



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-N975F/DS, SM-N975F, SM-N975X

FCC ID: A3LSMN975F

REPORT NUMBER: 4789067225-E11V2

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ACCREDITED*

Testing
Laboratory

TL-637

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	06/27/19	Initial issue	Junwhan Lee
V2	06/28/19	Updated to address TCB's question	Junwhan Lee

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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-N975F/DS, SM-N975F, SM-N975X

SERIAL NUMBER: R3CM506NLKW, R3CM506MKPR (Original);
R38M50ASH5W(Spot check)

DATE TESTED: MAY 30, 2019 – JUN 19, 2019(Original);
JUN 21, 2019 – JUN 26, 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.

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1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMN976B 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: A3LSMN975F shares the same enclosure and circuit board as FCC ID: A3LSMN976B. 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: A3LSMN976B remains representative of FCC ID: A3LSMN975F. The test data of FCC ID: A3LSMN976B being submitted for this application to cover NFC features.

1.3. SPOT CHECK VERIFICATION DATA

(Worst case of the radiated spurious emissions and fundamental signal)

Mode	Test Item	Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
				SM-N976B	SM-N975F/DS		
				FCC ID : A3LSMN976B	FCC ID : A3LSMN975F		
NFC	Fundamental	13.56 MHz	84.0 dBuV/m	17.22 dBuV/m	16.39 dBuV/m	-0.83 dB	Loop antenna Face on
	Emission	4.03298 MHz	29.5 dBuV/m	11.75 dBuV/m	9.97 dBuV/m	-1.78 dB	Loop antenna Face off Noise floor level Spot check Frequency : 7.87838 MHz

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

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	A3LSMN976B	Original Grant	4789009800-E2	Test Report	4789067225-E2	All
			4789009800-E3	Test Report	4789067225-E3	All
DTS	A3LSMN976B	Original Grant	4789009800-E5 (802.11b/g/n)	Test Report	4789067225-E5 (802.11b/g/n)	All
			4789009800-E6 (802.11ax)	Test Report	4789067225-E6 (802.11ax)	All
			4789009800-E4 Bluetooth LE	Test Report	4789067225-E4 Bluetooth LE	All
DSS	A3LSMN976B	Original Grant	4789009800-E7 (Bluetooth)	Test Report	4789067225-E7 (Bluetooth)	All
NII	A3LSMN976B	Original Grant	4789009800-E8 (802.11a/n/ac)	Test Report	4789067225-E8 (802.11a/n/ac)	All
			4789009800-E9 (802.11ax)	Test Report	4789067225-E9 (802.11ax)	All
DXX	A3LSMN976B	Original Grant	4789009800-E10 (ANT+)	Test Report	4789067225-E10 (ANT+)	All
			4789009800-E11 (NFC)	Test Report	4789067225-E11 (NFC)	All
DCD	A3LSMN976B	Original Grant	4789009800-E12 (WPT)	Test Report	4789067225-E12 (WPT)	All

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

Equipment Class	Reference FCC ID (Parent)	Application Type	Data Re-used
PCE	A3LSMN976B	Original Grant	All except SAR (full test), HAC (full test)
			All except SAR (full test), HAC (full test)
DTS	A3LSMN976B	Original Grant	All except SAR (full test), HAC (full test)
			All except SAR (full test), HAC (full test)
			All
DSS	A3LSMN976B	Original Grant	All except SAR (full test)
NII	A3LSMN976B	Original Grant	All except SAR (full test), HAC (full test)
			All except SAR (full test), HAC (full test)
DXX	A3LSMN976B	Original Grant	All
			All
DCD	A3LSMN976B	Original Grant	All except RF exposure

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 484596 D01 Referencing Test Data v01

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/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.

5.2. MAXIMUM E-FIELD STRENGTH

The testing was performed at 3 meter. The transmitter maximum E-field at 30m distance is 17.22 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) 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

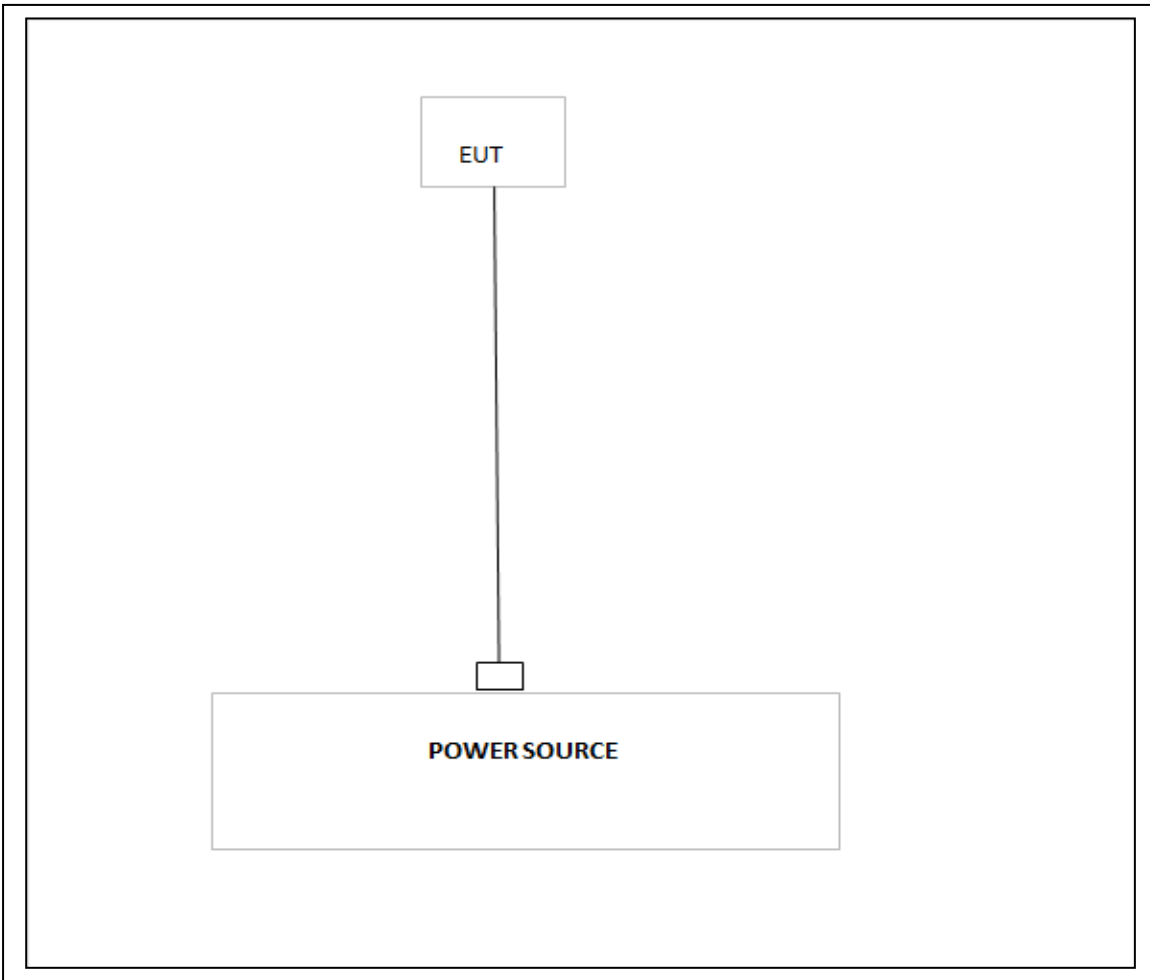
The EUT is a stand-alone device configured and tested in a worst-case setup.

