S-pen.

SETUP DIAGRAM FOR TESTS

Radiated Emissions Below 30 MHz:



Radiated Emissions Above 30 MHz, AC Line Conducted Emissions:



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-04-20
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-26-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-06-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-19
Spectrum Analyzer, 7 GHz	Agilent / HP	N9010A	MY54200580	08-07-19
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-19
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-06-19
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-06-19
DC Power Supply	Agilent / HP	E3640A	MY54226395	08-06-19
Temperature Chamber	ESPEC	SH-642	93001109	08-06-19
LISN	R&S	ENV216	101837	08-06-19
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

7. 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	432.05

20dB Bandwidth Plot



8. RADIATED EMISSION TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMIT

§15.225

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

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

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

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

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

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

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

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

Formula for converting the field strength from µV/m to dBµV/m is:

Limit (dBµV/m) = 20 log limit (µV/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

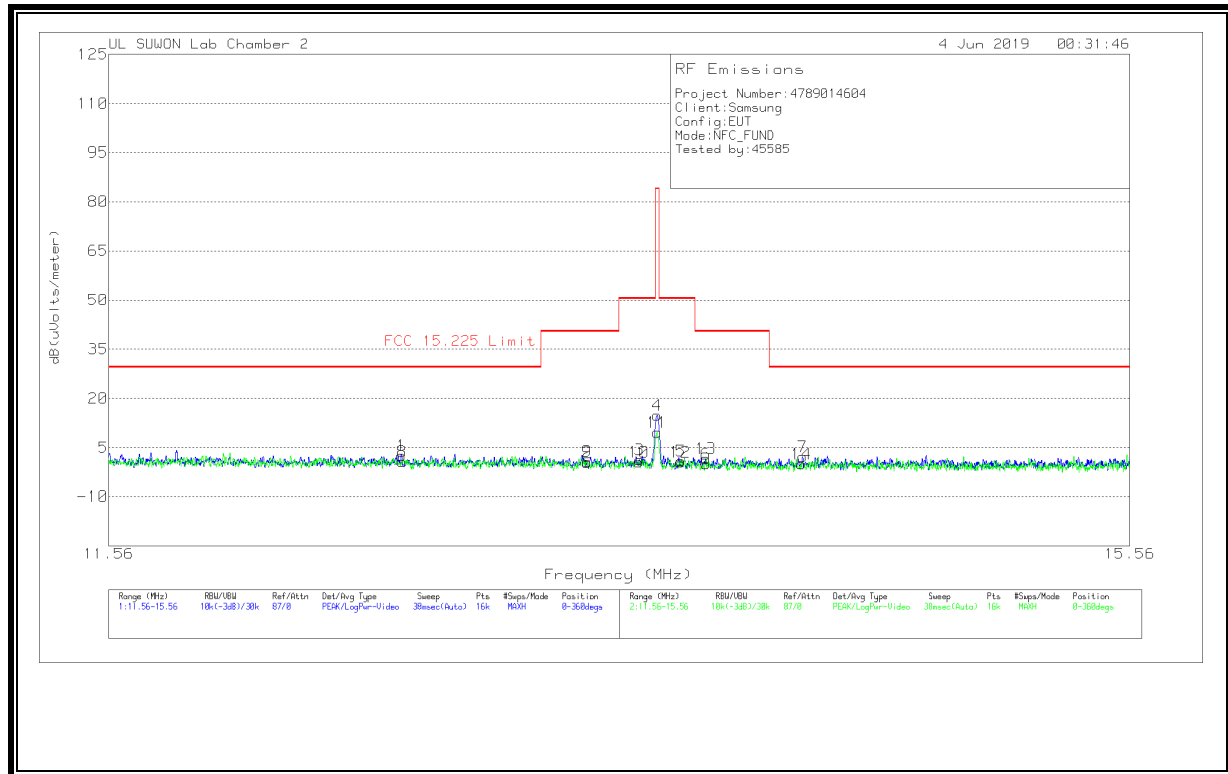
ANSI C63.10-2013

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) [EUT without 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	12.589	22.14	Pk	19.9	-40	.5	2.54	29.54	-27	0-360
2	13.288	19.98	Pk	19.9	-40	.5	.38	40.51	-40.13	0-360
3	13.49063	20.93	Pk	19.9	-40	.5	1.33	50.5	-49.17	0-360
**4	13.56075	34.47	Pk	19.9	-40	.5	14.87	84	-69.13	0-360
5	13.65525	20.35	Pk	19.9	-40	.6	.85	50.5	-49.65	0-360
6	13.754	19.53	Pk	19.8	-40	.6	-.07	40.51	-40.58	0-360
7	14.14663	21.81	Pk	19.8	-40	.6	2.21	29.54	-27.33	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	12.59013	20.39	Pk	19.9	-40	.5	.79	29.54	-28.75	0-360
9	13.28588	20.42	Pk	19.9	-40	.5	.82	40.51	-39.69	0-360
10	13.4895	20.13	Pk	19.9	-40	.5	.53	50.5	-49.97	0-360
**11	13.56	29.24	Pk	19.9	-40	.5	9.64	84	-74.36	0-360
12	13.65175	20.1	Pk	19.9	-40	.6	.6	50.5	-49.9	0-360
13	13.7545	21.3	Pk	19.8	-40	.6	1.7	40.51	-38.81	0-360
14	14.14113	19.65	Pk	19.8	-40	.6	.05	29.54	-29.49	0-360

