CERTIFICATION TEST REPORT

Report Number. : 4791196642-E10V1

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

Model : SC-55E, SCG28

FCC ID : A3LSMF956JPN

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

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

Date Of Issue:
2024-05-31

Prepared by:
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IAS ACCREDITED
Testing Laboratory
TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2024-05-31	Initial issue	Yeonhee Lim

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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/ax, NFC, WPT and UWB

MODEL NUMBER: SC-55E, SCG28

SERIAL NUMBER: R3CX30KWQJE (RADIATED);

DATE TESTED: 2024-05-13 ~ 2024-05-31

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies

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:

Seokhwan Hong
Suwon Lab Engineer
UL KOREA LTD.

Tested By:

Yeonhee Lim
Suwon Lab Engineer
UL KOREA LTD.

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2. TEST METHODOLOGY

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

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. ANSI C63.10-2013.
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
☐ Chamber 1(3m semi-anechoic chamber)
☒ Chamber 2(3m semi-anechoic chamber)
☐ Chamber 3(3m semi-anechoic chamber)
☐ Chamber 4(3m Full-anechoic chamber)
☐ Chamber 5(3m Full-anechoic chamber)

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.

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4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

Corrected Reading (dBuV) = Meter Reading (dBuV) + External Cable (dB) + Cableloss (dB)
46.62 dBuV + 9.8 dB + 0.1 dB = 56.52 dBuV

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	2.79 dB
Radiated Disturbance, 9 kHz to 30 MHz	1.69 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.07 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 Clause 4.4.3 in IEC Guide 115:2023.

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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, NFC, WPT and UWB. This test report addresses the DXX (NFC) operational mode.

Representative model	Difference	Derivative model
		SCG28
SC-55E	Hardware	Same as SC-55E
	Software	Different UI

The model SC-55E was used for final testing and is representative of the test results in this report.

5.2. MAXIMUM E-FIELD STRENGTH

The testing was performed at 3 meter. The transmitter maximum E-field at 30m distance is 19.56 dBuV/m which convert from 3 meter data.

Foldable conditions	NFC with tag mode [dBuV/m]	NFC without tag mode [dBuV/m]
Open	**19.63**	18.01
Harf-folded	18.68	**18.40**
Full-folded	19.00	18.11

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5.3. WORST-CASE CONFIGURATION AND MODE

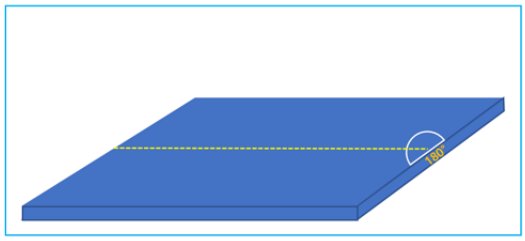
The NFC function was tested at its' fundamental and only operational frequency of 13.56 MHz.

i. Worst case of antenna axis:

NFC with tag mode	NFC without tag mode
Y	

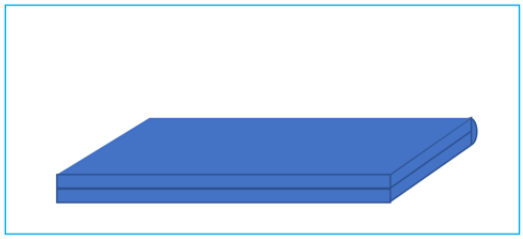
ii. Foldable condition

NFC with tag mode	NFC without tag mode
Open	Harf-folded



Open

Half-folded



Full-folded

The fundamental level of the EUT was investigated each type and bitrate.
All test was performed worst case condition below.

- ISO/IEC 14443-A(Type A) and bit rate 106 kbps

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

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5.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