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

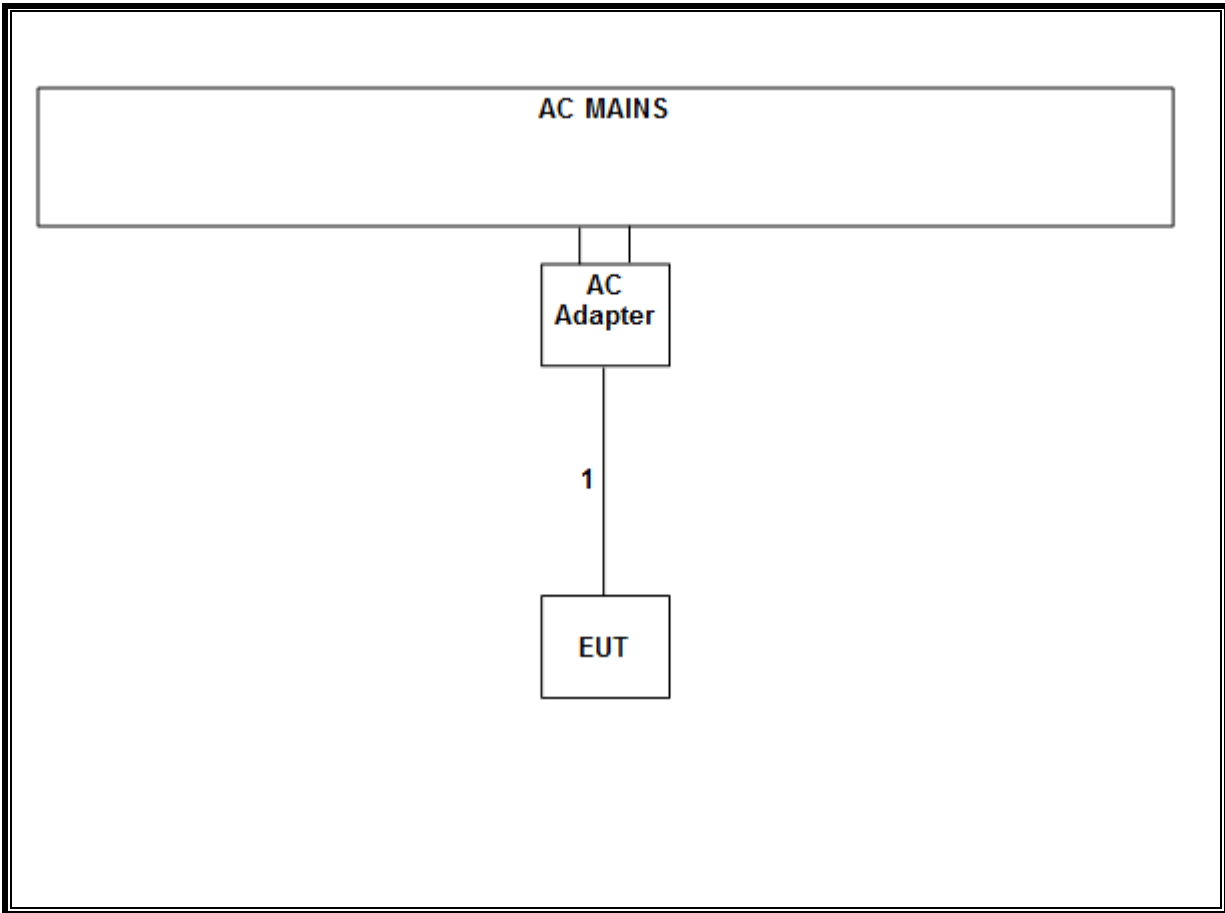
This EUT is able to equipped with S-pen on the inside. Spot check were performed both inserted and removed condition. Because there is no deviation between the two data, all tests were performed under equipped with the S-pen.