Pk - Peak detector

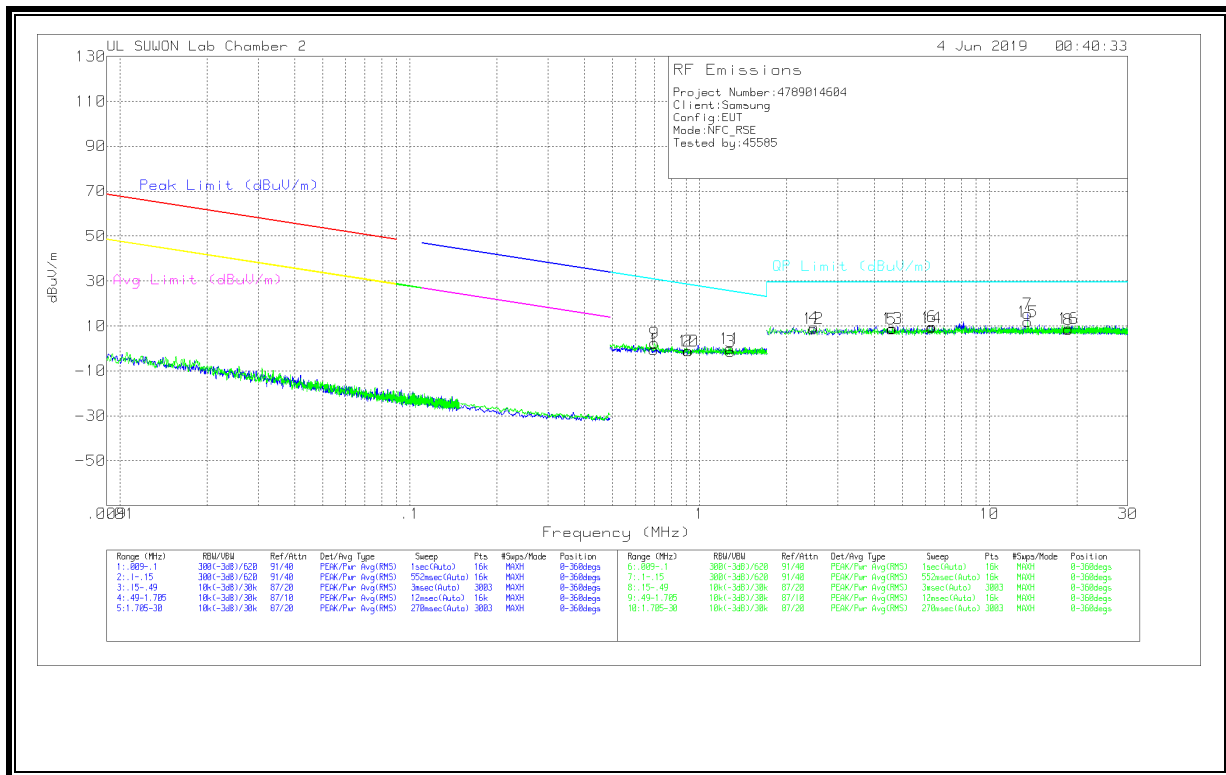
**Fundamental

Note 1 : Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field 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 0.09 TO 30 MHz [EUT without 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	.69645	19.63	Pk	19.7	.1	-40	-.57	30.75	-31.32	0-360
2	.91362	19	Pk	19.7	.2	-40	-1.1	28.4	-29.5	0-360
3	1.27827	18.63	Pk	19.7	.2	-40	-1.47	25.49	-26.96	0-360
4	2.47785	29.49	Pk	19.8	.3	-40	9.59	29.5	-19.91	0-360
5	4.61733	28.64	Pk	19.8	.3	-40	8.74	29.5	-20.76	0-360
6	6.35153	29.33	Pk	19.9	.4	-40	9.63	29.5	-19.87	0-360
**7	13.56165	35	Pk	19.9	.5	-40	15.4	29.5	-14.1	0-360
8	18.76425	27.94	Pk	19.8	.7	-40	8.44	29.5	-21.06	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)
9	.69809	22.61	Pk	19.7	.1	-40	2.41	30.73	-28.32	0-360
10	.91663	19.1	Pk	19.7	.2	-40	-.1	28.38	-29.38	0-360
11	1.27352	20.01	Pk	19.7	.2	-40	-.09	25.53	-25.62	0-360
12	2.46843	28.7	Pk	19.8	.3	-40	8.8	29.5	-20.7	0-360
13	4.62675	28.71	Pk	19.8	.3	-40	8.81	29.5	-20.69	0-360
14	6.3044	28.9	Pk	19.9	.4	-40	9.2	29.5	-20.3	0-360
**15	13.56165	31.61	Pk	19.9	.5	-40	12.01	29.5	-17.49	0-360
16	18.73598	28.48	Pk	19.8	.7	-40	8.98	29.5	-20.52	0-360