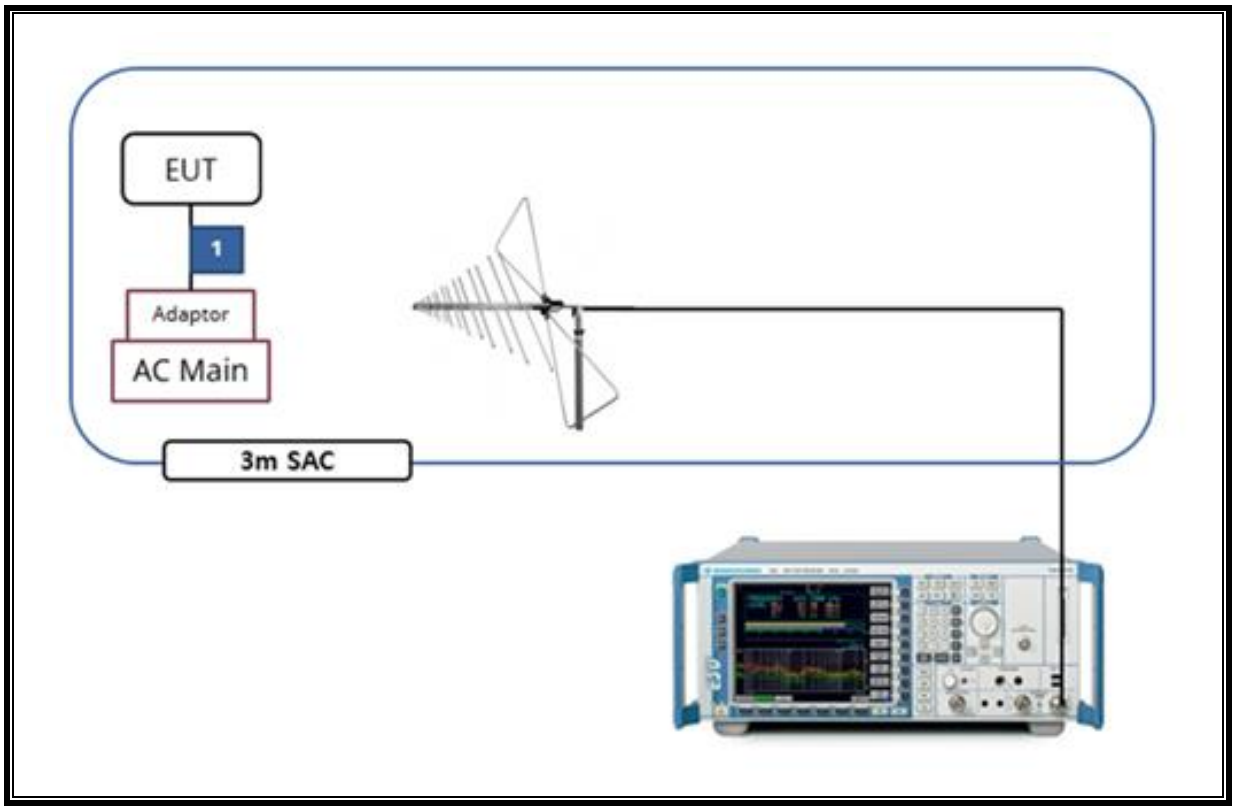
Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Charger	SAMSUNG	EP-TA800	R37N9QP6H09DK3	N/A
Data Cable	SAMSUNG	EP-DN980	GH39-02111A	N/A

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	1.0 m	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)



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6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	**Manufacturer**	**Model**	**S/N**	**Cal Due**
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	2024-08-15
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2024-08-15
Preamplifier, 1000 MHz	Sonoma	310N	341282	2024-07-24
Preamplifier, 1000 MHz	Sonoma	310N	351741	2024-07-24
Spectrum Analyzer, 7 GHz	Agilent / HP	N9010A	MY54200580	2024-07-23
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9030A	MY54170614	2024-07-24
EMI Test Receive, 3 GHz	R&S	ESR3	101832	2024-07-23
DC Power Supply	Agilent / HP	E3640A	MY54226395	2024-07-24
Temperature Chamber	ESPEC	SH-642	93001109	2024-07-24
LISN	R&S	ENV-216	101836	2024-07-23
LISN	R&S	ENV-216	101837	2024-07-23
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2025-09-06
UL Software				
Description	**Manufacturer**	**Model**	**Version**	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

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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 1-5% of emission BW. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

Frequency [MHz]	20 dB Bandwidth [kHz]
13.56	438.2

20dB Bandwidth Plot

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8. RADIATED EMISSION TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMIT

§15.225

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

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

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

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:
§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

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

Formula for converting the filed strength from uV/m to dBuV/m is:
Limit (dBuV/m) = 20 log limit (uV/m)

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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:

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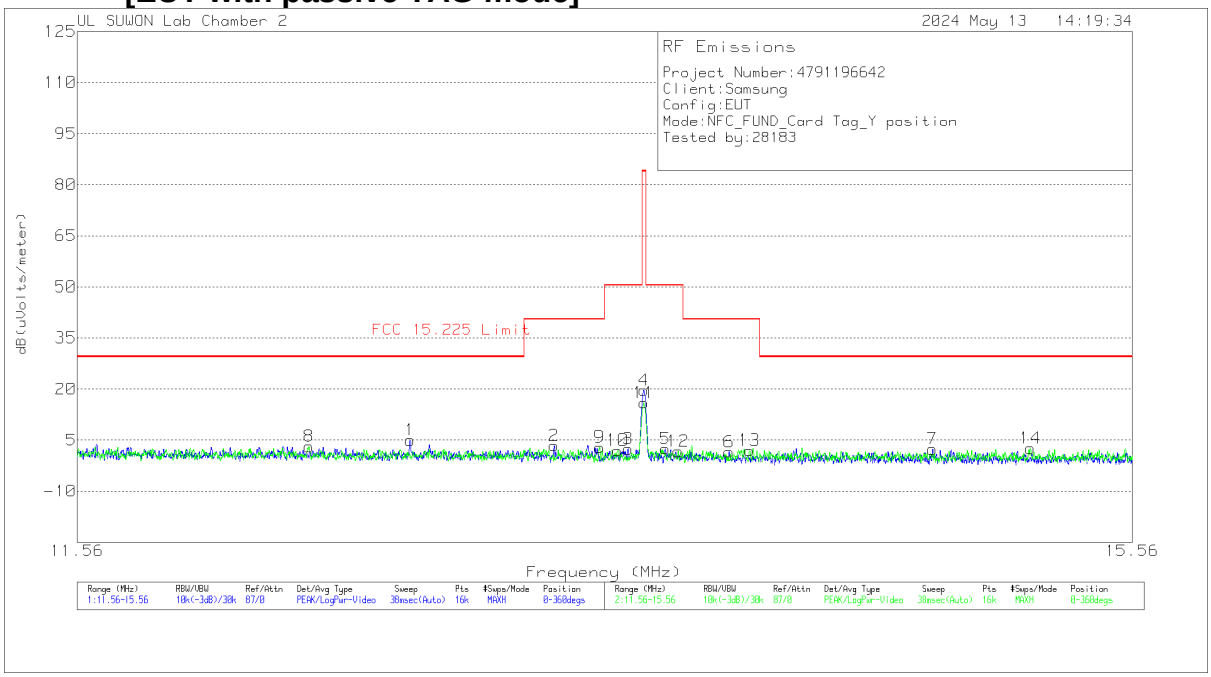
8.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz)

[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	12.69638	24.38	Pk	20.1	-40	.5	4.98	29.54	-24.56	0-360
2	13.22188	22.75	Pk	20.1	-40	.5	3.35	40.51	-37.16	0-360
3	13.49988	21.8	Pk	20.1	-40	.5	2.4	50.5	-48.1	0-360
**4	13.55988	39.03	Pk	20.1	-40	.5	19.63	84	-64.37	0-360
5	13.642	21.74	Pk	20.1	-40	.6	2.44	50.5	-48.06	0-360
6	13.88988	20.82	Pk	20.1	-40	.6	1.52	40.51	-38.99	0-360
7	14.70888	21.69	Pk	20.1	-40	.6	2.39	29.54	-27.15	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	12.3395	22.43	Pk	20.2	-40	.5	3.13	29.54	-26.41	0-360
9	13.39213	22.26	Pk	20.1	-40	.5	2.86	40.51	-37.65	0-360
10	13.46063	21.34	Pk	20.1	-40	.5	1.94	50.5	-48.56	0-360
**11	13.56	35.34	Pk	20.1	-40	.5	15.94	84	-68.06	0-360
12	13.69213	20.97	Pk	20.1	-40	.6	1.67	50.5	-48.83	0-360
13	13.97013	21.25	Pk	20.1	-40	.6	1.95	40.51	-38.56	0-360
14	15.11963	21.9	Pk	20.1	-40	.6	2.6	29.54	-26.94	0-360

Pk - Peak detector
**Fundamental

Note 1 : Although these tests were performed other than open filed test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
Note 2: Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.

