



CERTIFICATION TEST REPORT

Report Number. : 4790406782-E7V3

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

Model : SM-A236M/DSN, SM-A236M/N

FCC ID : A3LSMA236MN

EUT Description : GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac
and NFC

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

Date Of Issue:

2022-07-13

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ACCREDITED

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TL-637

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2022-07-01	Initial issue	SunGeun Lee
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac and NFC

MODEL NUMBER: SM-A236M/DSN, SM-A236M/N

SERIAL NUMBER: R3CT50DASKA, R3CT50DATQX(RADIATED, Original);
617c80251d347ece, 617c8028f4347ece (RADIATED, Spot-check);

DATE TESTED: 2022-05-18 ~ 2022-06-29(Original);
2022-06-22 ~ 2022-07-01(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
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Seokhwan Hong
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Tested By:



Sungeun Lee
Suwon Lab Engineer
UL Korea, Ltd.

1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMA236BN 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: A3LSMA236MN shares the same enclosure and circuit board as FCC ID: A3LSMA236BN. 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: A3LSMA236BN remains representative of FCC ID: A3LSMA236MN. The test data of FCC ID: A3LSMA236BN being submitted for this application to cover NFC features.

1.3. SPOT CHECK VERIFICATION DATA

(Worst case of the radiated fundamental and spurious emissions)

Band	Test Item	Mode	Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
					SM-A236B/DSN Results	SM-A236M/DSN Results		
					FCC ID : A3LSMA236BN	FCC ID : A3LSMA236MN		
NFC	NFC Fund	Card_Tag_Y_Position	13.56 MHz	84 dBuV/m	14.80 dBuV/m	15.54 dBuV/m	0.74 dB	
	NFC RSE	Card_Tag_Z_Position	13.56 MHz	29.5 dBuV/m(QP)	15.86 dBuV/m	16.92 dBuV/m	1.06 dB	

Comparison of two models, upper deviation is within 3 dB 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
DTS	A3LSMA236BN	Original Grant	4790406778-E3 (802.11b/g/n)	Test Report	4790406782-E3 (802.11b/g/n)	All
			4790406778-E4 Bluetooth LE	Test Report	4790406782-E4 Bluetooth LE	All
DSS	A3LSMA236BN	Original Grant	4790406778-E5 (Bluetooth)	Test Report	4790406782-E5 (Bluetooth)	All
NII	A3LSMA236BN	Original Grant	4790406778-E6 (802.11a/n/ac)	Test Report	4790406782-E6 (802.11a/n/ac)	All
DXX	A3LSMA236BN	Original Grant	4790406778-E7 (NFC)	Test Report	4790406782-E7 (NFC)	All

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. ANSI C63.10-2013.
4. KDB 414788 D01 Radiated Test Site v01r01

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro	
<input checked="" type="checkbox"/>	Chamber 1
<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 <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.02 dB
Radiated Disturbance, 9 kHz to 30 MHz	1.72 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.05 dB

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

4.4. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 2, Clause 4.4.3 in IEC Guide 115:2007.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax and NFC. This test report addresses the DXX (NFC) operational mode.

5.2. MAXIMUM E-FIELD STRENGTH

The testing was performed at 3 meter. The transmitter maximum E-field at 30m distance is 15.76 dBuV/m which convert from 3 meter data.

5.3. WORST-CASE CONFIGURATION AND MODE

The NFC function was tested at its' fundamental and only operational frequency of 13.56 MHz.

The NFC with tag mode's fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that the Y orientation was the worst-case orientation; therefore all final radiated testing was performed with the EUT in the Y orientation while generating continuous emissions.

The NFC without tag mode's fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that the Y orientation was the worst-case orientation; therefore all final radiated testing was performed with the EUT in the Y orientation while generating continuous emissions.

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

Radiated(fundamental level and spurious emissions) tests were performed both without reading a passive tag condition[test mode] and with reading a passive tag condition.

5.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37MANQ1E72SE3	N/A
Data Cable	SAMSUNG	EP-DN980	GH39-02115A BWE	N/A
Earphone	SAMSUNG	GH59-15055A	EHS64AVFWE	N/A

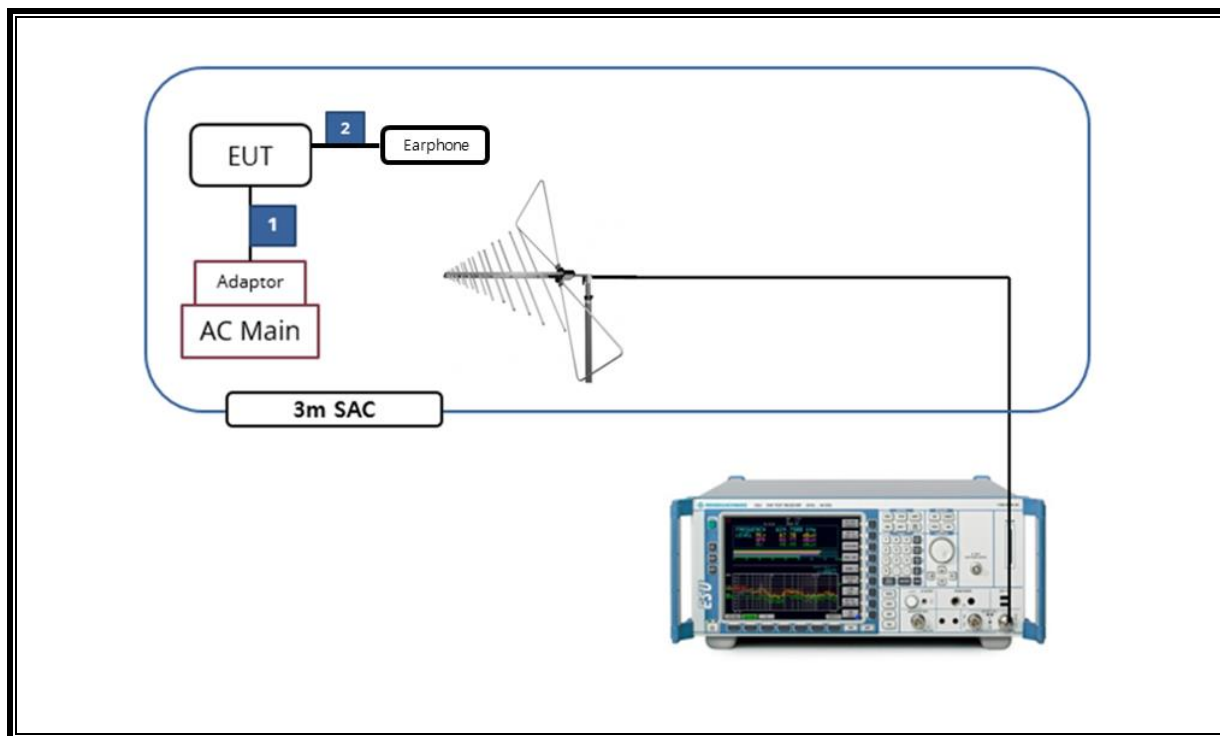
I/O CABLE

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

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

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

SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



5.5. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	2022-08-13
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2022-08-13
Preamplifier, 1000 MHz	Sonoma	310N	341282	2022-08-02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2022-08-02
Spectrum Analyzer, 7 GHz	Agilent / HP	N9010A	MY54200580	2022-08-02
EMI Test Receive, 3 GHz	R&S	ESR3	101832	2022-08-02
DC Power Supply	Agilent / HP	E3640A	MY54226395	2022-08-02
Temperature Chamber	ESPEC	SH-642	93001109	2022-08-02
LISN	R&S	ENV216	101837	2022-08-05
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2023-10-06
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