Pk - Peak detector

**Fundamental

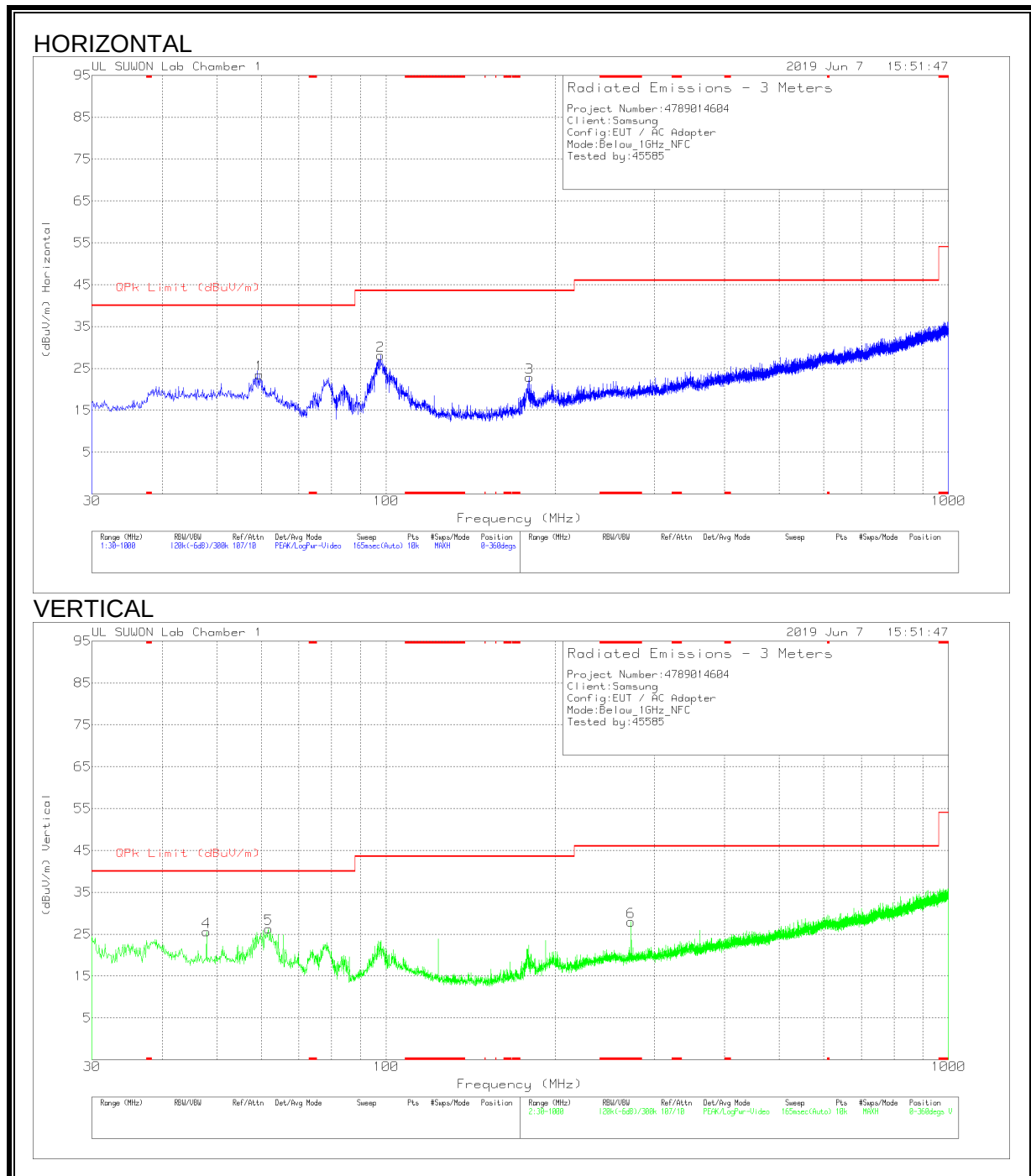
Note 1: The data for marker number 7 and 15 are the fundamental signal.

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 [EUT without passive TAG mode]



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	59.488	35.23	Pk	18.6	-30.3	23.53	40	-16.47	0-360	300	H
2	97.706	40.12	Pk	17.7	-29.7	28.12	43.52	-15.4	0-360	300	H
3	179.865	35.98	Pk	15.6	-28.7	22.88	43.52	-20.64	0-360	200	H
4	47.945	36.29	Pk	19.8	-30.5	25.59	40	-14.41	0-360	100	V
5	61.816	38.53	Pk	18.1	-30.3	26.33	40	-13.67	0-360	100	V
6	* 272.694	37.14	Pk	18.7	-27.9	27.94	46.02	-18.08	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	12.93525	21.43	Pk	19.9	-40	.5	1.83	29.54	-27.71	0-360