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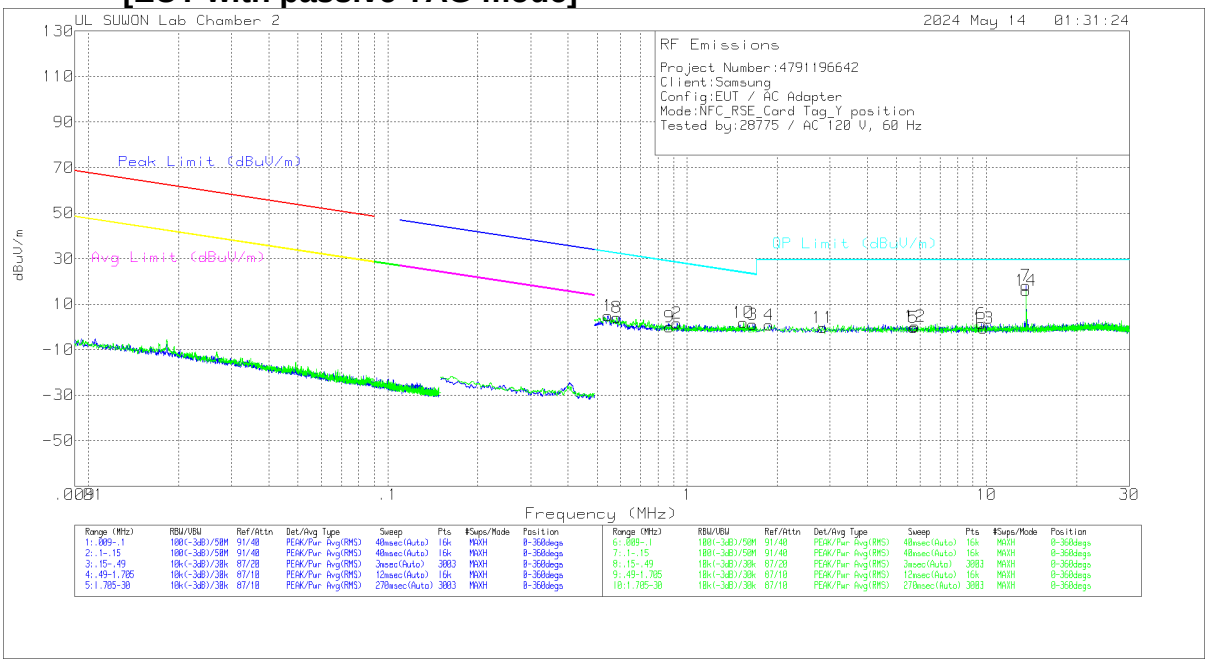
8.1.2. SPURIOUS EMISSION (0.009 – 30 MHz)
[EUT with passive TAG mode]



Trace Markers
Face on

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor(dB/m)	Cable Loss(dB)	Dist Corr 30m(dB)	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.54388	25.05	Pk	19.9	.1	-40	5.05	32.9	-27.85	0-360
2	.92499	21.56	Pk	19.9	.2	-40	1.66	28.3	-26.64	0-360
3	1.65398	21	Pk	20	.2	-40	1.2	23.26	-22.06	0-360
4	1.87465	20.55	Pk	20	.2	-40	.75	29.5	-28.75	0-360
5	5.7012	19.19	Pk	20.1	.4	-40	-.31	29.5	-29.81	0-360
6	9.622	20.9	Pk	20	.5	-40	1.4	29.5	-28.1	0-360
**7	13.56165	37.65	Pk	20	.5	-40	18.15	29.5	-11.35	0-360

Face off

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor(dB/m)	Cable Loss(dB)	Dist Corr 30m(dB)	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
8	.58234	24.25	Pk	19.9	.1	-40	4.25	32.3	-28.05	0-360
9	.87163	19.78	Pk	19.9	.2	-40	-.12	28.81	-28.93	0-360
10	1.54233	21.81	Pk	20	.2	-40	2.01	23.87	-21.86	0-360
11	2.836	19.32	Pk	20.1	.3	-40	-.28	29.5	-29.78	0-360
12	5.76718	19.67	Pk	20.1	.4	-40	.17	29.5	-29.33	0-360
13	9.75395	19.04	Pk	20	.5	-40	-.46	29.5	-29.96	0-360
**14	13.56165	35.43	Pk	20	.5	-40	15.93	29.5	-13.57	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.