6. 20dB BANDWIDTH

LIMITS

§15.215

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated

§15.225

Operation within the band 13.110 – 14.010MHz

TEST PROCEDURE

The spectrum analyzer connected receive antenna and the EUT placed on near the receive antenna. The RBW is set to 10kHz. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

Frequency [MHz]	20 dB Bandwidth [kHz]
13.56	434.00

20dB Bandwidth Plot



7. RADIATED EMISSION TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMIT

§15.225

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

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

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

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

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

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

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

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

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

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

In addition:

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

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

TEST PROCEDURE

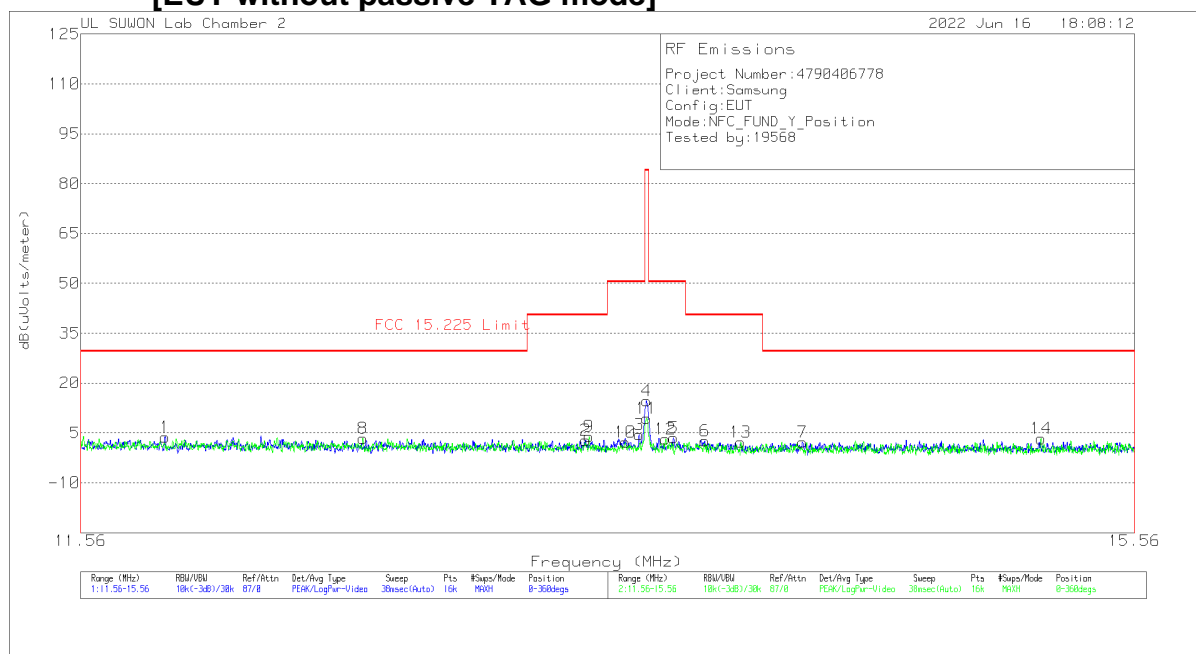
ANSI C63.10-2013

The EUT is an intentional radiator that incorporates a digital device. The highest fundamental frequency generated or used in the device is 13.56 MHz. The frequency range was investigated from 0.15 MHz to the 10th harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater (1000MHz)

RESULTS

No non-compliance noted:

7.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz) [EUT without passive TAG mode]



Trace Markers
 Face on

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
1	11.83925	23.27	Pk	20	-40	.5	3.77	29.54	-25.77	0-360
2	13.32888	22.22	Pk	20	-40	.5	2.72	40.51	-37.79	0-360
3	13.53138	24.05	Pk	20	-40	.5	4.55	50.5	-45.95	0-360
**4	13.55963	34.11	Pk	20	-40	.5	14.61	84	-69.39	0-360
5	13.6635	22.94	Pk	20	-40	.6	3.54	50.5	-46.96	0-360
6	13.78413	21.93	Pk	20	-40	.6	2.53	40.51	-37.98	0-360
7	14.16963	21.6	Pk	20	-40	.6	2.2	29.54	-27.34	0-360

Face off

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
8	12.51738	22.94	Pk	20	-40	.5	3.44	29.54	-26.1	0-360
9	13.34213	23.37	Pk	20	-40	.5	3.87	40.51	-36.64	0-360
10	13.47888	21.69	Pk	20	-40	.5	2.19	50.5	-48.31	0-360
**11	13.56063	28.88	Pk	20	-40	.5	9.38	84	-74.62	0-360
12	13.63313	22.56	Pk	20	-40	.6	3.16	50.5	-47.34	0-360
13	13.92488	21.54	Pk	20	-40	.6	2.14	40.51	-38.37	0-360
14	15.15513	22.67	Pk	20	-40	.6	3.27	29.54	-26.27	0-360