2	13.25038	19.19	Pk	19.9	-40	.5	-.41	40.51	-40.92	0-360
3	13.48613	20.19	Pk	19.9	-40	.5	.59	50.5	-49.91	0-360
**4	13.559	34.37	Pk	19.9	-40	.5	14.77	84	-69.23	0-360
5	13.67238	19.5	Pk	19.9	-40	.6	0	50.5	-50.5	0-360
6	13.91463	18.22	Pk	19.8	-40	.6	-1.38	40.51	-41.89	0-360
7	14.189	18.24	Pk	19.8	-40	.6	-1.36	29.54	-30.9	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	12.928	19.71	Pk	19.9	-40	.5	.11	29.54	-29.43	0-360
9	13.2435	20.08	Pk	19.9	-40	.5	.48	40.51	-40.03	0-360
10	13.48275	18.48	Pk	19.9	-40	.5	-1.12	50.5	-51.62	0-360
**11	13.56	30.11	Pk	19.9	-40	.5	10.51	84	-73.49	0-360
12	13.67438	19.02	Pk	19.9	-40	.6	-.48	50.5	-50.98	0-360
13	13.90725	20.01	Pk	19.8	-40	.6	.41	40.51	-40.1	0-360
14	14.1865	19.26	Pk	19.8	-40	.6	-.34	29.54	-29.88	0-360