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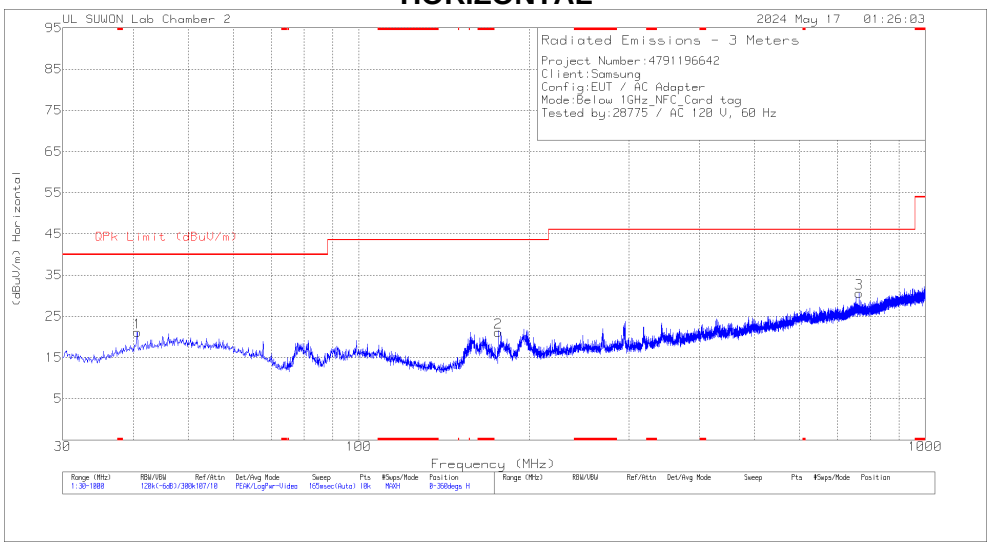
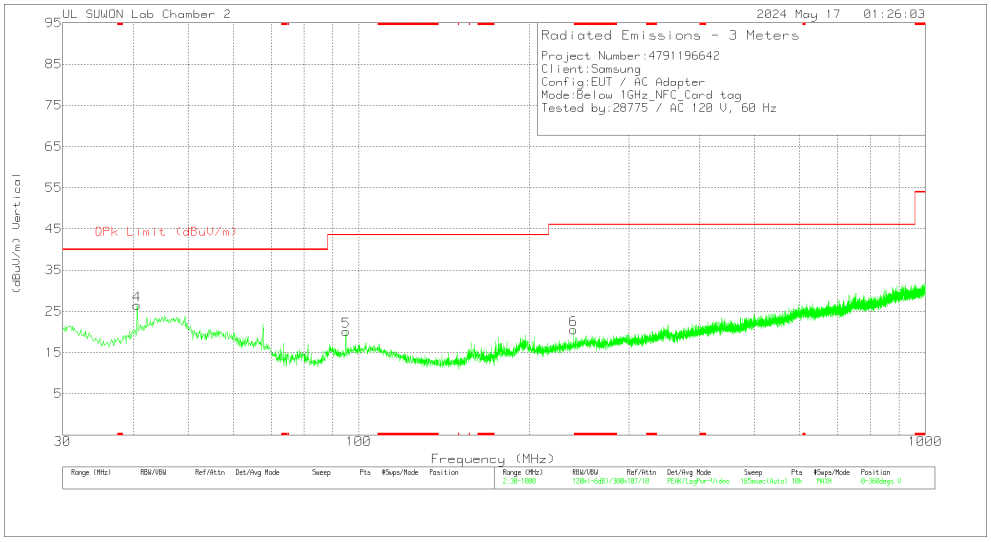
8.1.3. SPURIOUS EMISSION (30 – 1000 MHz)

[EUT with passive TAG mode]

HORIZONTAL



VERTICAL



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Antenna_749_Factor(dB)	Below_1G_Path Loss(dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	40.67	33.99	Pk	18.9	-31.8	21.09	40	-18.91	0-360	100	H
2	176.179	36.81	Pk	15	-30.7	21.11	43.52	-22.41	0-360	100	H
3	764.29	32.76	Pk	26.5	-28.6	30.66	46.02	-15.36	0-360	200	H
4	40.573	39.28	Pk	18.9	-31.7	26.48	40	-13.52	0-360	100	V
5	94.893	34.82	Pk	16.6	-31.3	20.12	43.52	-23.4	0-360	100	V
6	239.52	32.66	Pk	18.2	-30.4	20.46	46.02	-25.56	0-360	100	V