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

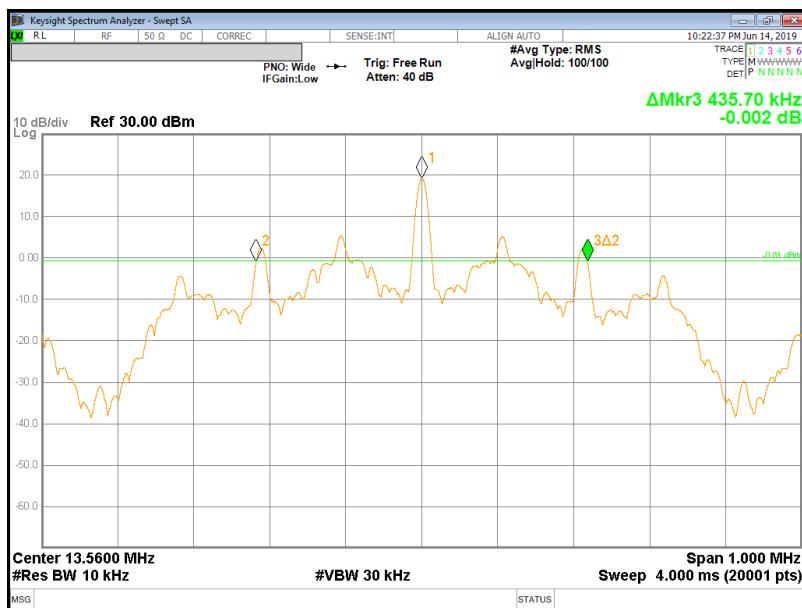
TEST PROCEDURE

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	435.70

20dB Bandwidth Plot



8. RADIATED EMISSION TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMIT

§15.225

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

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

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

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

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

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

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

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

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

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

In addition:

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

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

TEST PROCEDURE

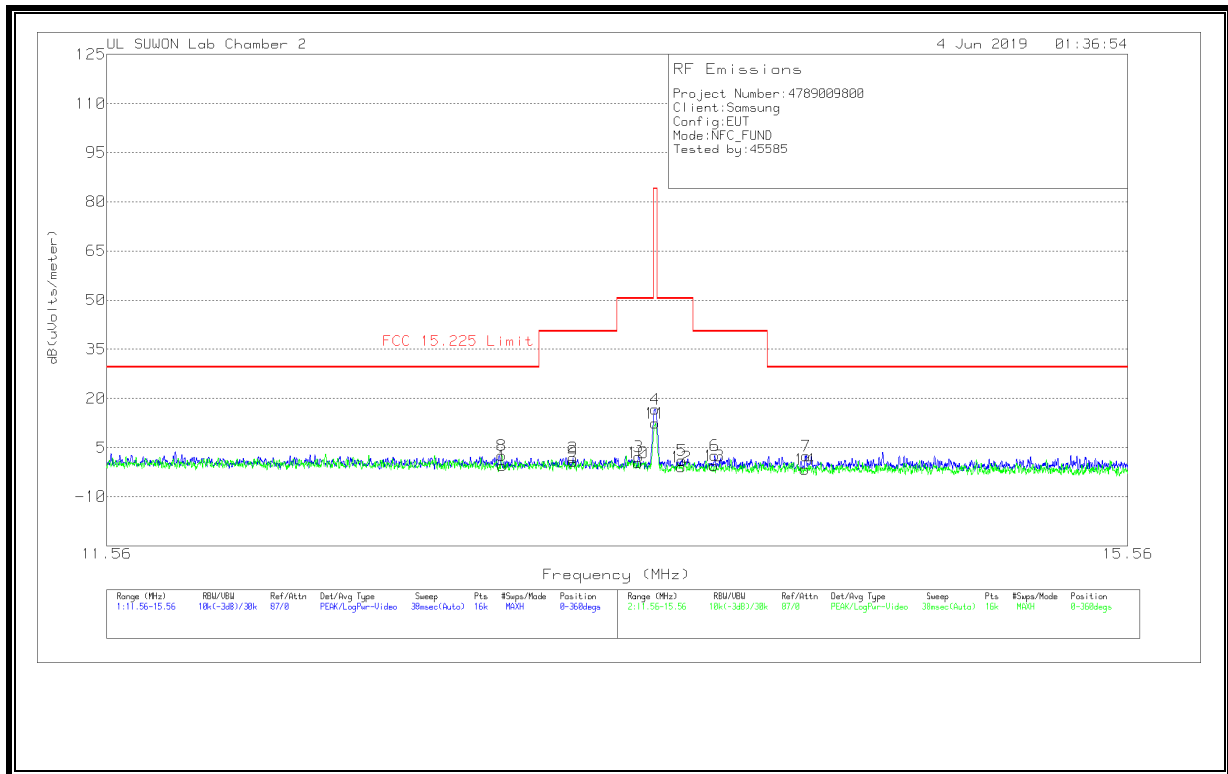
ANSI C63.10-2013

The EUT is an intentional radiator that incorporates a digital device. The highest fundamental frequency generated or used in the device is 13.56 MHz. The frequency range was investigated from 0.15 MHz to the 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	12.97013	19.11	Pk	19.9	-40	.5	-.49	29.54	-30.03	0-360
2	13.23988	21.38	Pk	19.9	-40	.5	1.78	40.51	-38.73	0-360
3	13.49538	21.91	Pk	19.9	-40	.5	2.31	50.5	-48.19	0-360
**4	13.56038	36.38	Pk	19.9	-40	.5	16.78	84	-67.22	0-360
5	13.6665	20.6	Pk	19.9	-40	.6	1.1	50.5	-49.4	0-360
6	13.79763	22.22	Pk	19.8	-40	.6	2.62	40.51	-37.89	0-360
7	14.169	22.04	Pk	19.8	-40	.6	2.44	29.54	-27.1	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	12.96838	22.2	Pk	19.9	-40	.5	2.6	29.54	-26.94	0-360
9	13.24038	20.28	Pk	19.9	-40	.5	.68	40.51	-39.83	0-360
10	13.49438	19.96	Pk	19.9	-40	.5	.36	50.5	-50.14	0-360
**11	13.56063	32.04	Pk	19.9	-40	.5	12.44	84	-71.56	0-360
12	13.66363	18.64	Pk	19.9	-40	.6	-.86	50.5	-51.36	0-360
13	13.79563	19.1	Pk	19.8	-40	.6	-.5	40.51	-41.01	0-360
14	14.16488	17.88	Pk	19.8	-40	.6	-1.72	29.54	-31.26	0-360