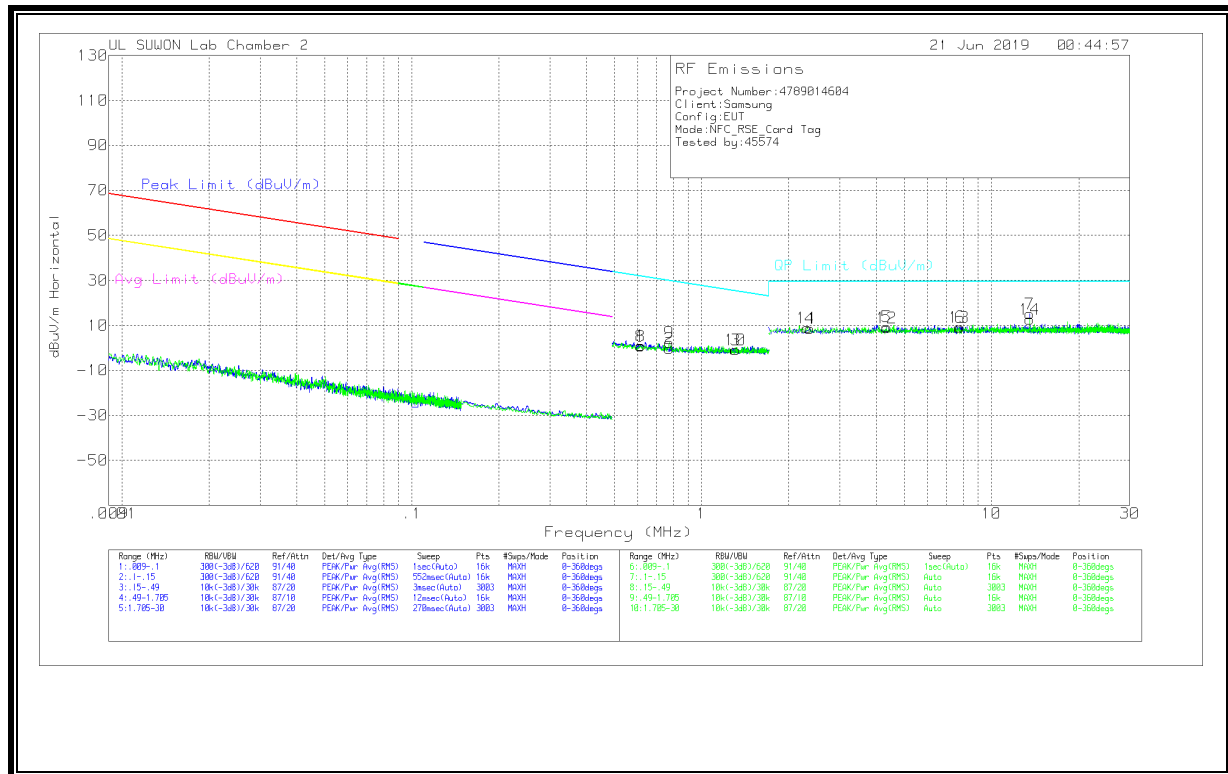
Pk - Peak detector

**Fundamental

Note 1: Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field 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	.61589	21.38	Pk	19.7	.1	-40	1.18	31.82	-30.64	0-360
2	.77382	19.85	Pk	19.7	.2	-40	-.25	29.84	-30.09	0-360
3	1.31	19.22	Pk	19.7	.2	-40	-.88	25.28	-26.16	0-360
4	2.36475	28.62	Pk	19.8	.2	-40	8.62	29.5	-20.88	0-360
5	4.344	29.33	Pk	19.8	.3	-40	9.43	29.5	-20.07	0-360
6	7.80298	29.03	Pk	19.9	.4	-40	9.33	29.5	-20.17	0-360
**7	13.56165	34.82	Pk	19.9	.5	-40	15.22	29.5	-14.28	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	.6151	20.95	Pk	19.7	.1	-40	.75	31.83	-31.08	0-360
9	.77264	22.51	Pk	19.7	.2	-40	2.41	29.86	-27.45	0-360