Pk - Peak detector
 **Fundamental

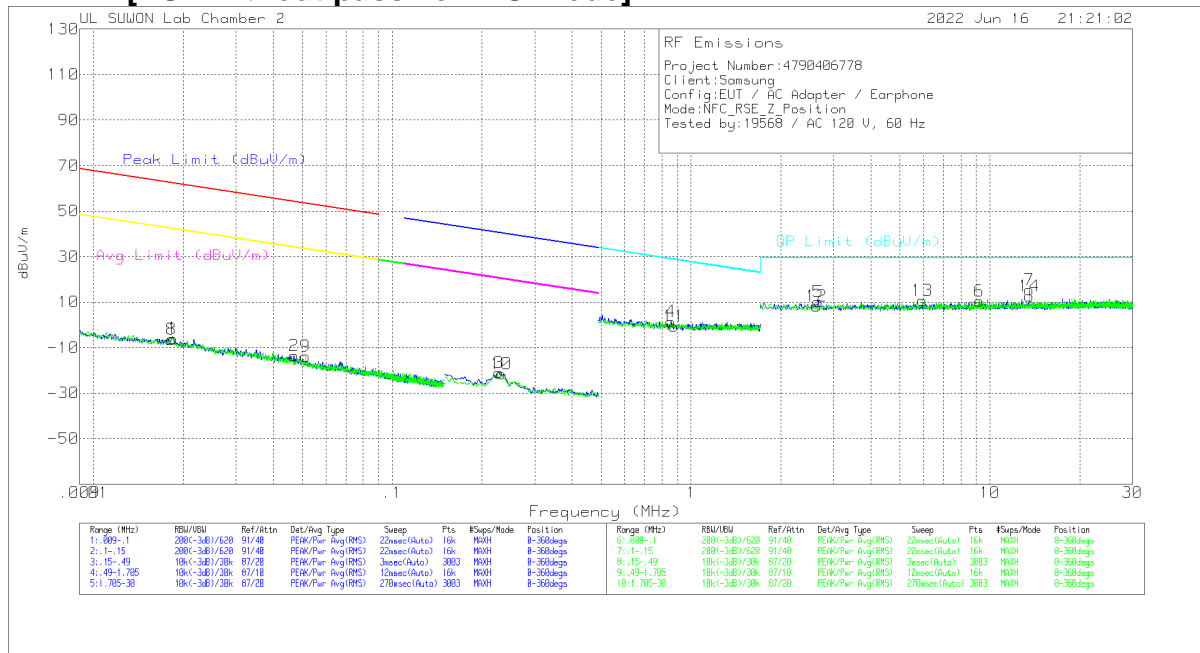
Note 1 : Although these tests were performed other than open filed test site, adequate comparison measurements were confirmed against 30 m open are test site.

Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

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

7.1.2. SPURIOUS EMISSION 0.009 TO 30 MHz

[EUT without passive TAG mode]



Trace Markers

Face on

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Cable Loss	Dist Corr 300m	Corrected Reading dBuV/m	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.01845	53.78	Pk	20.2	.1	-80	-5.92	62.26	-68.18	42.26	-48.18	-
2	.04691	46.6	Pk	19.9	.1	-80	-13.4	54.16	-67.56	34.16	-47.56	-
3	.22712	39.29	Pk	19.7	.1	-80	-20.91	-	-	-	-	40.49

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
4	.85503	21.51	Pk	19.8	.2	-40	1.51	28.98	-27.47	0-360
5	2.66164	30.08	Pk	19.9	.3	-40	10.28	29.5	-19.22	0-360
6	9.22615	30	Pk	20	.5	-40	10.5	29.5	-19	0-360
**7	13.56165	34.9	Pk	20	.5	-40	15.4	29.5	-14.1	0-360

Face off

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Cable Loss	Dist Corr 300m	Corrected Reading dBuV/m	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
8	.01828	53.33	Pk	20.2	.1	-80	-6.37	62.35	-68.72	42.35	-48.72	-
9	.05126	46.31	Pk	19.9	.1	-80	-13.69	53.39	-67.08	33.39	-47.08	-
10	.23136	38.74	Pk	19.7	.1	-80	-21.46	-	-	-	-	40.33

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
11	.87612	19.52	Pk	19.8	.2	-40	-48	28.77	-29.25	0-360
12	2.62865	28.06	Pk	19.9	.3	-40	8.26	29.5	-21.24	0-360
13	5.94625	30.67	Pk	19.8	.4	-40	10.87	29.5	-18.63	0-360
**14	13.56165	32.23	Pk	20	.5	-40	12.73	29.5	-16.77	0-360

Pk - Peak detector

**Fundamental

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

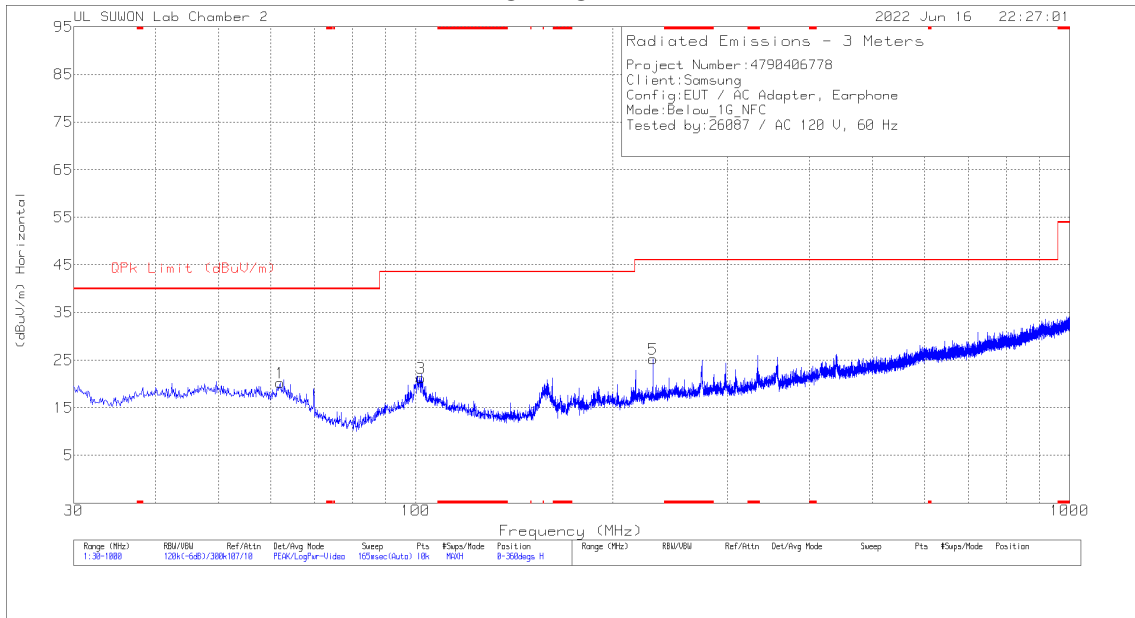
Please refer to section 8.1.1 about the fundamental level.