Pk - Peak detector

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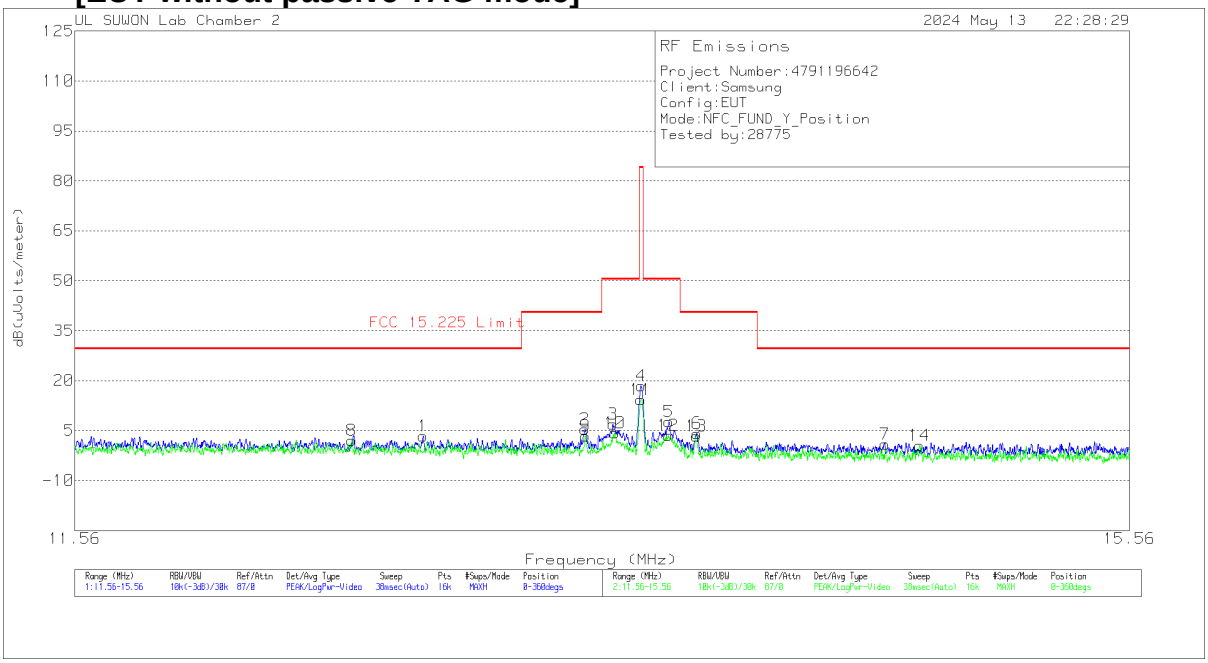
8.1.4. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz) [EUT without passive TAG mode]



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	12.75263	22.75	Pk	20.1	-40	.5	3.35	29.54	-26.19	0-360
2	13.34688	24.81	Pk	20.1	-40	.5	5.41	40.51	-35.1	0-360
3	13.45238	26.29	Pk	20.1	-40	.5	6.89	50.5	-43.61	0-360
**4	13.55988	37.8	Pk	20.1	-40	.5	18.4	84	-65.6	0-360
5	13.66638	26.95	Pk	20.1	-40	.6	7.65	50.5	-42.85	0-360
6	13.77463	23.5	Pk	20.1	-40	.6	4.2	40.51	-36.31	0-360
7	14.52525	20.13	Pk	20.1	-40	.6	.83	29.54	-28.71	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	12.49863	21.31	Pk	20.2	-40	.5	2.01	29.54	-27.53	0-360
9	13.34813	22.8	Pk	20.1	-40	.5	3.4	40.51	-37.11	0-360
10	13.45963	23.71	Pk	20.1	-40	.5	4.31	50.5	-46.19	0-360
**11	13.55913	33.73	Pk	20.1	-40	.5	14.33	84	-69.67	0-360
12	13.66438	22.81	Pk	20.1	-40	.6	3.51	50.5	-46.99	0-360
13	13.772	22.72	Pk	20.1	-40	.6	3.42	40.51	-37.09	0-360
14	14.666	19.75	Pk	20.1	-40	.6	.45	29.54	-29.09	0-360

Pk - Peak detector
**Fundamental

Note 1: Although these tests were performed other than open filed test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