10	1.30715	19.22	Pk	19.7	.2	-40	-.88	25.3	-26.18	0-360
11	2.31291	28.92	Pk	19.8	.2	-40	8.92	29.5	-20.58	0-360
12	4.344	28.77	Pk	19.8	.3	-40	8.87	29.5	-20.63	0-360
13	7.71815	28.99	Pk	19.9	.4	-40	9.29	29.5	-20.21	0-360
**14	13.56165	32.32	Pk	19.9	.5	-40	12.72	29.5	-16.78	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.

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 μ 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 μ 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.

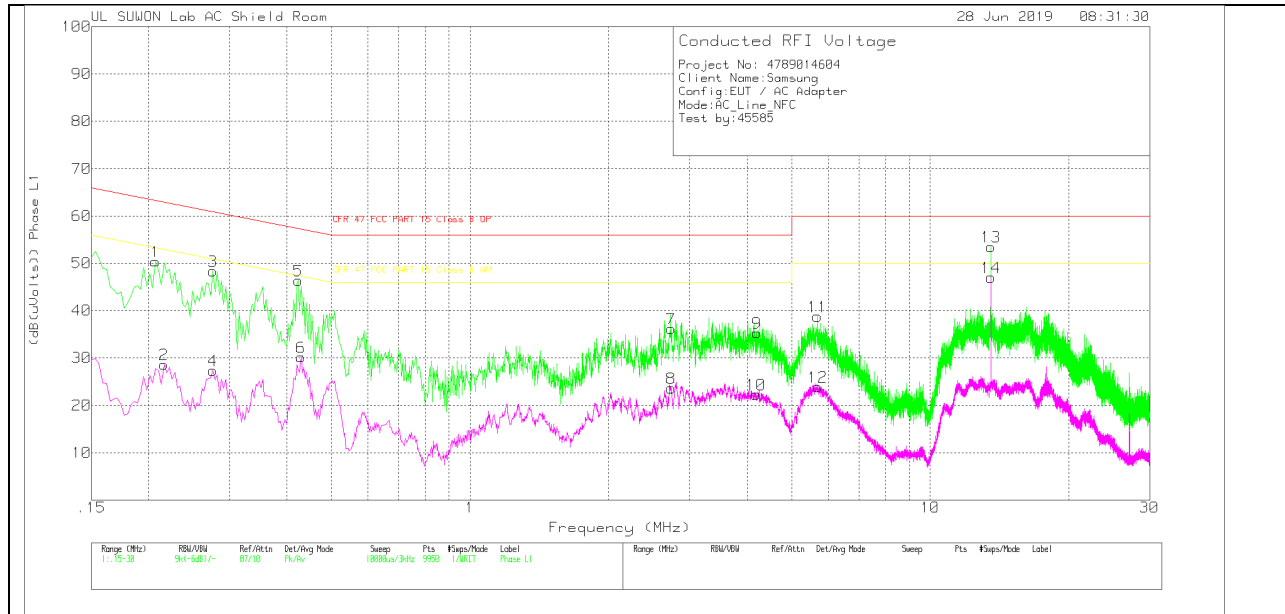
Line conducted data is recorded for both NEUTRAL and HOT lines.