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

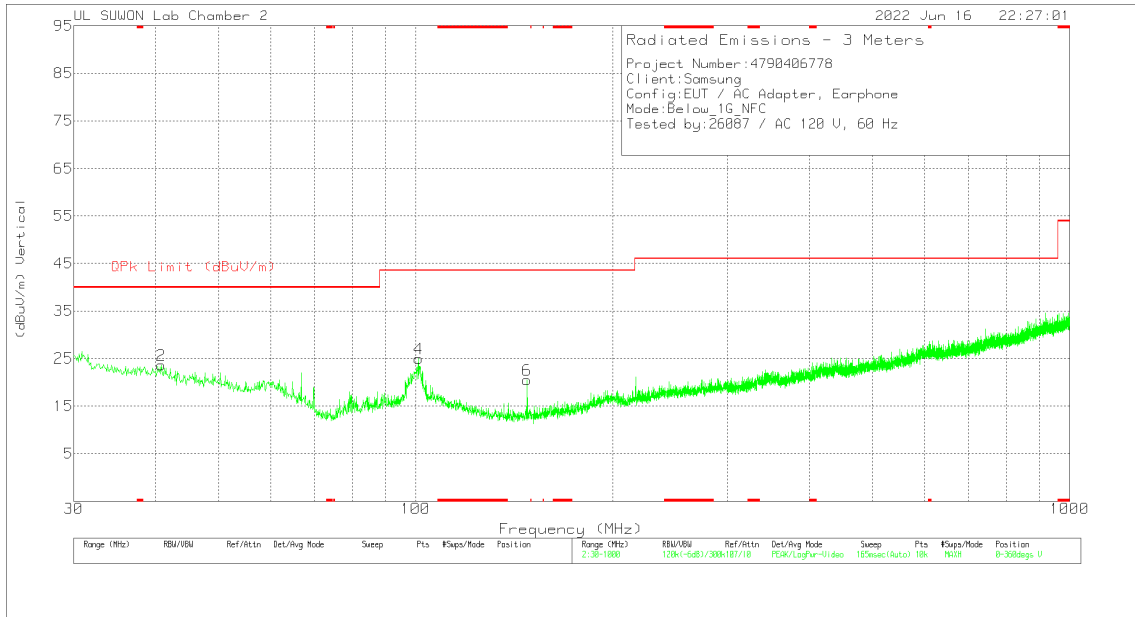
Note 2: Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.

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

HORIZONTAL



VERTICAL

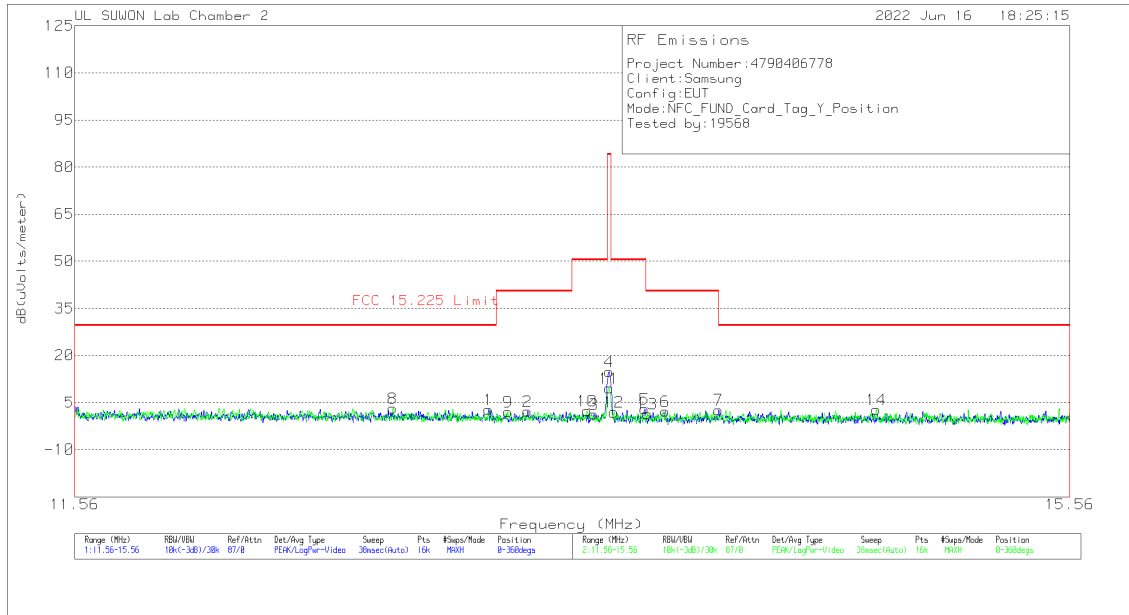


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Below 1G[dB]	Corrected Reading (dBuV/m)	QPK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	62.01	33.31	Pk	18	-31.1	20.21	40	-19.79	0-360	300	H
3	101.877	34.33	Pk	17.5	-30.6	21.23	43.52	-22.29	0-360	200	H
5	230.499	37.15	Pk	17.6	-29.5	25.25	46.02	-20.77	0-360	100	H
2	40.864	36.02	Pk	18.9	-31.3	23.62	40	-16.38	0-360	100	V
4	101.101	38.08	Pk	17.5	-30.6	24.98	43.52	-18.54	0-360	100	V
6	148.049	36.77	Pk	13.8	-30.1	20.47	43.52	-23.05	0-360	100	V

Pk - Peak detector

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



Trace Markers Face on

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
1	13.08163	22.34	Pk	20	-40	.5	2.84	29.54	-26.7	0-360
2	13.23488	21.69	Pk	20	-40	.5	2.19	40.51	-38.32	0-360
3	13.49938	20.79	Pk	20	-40	.5	1.29	50.5	-49.21	0-360
**4	13.55988	34.3	Pk	20	-40	.5	14.8	84	-69.2	0-360
5	13.70525	22.34	Pk	20	-40	.6	2.94	50.5	-47.56	0-360
6	13.78963	21.58	Pk	20	-40	.6	2.18	40.51	-38.33	0-360
7	14.01163	22.09	Pk	20	-40	.6	2.69	29.54	-26.85	0-360

Face off

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
8	12.71263	22.64	Pk	20	-40	.5	3.14	29.54	-26.4	0-360
9	13.15638	21.61	Pk	20	-40	.5	2.11	40.51	-38.4	0-360
10	13.47138	21.88	Pk	20	-40	.5	2.38	50.5	-48.12	0-360
**11	13.55938	29.13	Pk	20	-40	.5	9.63	84	-74.37	0-360
12	13.58013	21.35	Pk	20	-40	.6	1.95	50.5	-48.55	0-360
13	13.71563	20.95	Pk	20	-40	.6	1.55	40.51	-38.96	0-360
14	14.68738	22.27	Pk	20	-40	.6	2.87	29.54	-26.67	0-360