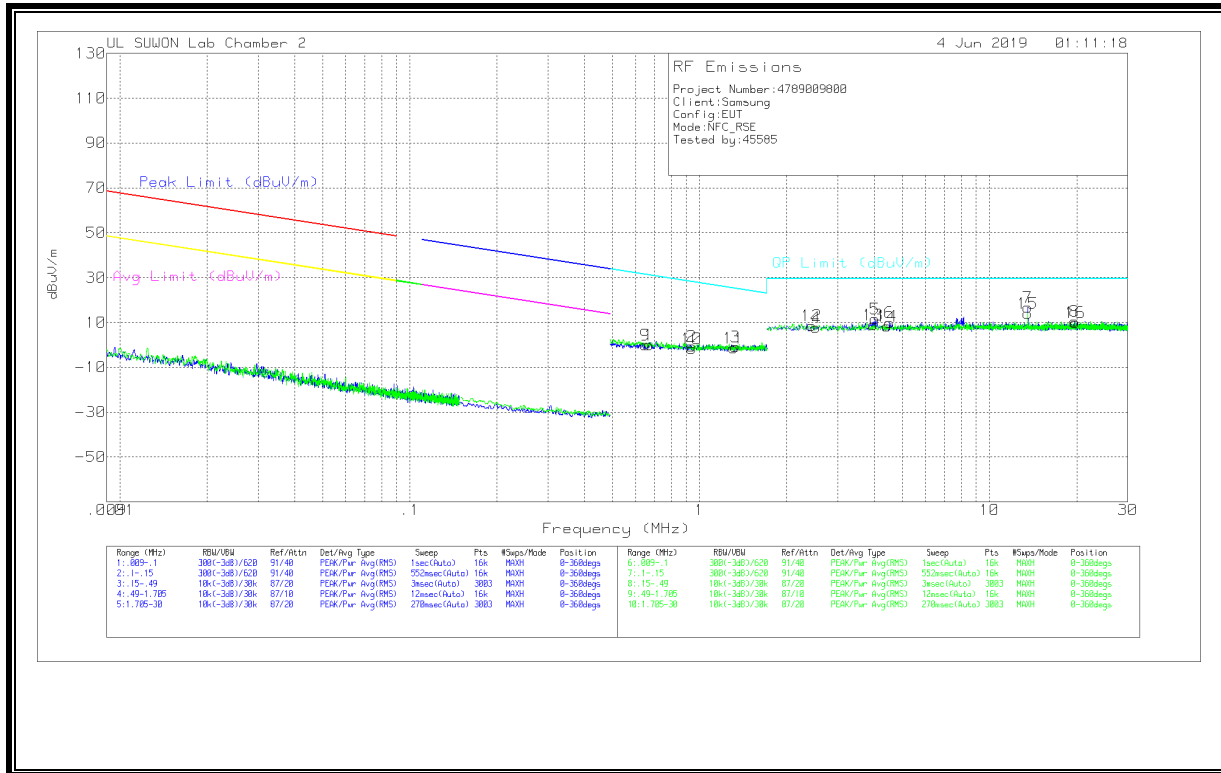
Pk - Peak detector

**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 0.09 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	.66788	20.31	Pk	19.7	.1	-40	.11	31.12	-31.01	0-360
2	.93658	19.44	Pk	19.7	.2	-40	-.66	28.19	-28.85	0-360
3	1.32676	19.25	Pk	19.7	.2	-40	-.85	25.17	-26.02	0-360
4	2.51555	27.79	Pk	19.8	.3	-40	7.89	29.5	-21.61	0-360
5	4.03298	31.65	Pk	19.8	.3	-40	11.75	29.5	-17.75	0-360
6	4.52308	29.81	Pk	19.8	.3	-40	9.91	29.5	-19.59	0-360
**7	13.56165	36.39	Pk	19.9	.5	-40	16.79	29.5	-12.71	0-360
8	19.66905	30.09	Pk	19.8	.7	-40	10.59	29.5	-18.91	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	.65028	20.1	Pk	19.7	.1	-40	-.1	31.35	-31.45	0-360
10	.93893	18.5	Pk	19.7	.2	-40	-1.6	28.17	-29.77	0-360
11	1.31061	18.68	Pk	19.7	.2	-40	-1.42	25.28	-26.7	0-360
12	2.43073	28.77	Pk	19.8	.2	-40	8.77	29.5	-20.73	0-360
13	3.95758	28.72	Pk	19.8	.3	-40	8.82	29.5	-20.68	0-360
14	4.42883	28.31	Pk	19.8	.3	-40	8.41	29.5	-21.09	0-360
**15	13.56165	33.79	Pk	19.9	.5	-40	14.19	29.5	-15.31	0-360
16	19.74445	29.42	Pk	19.8	.7	-40	9.92	29.5	-19.58	0-360