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	ENV216_10183 6_With ex-cord_L1	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
1	.207	40.3	Pk	9.9	.2	50.4	63.32	-12.92	-	-
2	.216	18.64	Av	9.8	.2	28.64	-	-	52.97	-24.33
3	.276	38.48	Pk	9.7	.2	48.38	60.94	-12.56	-	-
4	.276	17.45	Av	9.7	.2	27.35	-	-	50.94	-23.59
5	.423	36.28	Pk	9.9	.2	46.38	57.39	-11.01	-	-
6	.429	20.09	Av	9.9	.2	30.19	-	-	47.27	-17.08
7	2.736	25.88	Pk	10	.3	36.18	56	-19.82	-	-
8	2.736	13.35	Av	10	.3	23.65	-	-	46	-22.35
9	4.2	25.21	Pk	9.8	.3	35.31	56	-20.69	-	-
10	4.182	12.22	Av	9.8	.3	22.32	-	-	46	-23.68
11	5.691	28.69	Pk	9.8	.3	38.79	60	-21.21	-	-
12	5.697	13.8	Av	9.8	.3	23.9	-	-	50	-26.1
13	13.56	42.98	Pk	10.1	.4	53.48	60	-6.52	-	-
14	13.56	36.55	Av	10.1	.4	47.05	-	-	50	-2.95

Pk - Peak detector

Av - Average detection

Quasi-Peak and CISPR average Emissions

Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_101836 _With ex-cord_L1	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13.5602	41.17	Qp	10.1	.4	51.67	60	-8.33	-	-

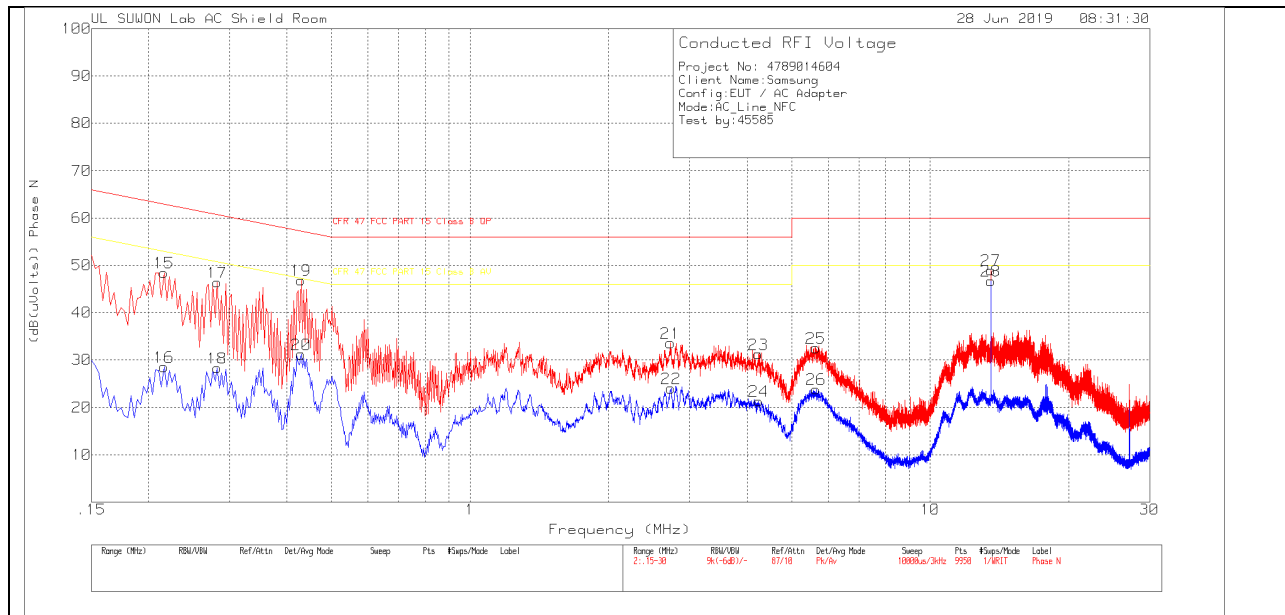
Qp - Quasi-Peak detector

Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_101836 _With ex-cord_L1	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13.5608	36.39	Ca	10.1	.4	46.89	-	-	50	-3.11