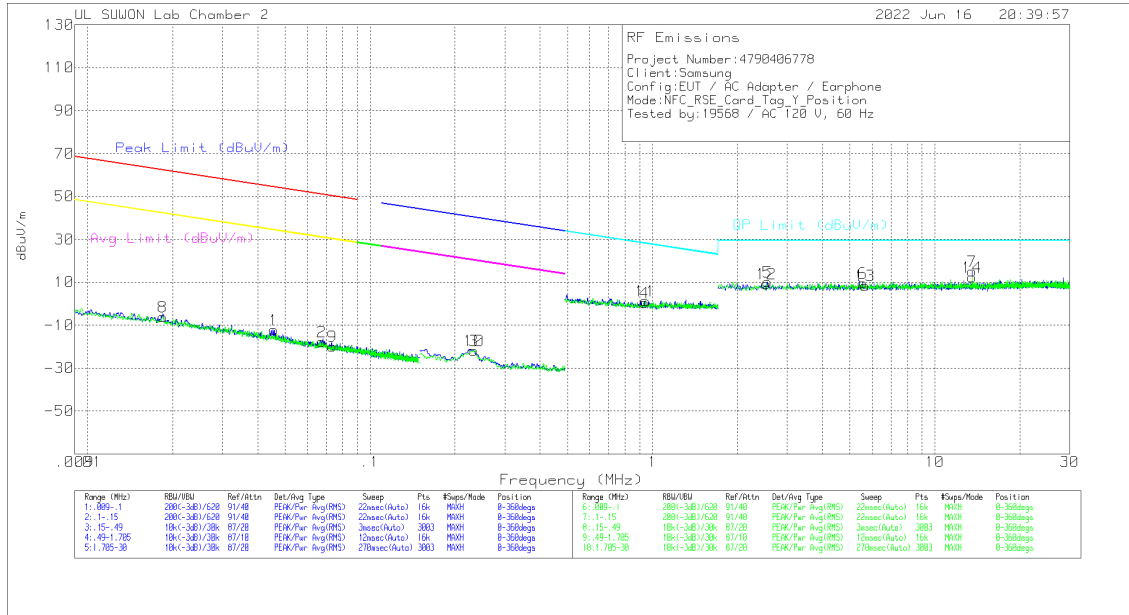
Pk - Peak detector
 **Fundamental

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

Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

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

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



Trace Markers

Face on

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Cable Loss	Dist Corr 300m	Corrected Reading dBuV/m	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.04573	47.94	Pk	19.9	.1	-80	-12.06	54.38	-66.44	34.38	-46.44	-
2	.06738	42.31	Pk	19.9	.1	-80	-17.69	51.01	-68.7	31.01	-48.7	-
3	.23232	38.53	Pk	19.7	.1	-80	-21.67	-	-	-	-	40.29

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
4	.93642	20.59	Pk	19.8	.2	-40	.59	28.19	-27.6	0-360
5	2.55325	29.89	Pk	19.9	.3	-40	10.09	29.5	-19.41	0-360
6	5.5504	29.32	Pk	19.8	.4	-40	9.52	29.5	-19.98	0-360
**7	13.56165	34.71	Pk	20	.5	-40	15.21	29.5	-14.29	0-360

Face off

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Cable Loss	Dist Corr 300m	Corrected Reading dBuV/m	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
8	.01842	53.7	Pk	20.2	.1	-80	-6	62.28	-68.28	42.28	-48.28	-
9	.07359	40.25	Pk	19.9	.1	-80	-19.75	50.25	-70	30.25	-50	-
10	.23334	38.32	Pk	19.7	.1	-80	-21.88	-	-	-	-	40.26

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
11	.94421	21.5	Pk	19.8	.2	-40	1.5	28.12	-26.62	0-360
12	2.52498	29.12	Pk	19.9	.3	-40	9.32	29.5	-20.18	0-360
13	5.64936	28.45	Pk	19.8	.4	-40	8.65	29.5	-20.85	0-360
**14	13.56165	31.81	Pk	20	.5	-40	12.31	29.5	-17.19	0-360

Pk - Peak detector

**Fundamental

Pk - Peak detector

**Fundamental

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

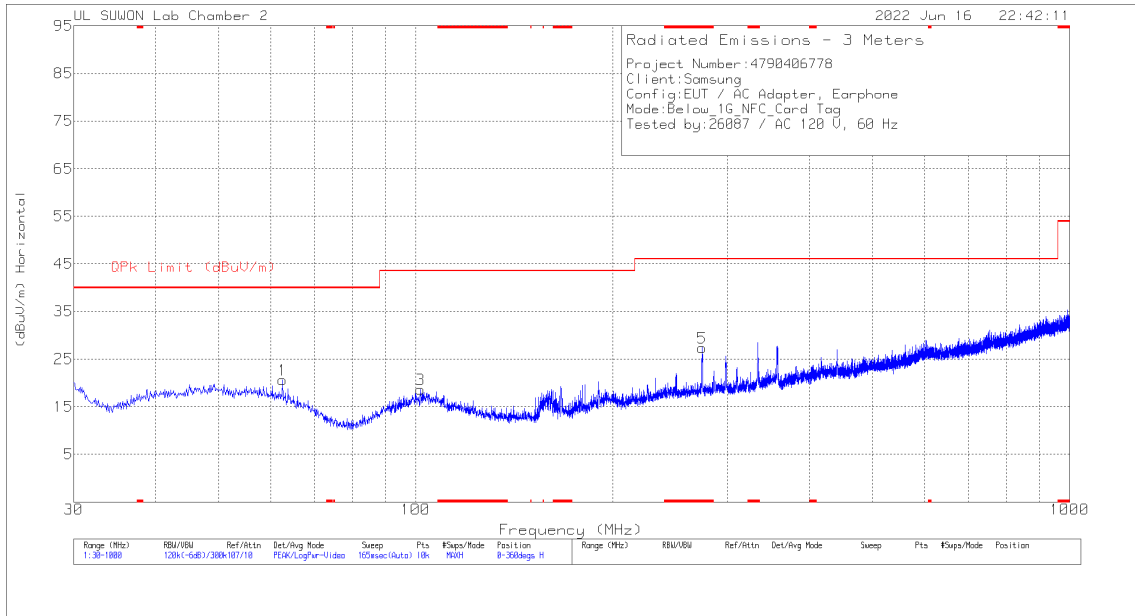
Please refer to section 8.1.4 about the fundamental level.