Pk - Peak detector

**Fundamental

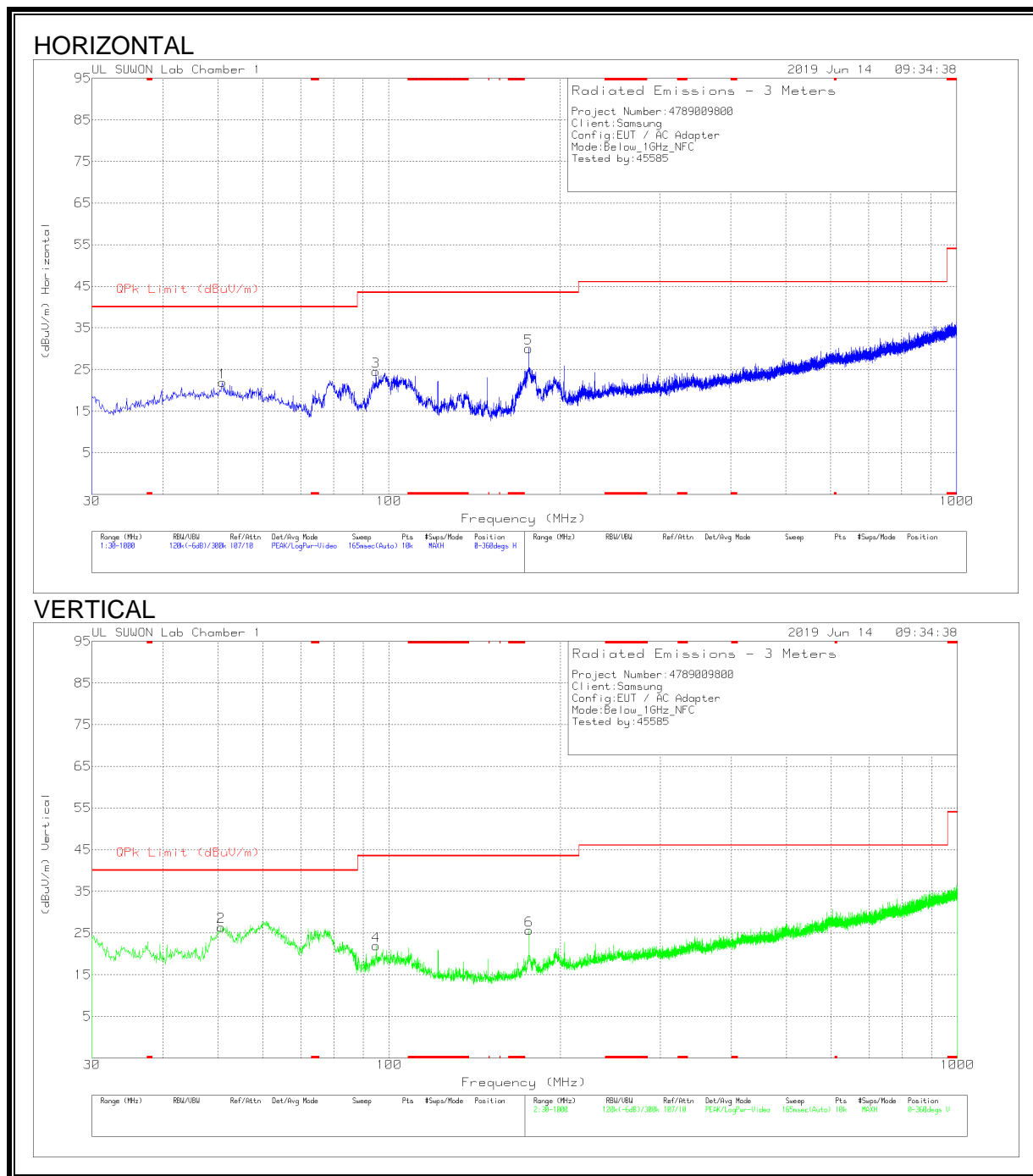
Note 1: The data for marker number 7 and 15 are the fundamental signal.

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

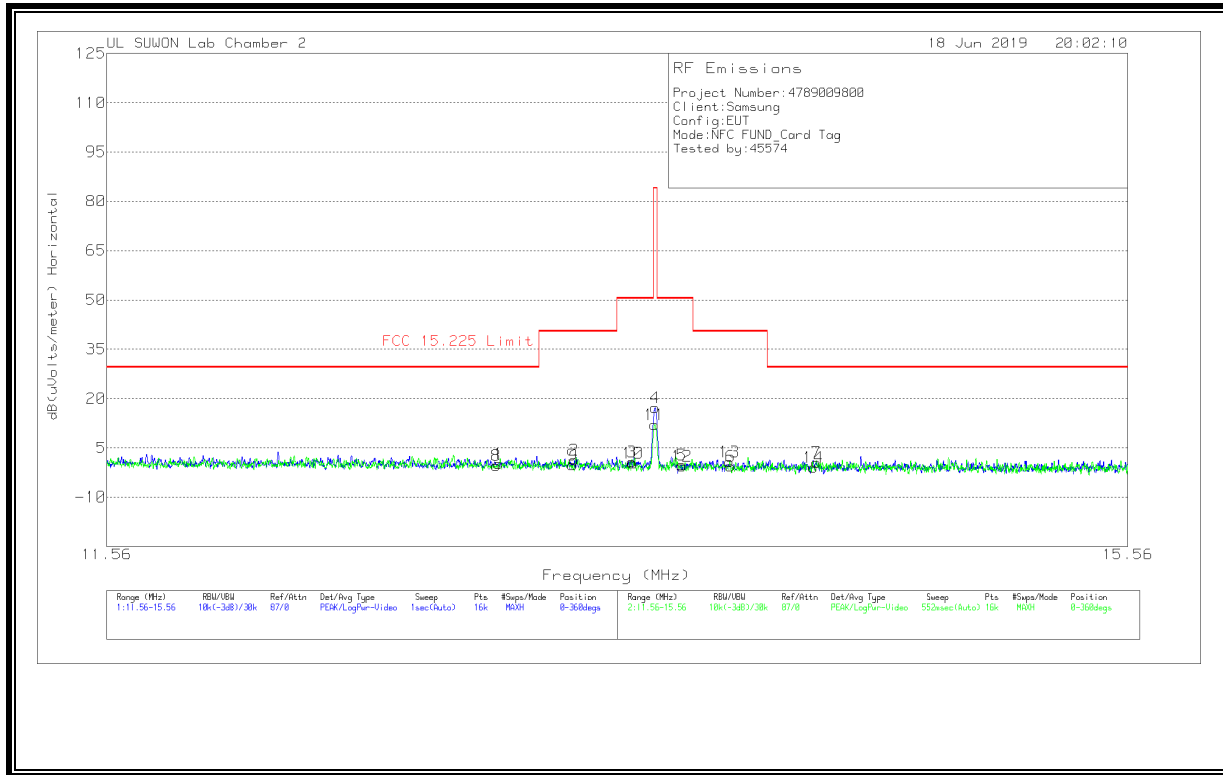


Trace Markers

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	50.952	32.59	Pk	19.8	-30.5	21.89	40	-18.11	0-360	400	H
3	94.893	37	Pk	17.3	-29.8	24.5	43.52	-19.02	0-360	300	H
5	176.276	43.74	Pk	15.1	-28.8	30.04	43.52	-13.48	0-360	200	H
2	50.661	37.25	Pk	19.7	-30.5	26.45	40	-13.55	0-360	100	V
4	94.893	34.43	Pk	17.3	-29.8	21.93	43.52	-21.59	0-360	100	V
6	176.276	39.29	Pk	15.1	-28.8	25.59	43.52	-17.93	0-360	200	V