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

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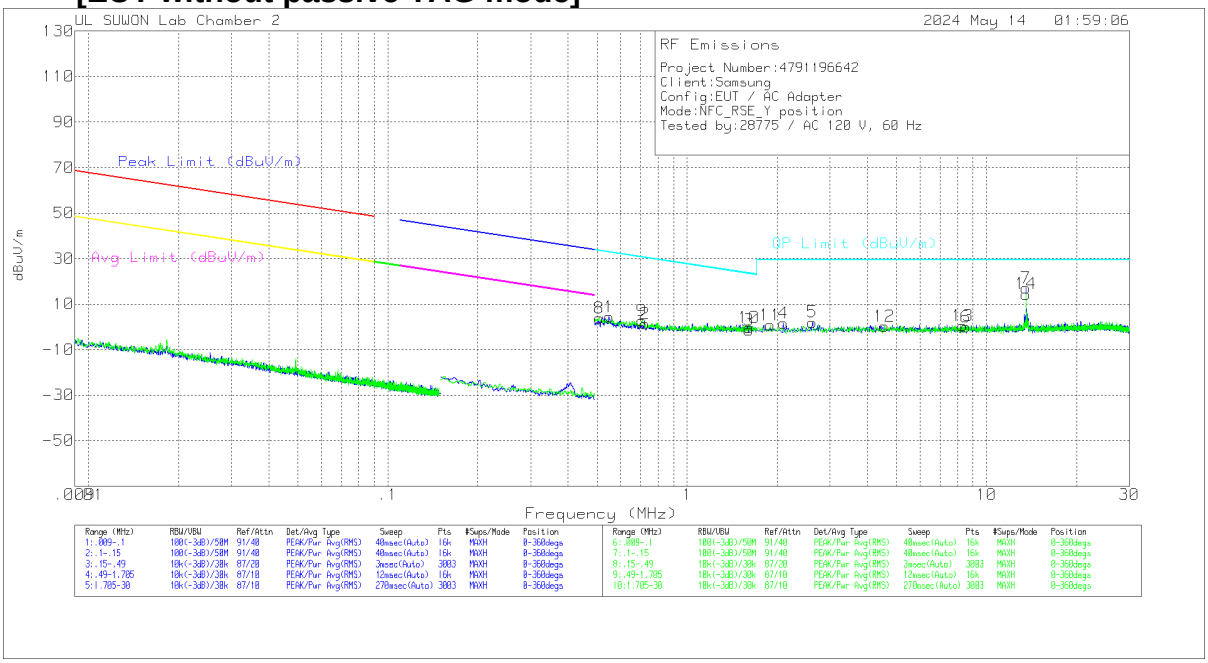
8.1.5. SPURIOUS EMISSION (0.009 – 30 MHz)
[EUT without passive TAG mode]



Trace Markers
Face on

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor(dB/m)	Cable Loss(dB)	Dist Corr 30m(dB)	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.54818	24.36	Pk	19.9	.1	-40	4.36	32.83	-28.47	0-360
2	.72294	21.27	Pk	19.9	.1	-40	1.27	30.43	-29.16	0-360
3	1.6121	18.37	Pk	20	.2	-40	-1.43	23.49	-24.92	0-360
4	2.10085	21.41	Pk	20	.2	-40	1.61	29.5	-27.89	0-360
5	2.61923	21.67	Pk	20.1	.3	-40	2.07	29.5	-27.43	0-360
6	8.51928	19.56	Pk	20	.4	-40	-.04	29.5	-29.54	0-360
**7	13.56165	36.57	Pk	20	.5	-40	17.07	29.5	-12.43	0-360

Face off

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor(dB/m)	Cable Loss(dB)	Dist Corr 30m(dB)	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
8	.50847	23.88	Pk	19.9	.1	-40	3.88	33.48	-29.6	0-360
9	.70428	22.66	Pk	19.9	.1	-40	2.66	30.66	-28	0-360
10	1.60994	19.54	Pk	20	.2	-40	-.26	23.5	-23.76	0-360
11	1.8935	20.68	Pk	20	.2	-40	.88	29.5	-28.62	0-360
12	4.56078	19.92	Pk	20.1	.3	-40	.32	29.5	-29.18	0-360
13	8.33078	20.07	Pk	20	.4	-40	.47	29.5	-29.03	0-360
**14	13.56165	33.97	Pk	20	.5	-40	14.47	29.5	-15.03	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.