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

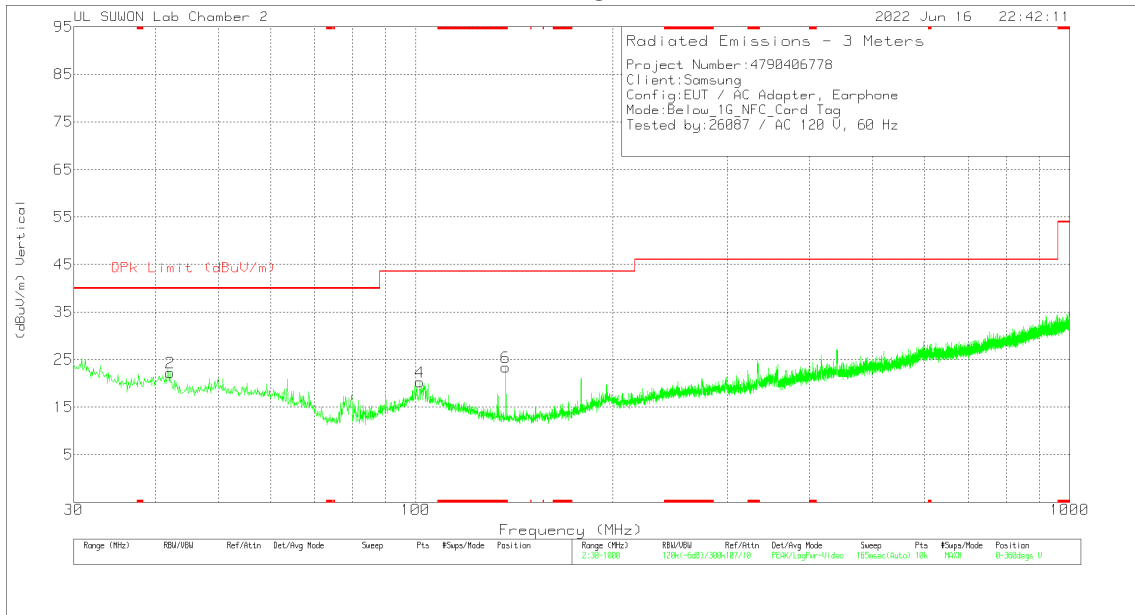
Note 2: Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.

7.1.6. TX SPURIOUS EMISSION 30 TO 1000 MHz [EUT with passive TAG mode]

HORIZONTAL



VERTICAL



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Below 1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	62.592	33.9	Pk	17.8	-31.1	20.6	40	-19.4	0-360	300	H
3	101.78	31.75	Pk	17.5	-30.6	18.65	43.52	-24.87	0-360	200	H
5	* 274.052	37.94	Pk	18.6	-29.2	27.34	46.02	-18.68	0-360	100	H
2	42.125	34.54	Pk	19.1	-31.4	22.24	40	-17.76	0-360	100	V
4	101.392	33.4	Pk	17.5	-30.6	20.3	43.52	-23.22	0-360	100	V
6	* 137.379	39.88	Pk	13.8	-30.3	23.38	43.52	-20.14	0-360	100	V

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

8. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 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.

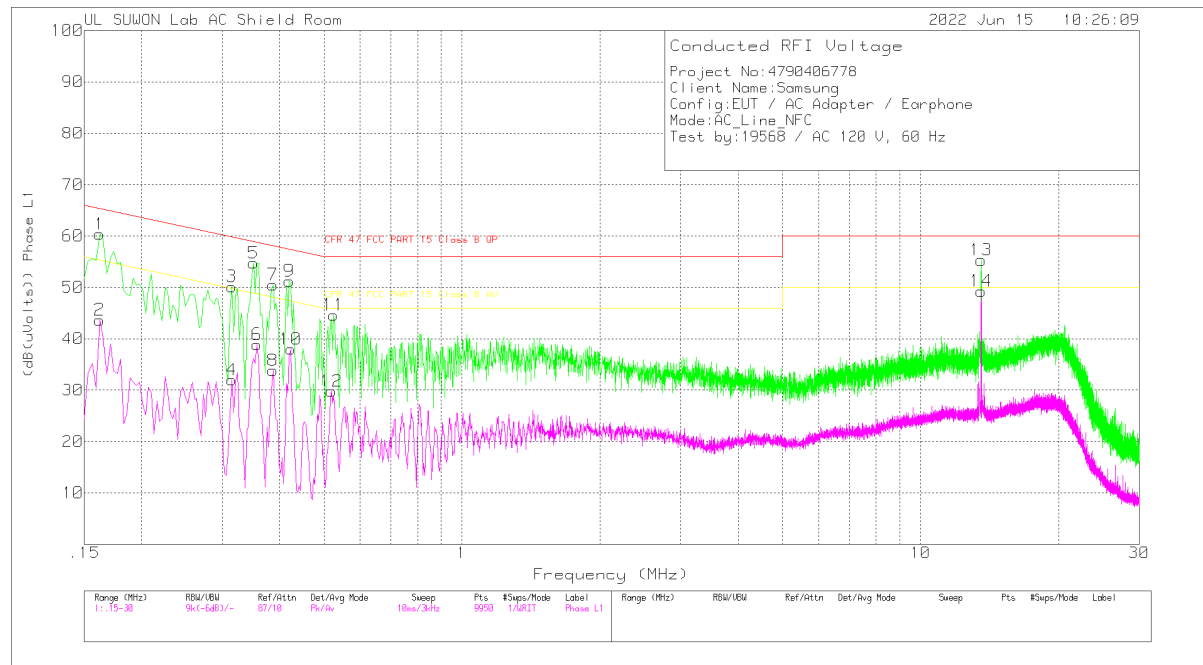
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

No non-compliance noted:

WORST EMISSIONS

LINE 1 PLOT



Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With 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	.162	50.37	Pk	9.9	.1	60.37	65.36	-4.99	-	-
2	.162	33.66	Av	9.9	.1	43.66	-	-	55.36	-11.7
3	.315	40.25	Pk	9.7	.2	50.15	59.84	-9.69	-	-
4	.315	22.09	Av	9.7	.2	31.99	-	-	49.84	-17.85
5	.351	44.72	Pk	9.8	.2	54.72	58.94	-4.22	-	-
6	.357	28.87	Av	9.8	.2	38.87	-	-	48.8	-9.93
7	.387	40.48	Pk	9.8	.2	50.48	58.13	-7.65	-	-
8	.387	23.82	Av	9.8	.2	33.82	-	-	48.13	-14.31
9	.42	41.23	Pk	9.8	.2	51.23	57.45	-6.22	-	-
10	.423	27.98	Av	9.8	.2	37.98	-	-	47.39	-9.41
11	.525	34.54	Pk	9.9	.2	44.64	56	-11.36	-	-
12	.519	19.7	Av	9.9	.2	29.8	-	-	46	-16.2
13	13.56	44.91	Pk	10	.4	55.31	60	-4.69	-	-
14	13.56	38.87	Av	10	.4	49.27	-	-	50	-7.3