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	12.95575	19.85	Pk	19.9	-40	.5	.25	29.54	-29.29	0-360
2	13.245	20.85	Pk	19.9	-40	.5	1.25	40.51	-39.26	0-360
3	13.46838	20.33	Pk	19.9	-40	.5	.73	50.5	-49.77	0-360
4**	13.55988	36.82	Pk	19.9	-40	.5	17.22	84	-66.78	0-360
5	13.6655	19.29	Pk	19.9	-40	.6	-.21	50.5	-50.71	0-360
6	13.8605	19.13	Pk	19.8	-40	.6	-.47	40.51	-40.98	0-360
7	14.21313	20.16	Pk	19.8	-40	.6	.56	29.54	-28.98	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	12.94788	19.15	Pk	19.9	-40	.5	-.45	29.54	-29.99	0-360
9	13.23875	19.48	Pk	19.9	-40	.5	-.12	40.51	-40.63	0-360
10	13.473	19.9	Pk	19.9	-40	.5	.3	50.5	-50.2	0-360
11**	13.55888	31.65	Pk	19.9	-40	.5	12.05	84	-71.95	0-360
12	13.66638	18.92	Pk	19.9	-40	.6	-.58	50.5	-51.08	0-360
13	13.85675	20.27	Pk	19.8	-40	.6	.67	40.51	-39.84	0-360
14	14.19975	18.67	Pk	19.8	-40	.6	-.93	29.54	-30.47	0-360

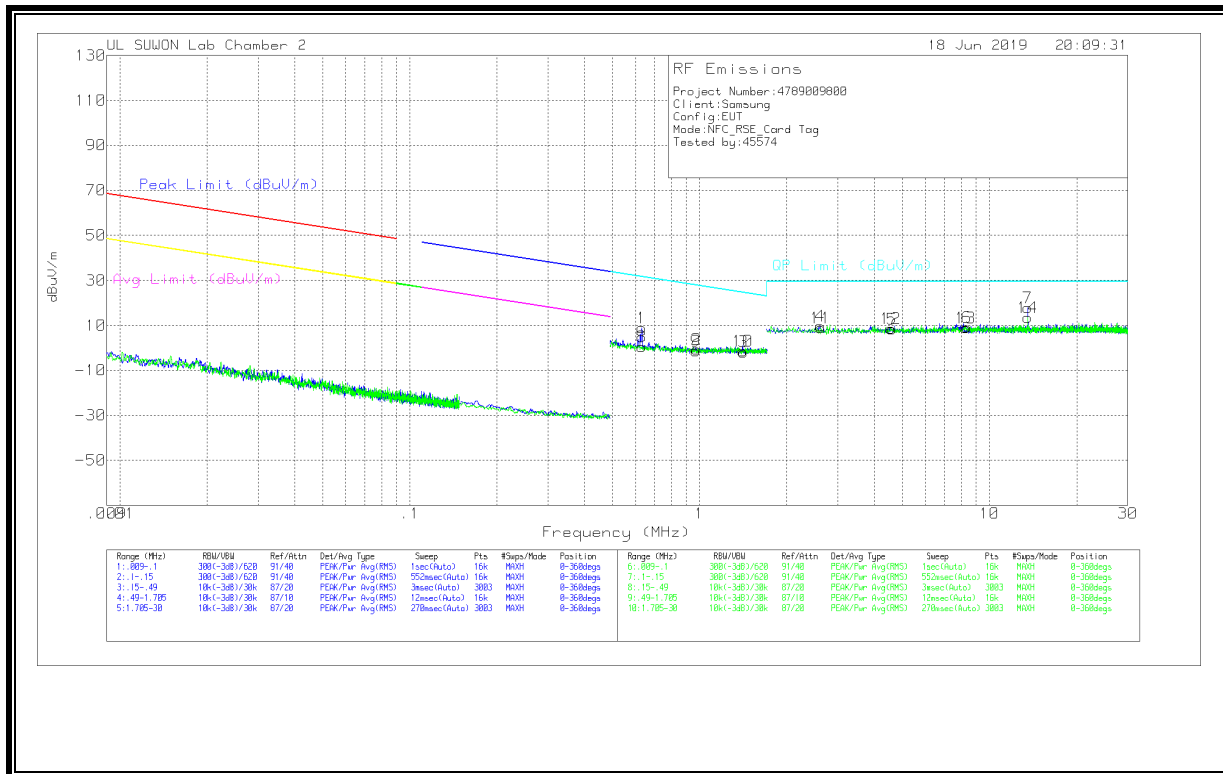
Pk - Peak detector

**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	.63132	29.19	Pk	19.7	.1	-40	8.99	31.61	-22.62	0-360
2	.97545	19.51	Pk	19.7	.2	-40	-.59	27.84	-28.43	0-360
3	1.41477	18.33	Pk	19.7	.2	-40	-1.77	24.62	-26.39	0-360
4	2.6098	29.71	Pk	19.8	.3	-40	9.81	29.5	-19.69	0-360
5	4.6079	28.34	Pk	19.8	.3	-40	8.44	29.5	-21.06	0-360
6	8.35905	28.84	Pk	19.9	.4	-40	9.14	29.5	-20.36	0-360
**7	13.56165	37.45	Pk	19.9	.5	-40	17.85	29.5	-11.65	0-360

[Face Off]