Ca - CISPR average detection

LINE 2 PLOT



LINE 2 RESULTS

Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_10183 6_With ex-cord_N	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
15	.216	38.43	Pk	9.8	.2	48.43	62.97	-14.54	-	-
16	.216	18.55	Av	9.8	.2	28.55	-	-	52.97	-24.42
17	.282	36.52	Pk	9.7	.2	46.42	60.76	-14.34	-	-
18	.282	18.43	Av	9.7	.2	28.33	-	-	50.76	-22.43
19	.429	37.34	Pk	9.3	.2	46.84	57.27	-10.43	-	-
20	.429	21.7	Av	9.3	.2	31.2	-	-	47.27	-16.07
21	2.727	23.6	Pk	9.7	.3	33.6	56	-22.4	-	-
22	2.733	14.04	Av	9.7	.3	24.04	-	-	46	-21.96
23	4.233	21.14	Pk	9.8	.3	31.24	56	-24.76	-	-
24	4.239	11.21	Av	9.8	.3	21.31	-	-	46	-24.69
25	5.643	22.42	Pk	9.8	.3	32.52	60	-27.48	-	-
26	5.649	13.73	Av	9.8	.3	23.83	-	-	50	-26.17
27	13.56	38.35	Pk	10.2	.4	48.95	60	-11.05	-	-
28	13.56	36.09	Av	10.2	.4	46.69	-	-	50	-3.31

Pk - Peak detector

Av - Average detection

Quasi-Peak and CISPR average Emissions

Range 2: Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_101836 _With ex-cord_N	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13.5602	37.24	Qp	10.2	.4	47.84	60	-12.16	-	-

Qp - Quasi-Peak detector

Range 2: Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_101836 _With ex-cord_N	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13.5608	36.1	Ca	10.2	.4	46.7	-	-	50	-3.3

Ca - CISPR average detection

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: ± 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)
3.80	50	13.560004683	-0.066	13.560004703	-0.068	13.560004984	-0.089	13.560004878	-0.081	100
3.80	40	13.560003885	-0.008	13.560004024	-0.018	13.560004428	-0.048	13.560004549	-0.056	100
3.80	30	13.560002896	0.065	13.560002780	0.074	13.560002527	0.093	13.560002263	0.112	100
3.80	20	13.560003783	0	13.560003715	0.005	13.560003651	0.010	13.560003199	0.043	100
3.80	10	13.560004386	-0.044	13.560004271	-0.036	13.560004100	-0.023	13.560003945	-0.012	100
3.80	0	13.560004990	-0.089	13.560004828	-0.077	13.560004708	-0.068	13.560004610	-0.061	100
3.80	-10	13.560005579	-0.132	13.560005612	-0.135	13.560005755	-0.145	13.560005950	-0.160	100
3.80	-20	13.560005788	-0.148	13.560005676	-0.140	13.560005468	-0.124	13.560005106	-0.098	100
3.80	-30	13.560006290	-0.185	13.560006438	-0.196	13.560006753	-0.219	13.560006979	-0.236	100

Reference Frequency: EUT Channel 13.56 MHz @ 20°C Limit: ± 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)
3.80	20	13.560003783	0	13.560003715	0.005	13.560003651	0.010	13.560003199	0.043	100
4.30	20	13.560003477	0.023	13.560003278	0.037	13.560003112	0.040	13.560002961	0.061	100
3.60	20	13.560004172	-0.029	13.560004323	-0.040	13.560004567	-0.068	13.560004749	-0.071	100

No non-compliance noted.