Pk - Peak detector

Av - Average detection

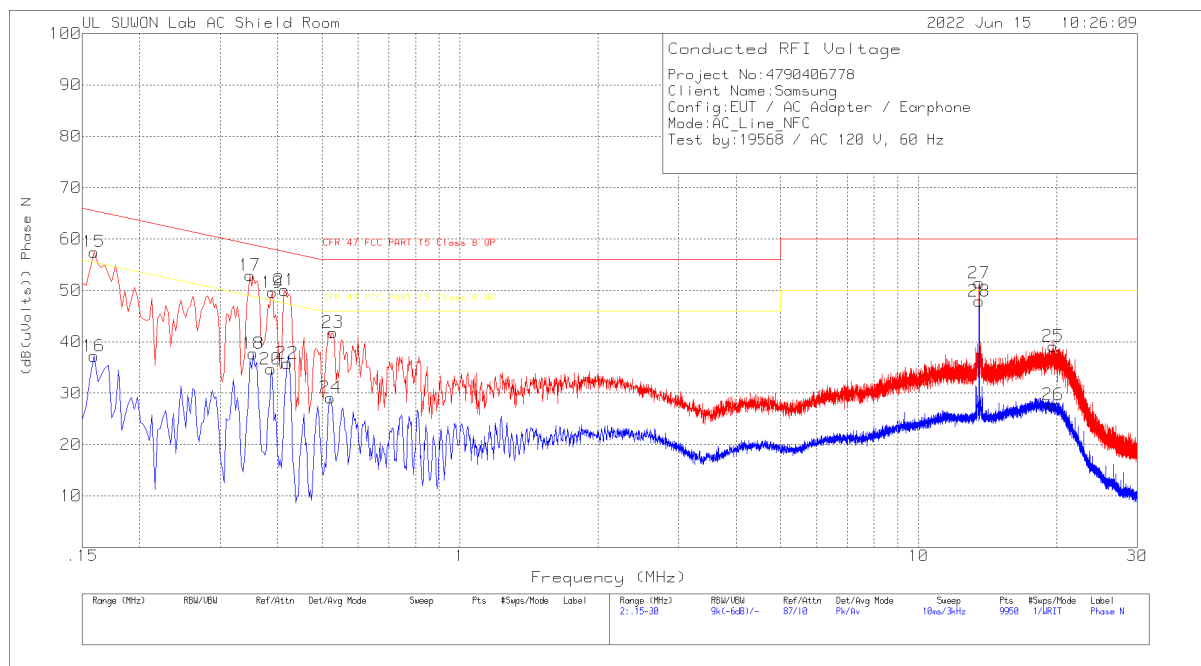
Quasi-Peak Emissions

Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With 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)
.16215	44.43	Qp	9.9	.1	54.43	65.35	-10.92	-	-
.31575	33.26	Qp	9.7	.2	43.16	59.82	-16.66	-	-
.35175	40.95	Qp	9.8	.2	50.95	58.92	-7.97	-	-
.38775	37.3	Qp	9.8	.2	47.3	58.11	-10.81	-	-
.42075	38.03	Qp	9.8	.2	48.03	57.43	-9.4	-	-
13.5602	42.8	Qp	10	.4	53.2	60	-6.8	-	-

Qp - Quasi-Peak detector

LINE 2 PLOT



Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With 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)
15	.159	47.6	Pk	9.8	.1	57.5	65.52	-8.02	-	-
16	.159	27.32	Av	9.8	.1	37.22	-	-	55.52	-18.3
17	.348	42.92	Pk	9.8	.2	52.92	59.01	-6.09	-	-
18	.354	27.71	Av	9.8	.2	37.71	-	-	48.87	-11.16
19	.39	39.6	Pk	9.8	.2	49.6	58.06	-8.46	-	-
20	.387	24.67	Av	9.8	.2	34.67	-	-	48.13	-13.46
21	.414	40.05	Pk	9.8	.2	50.05	57.57	-7.52	-	-
22	.42	25.83	Av	9.8	.2	35.83	-	-	47.45	-11.62
23	.528	31.73	Pk	9.9	.2	41.83	56	-14.17	-	-
24	.522	19.02	Av	9.9	.2	29.12	-	-	46	-16.88
25	19.641	28.54	Pk	10.2	.4	39.14	60	-20.86	-	-
26	19.644	17.16	Av	10.2	.4	27.76	-	-	50	-22.24
27	13.56	41.02	Pk	10	.4	51.42	60	-8.58	-	-
28	13.56	37.51	Av	10	.4	47.91	-	-	50	-2.09

Pk - Peak detector

Av - Average detection

Quasi-Peak Emissions

Range 2: Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	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)
.15975	42.07	Qp	9.8	.1	51.97	65.48	-13.51	-	-
.34875	39.22	Qp	9.8	.2	49.22	58.99	-9.77	-	-
.38925	37.04	Qp	9.8	.2	47.04	58.08	-11.04	-	-
.41475	34.54	Qp	9.8	.2	44.54	57.55	-13.01	-	-
13.5608	40.63	Qp	10	.4	51.03	60	-8.97	-	-

Qp - Quasi-Peak detector

9. FREQUENCY STABILITY

LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency, over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

TEST PROCEDURE

ANSI C63.10 §6.8

RESULTS

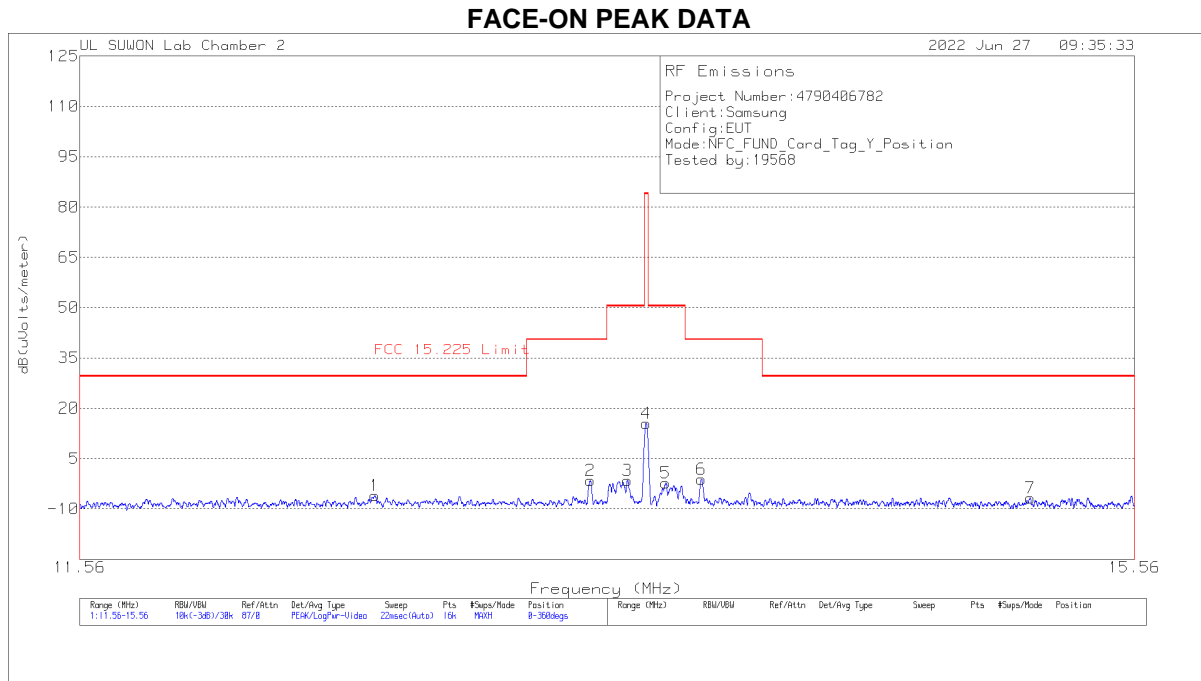
Power Supply (Vdc)	Envir. Temp (°C)	Frequency Deviation Measured with Time Elapse								
		Start up (MHz)	Delta (ppm)	@ 2mins (MHz)	Delta (ppm)	@ 5mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
3.86	50	13.559926422	-2.706	13.559919824	-3.193	13.559912415	-3.739	13.559907778	-4.081	100
3.86	40	13.559909022	-3.989	13.559910518	-3.879	13.559912633	-3.723	13.559914336	-3.598	100
3.86	30	13.559925819	-2.751	13.559929899	-2.450	13.559934534	-2.108	13.559939821	-1.718	100
3.86	20	13.559963119	0	13.559967853	0.349	13.559972928	0.723	13.559978725	1.151	100
3.86	10	13.560027428	4.743	13.560027426	4.742	13.560027622	4.757	13.560027664	4.760	100
3.86	0	13.560041395	5.773	13.560047712	6.238	13.560052331	6.579	13.560057184	6.937	100
3.86	-10	13.560073423	8.135	13.560066379	7.615	13.560072807	8.089	13.560078147	8.483	100
3.86	-20	13.560083570	8.883	13.560083563	8.882	13.560082960	8.838	13.560082084	8.773	100
3.86	-30	13.560072785	8.087	13.560067350	7.687	13.560062028	7.294	13.560056213	6.865	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)
3.86	20	13.559924673	0	13.559923320	-0.100	13.559924149	-0.039	13.559924226	-0.033	100
3.75	20	13.559919501	-0.381	13.559919466	-0.384	13.559919262	-0.399	13.559919141	-0.408	100
4.40	20	13.559919745	-0.363	13.559920673	-0.295	13.559920744	-0.290	13.559920456	-0.311	100