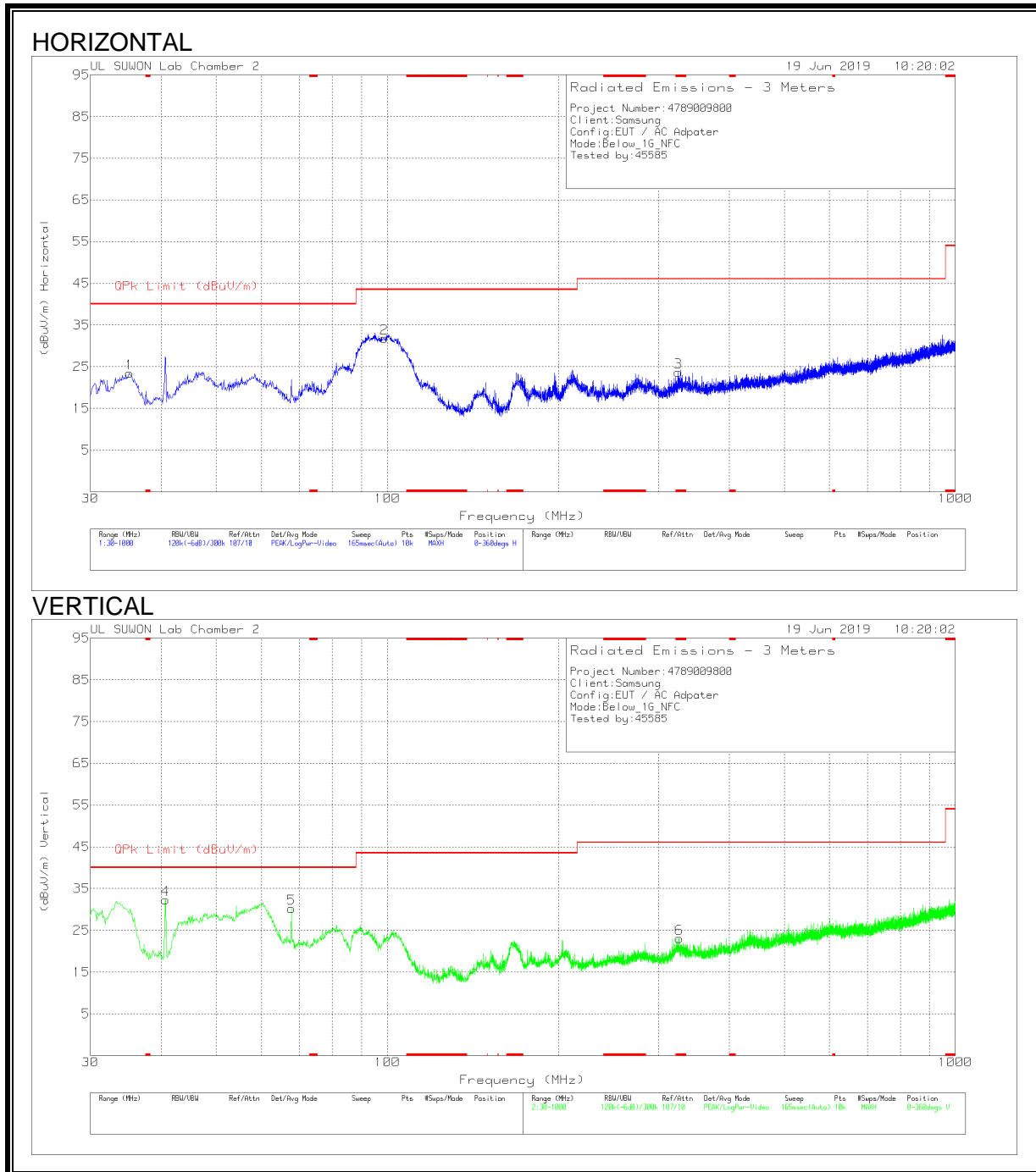
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
8	.63121	20.68	Pk	19.7	.1	-40	.48	31.61	-31.13	0-360
9	.97119	18.75	Pk	19.7	.2	-40	-1.35	27.87	-29.22	0-360
10	1.41055	18.83	Pk	19.7	.2	-40	-1.27	24.64	-25.91	0-360
11	2.61923	28.81	Pk	19.8	.3	-40	8.91	29.5	-20.59	0-360
12	4.5702	28.56	Pk	19.8	.3	-40	8.66	29.5	-20.84	0-360
13	8.28365	28.73	Pk	19.9	.4	-40	9.03	29.5	-20.47	0-360
**14	13.56165	33.08	Pk	19.9	.5	-40	13.48	29.5	-16.02	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	35.141	38.57	Pk	16.7	-31.9	23.37	40	-16.63	0-360	300	H
2	98.676	45.67	Pk	17.7	-31.5	31.87	43.52	-11.65	0-360	300	H
3	* 325.462	34.12	Pk	19.9	-30.4	23.62	46.02	-22.4	0-360	100	H
4	40.67	45.31	Pk	18.9	-31.9	32.31	40	-7.69	0-360	100	V
5	67.733	45.67	Pk	16.3	-31.7	30.27	40	-9.73	0-360	100	V
6	* 326.238	33.56	Pk	19.9	-30.4	23.06	46.02	-22.96	0-360	100	V

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

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 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.

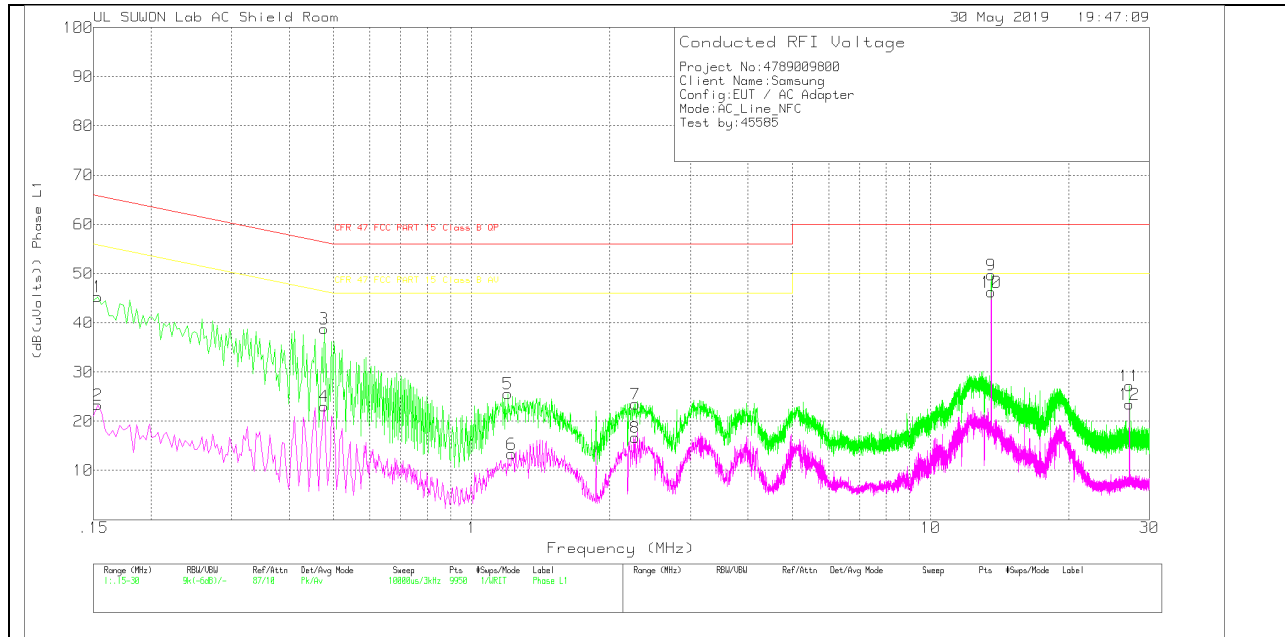
Line conducted data is recorded for both NEUTRAL and HOT lines.