No non-compliance noted.

10. SPOT-CHECK TEST RESULT

FUNDAMENTAL EMISSIONS



Trace Markers

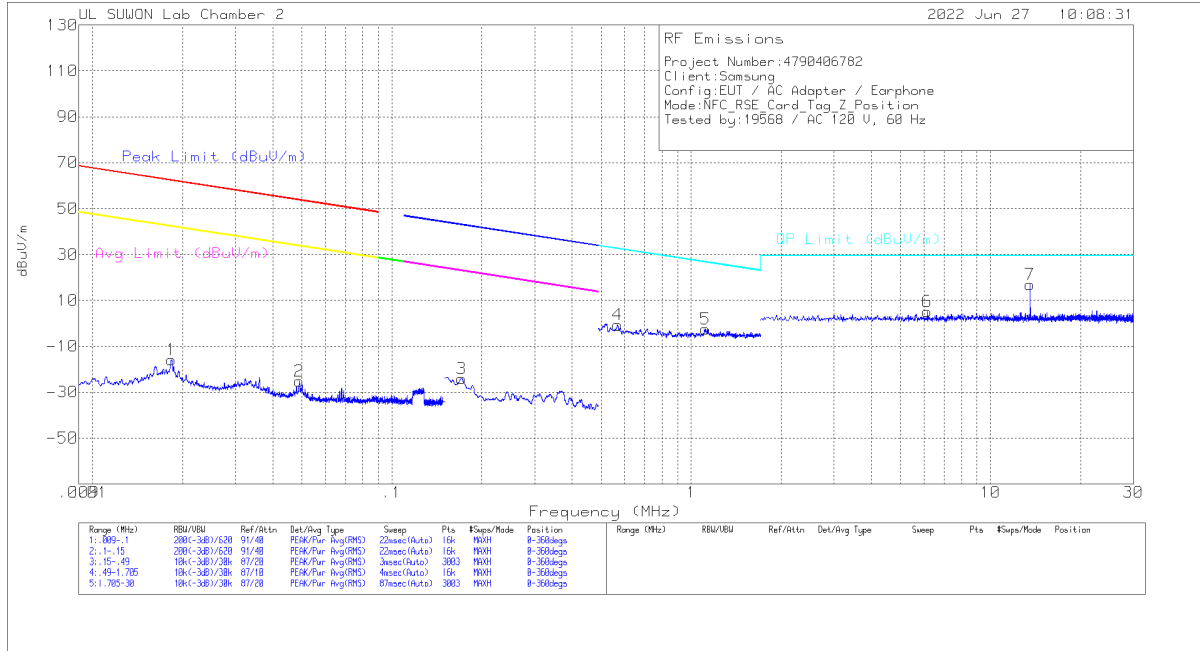
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Dist Corr 30m	Cable Loss	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	Margin (dB)	Azimuth (Degs)
1	12.56238	13.44	Pk	20	-40	.5	-6.06	29.54	-35.6	0-360
2	13.34838	17.92	Pk	20	-40	.5	-1.58	40.51	-42.09	0-360
3	13.48913	18.07	Pk	20	-40	.5	-1.43	50.5	-51.93	0-360
**4	13.56025	35.04	Pk	20	-40	.5	15.54	84	-68.46	0-360
5	13.63588	17.22	Pk	20	-40	.6	-2.18	50.5	-52.68	0-360
6	13.77313	18.34	Pk	20	-40	.6	-1.06	40.51	-41.57	0-360
7	15.10963	12.73	Pk	20	-40	.6	-6.67	29.54	-36.21	0-360

Pk - Peak detector

**Fundamental

HARMONICS AND SPURIOUS EMISSIONS

FACE-ON



Note: Emission was scanned up to 40GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Radiated Emissions

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Cable Loss	Dist Corr 300m	Corrected Reading dBuV/m	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.0184	43.9	Pk	20.2	.1	-80	-15.8	62.29	-78.09	42.29	-58.09	0-360
2	.04911	34.83	Pk	19.9	.1	-80	-25.17	53.76	-78.93	33.76	-58.93	0-360
3	.17091	36.06	Pk	19.8	.1	-80	-24.04	42.97	-67.01	22.97	-47.01	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	HFH2-Z2_Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
4	.56748	19.52	Pk	19.7	.1	-40	-68	32.53	-33.21	0-360
5	1.11635	17.48	Pk	19.8	.2	-40	-2.52	26.67	-29.19	0-360
6	6.1536	24.88	Pk	19.8	.4	-40	5.08	29.5	-24.42	0-360
**7	13.56165	36.42	Pk	20	.5	-40	16.92	29.5	-12.58	0-360

Pk - Peak detector
 **Fundamental

END OF TEST REPORT