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	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)
1	.153	35.39	Pk	9.8	.1	45.29	65.84	-20.55	-	-
2	.153	13.4	Av	9.8	.1	23.3	-	-	55.84	-32.54
3	.477	28.68	Pk	9.9	.2	38.78	56.39	-17.61	-	-
4	.477	12.93	Av	9.9	.2	23.03	-	-	46.39	-23.36
5	1.2	15.49	Pk	9.8	.3	25.59	56	-30.41	-	-
6	1.221	3.24	Av	9.8	.3	13.34	-	-	46	-32.66
7	2.274	13.32	Pk	9.9	.3	23.52	56	-32.48	-	-
8	2.271	6.51	Av	9.9	.3	16.71	-	-	46	-29.29
9	13.56	39.21	Pk	10.1	.4	49.71	60	-10.29	-	-
10	13.56	35.74	Av	10.1	.4	46.24	-	-	50	-3.76
11	27.12	16.19	Pk	10.7	.3	27.19	60	-32.81	-	-
12	27.12	12.44	Av	10.7	.3	23.44	-	-	50	-26.56

Pk - Peak detector

Av - Average detection

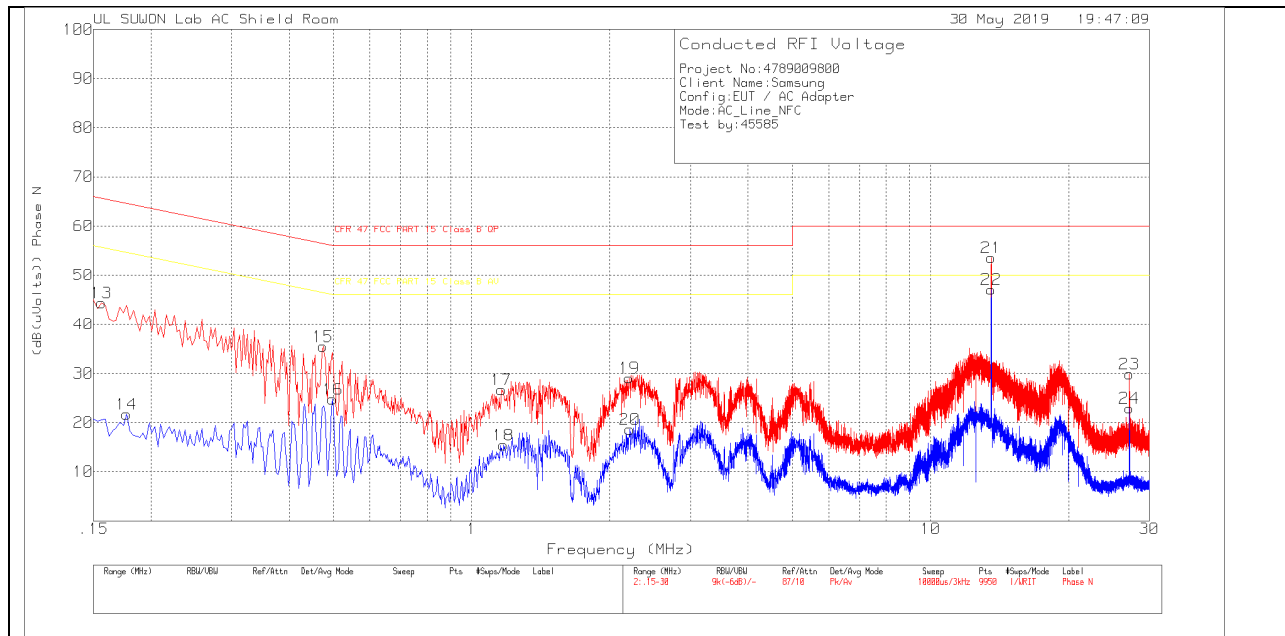
Quasi-Peak Emissions

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	38.66	Qp	10.1	.4	49.16	60	-10.84	-	-
27.1208	13.79	Qp	10.7	.3	24.79	60	-35.21	-	-

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	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)
13	.156	34.47	Pk	9.8	.1	44.37	65.67	-21.3	-	-
14	.177	11.53	Av	10	.2	21.73	-	-	54.63	-32.9
15	.474	25.58	Pk	9.7	.2	35.48	56.44	-20.96	-	-
16	.498	14.66	Av	9.9	.2	24.76	-	-	46.03	-21.27
17	1.161	16.6	Pk	9.8	.3	26.7	56	-29.3	-	-
18	1.173	5.34	Av	9.8	.3	15.44	-	-	46	-30.56
19	2.205	19.05	Pk	9.7	.3	29.05	56	-26.95	-	-
20	2.211	8.66	Av	9.7	.3	18.66	-	-	46	-27.34
21	13.56	42.98	Pk	10.2	.4	53.58	60	-6.42	-	-
22	13.56	36.48	Av	10.2	.4	47.08	-	-	50	-2.92
23	27.12	18.82	Pk	10.8	.3	29.92	60	-30.08	-	-
24	27.12	11.82	Av	10.8	.3	22.92	-	-	50	-27.08

Pk - Peak detector

Av - Average detection

Quasi-Peak 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	41.9	Qp	10.2	.4	52.5	60	-7.5	-	-
27.1208	16.9	Qp	10.8	.3	28	60	-32	-	-

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: ± 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.