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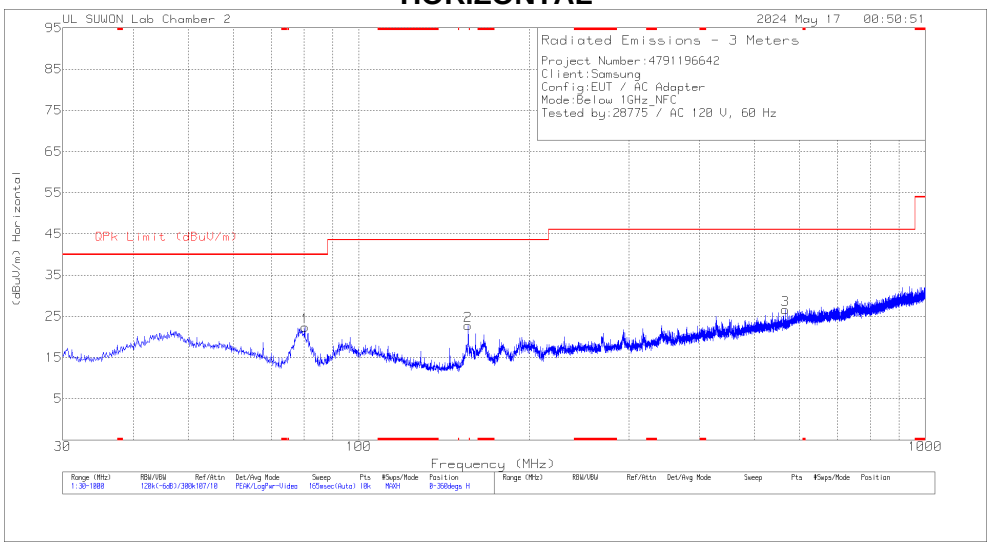
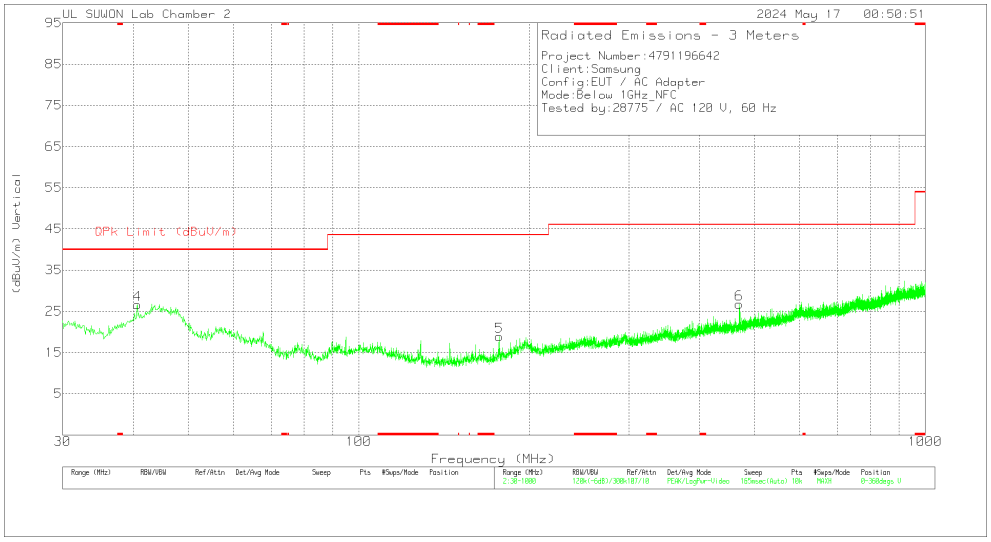
8.1.6. SPURIOUS EMISSION (30 – 1000 MHz)

[EUT without passive TAG mode]

HORIZONTAL



VERTICAL



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Antenna_749_Factor(dB)	Below_1G_Path Loss(dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	80.343	40.84	Pk	12.9	-31.4	22.34	40	-17.66	0-360	100	H
2	156.003	39.42	Pk	14.2	-30.9	22.72	43.52	-20.8	0-360	100	H
3	565.731	32.29	Pk	23.6	-29.3	26.59	46.02	-19.43	0-360	300	H
4	40.67	39.47	Pk	18.9	-31.8	26.57	40	-13.43	0-360	100	V
5	176.858	34.48	Pk	15.1	-30.7	18.88	43.52	-24.64	0-360	100	V
6	469.798	34.36	Pk	22	-29.6	26.76	46.02	-19.26	0-360	200	V

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

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9. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

No non-compliance noted:

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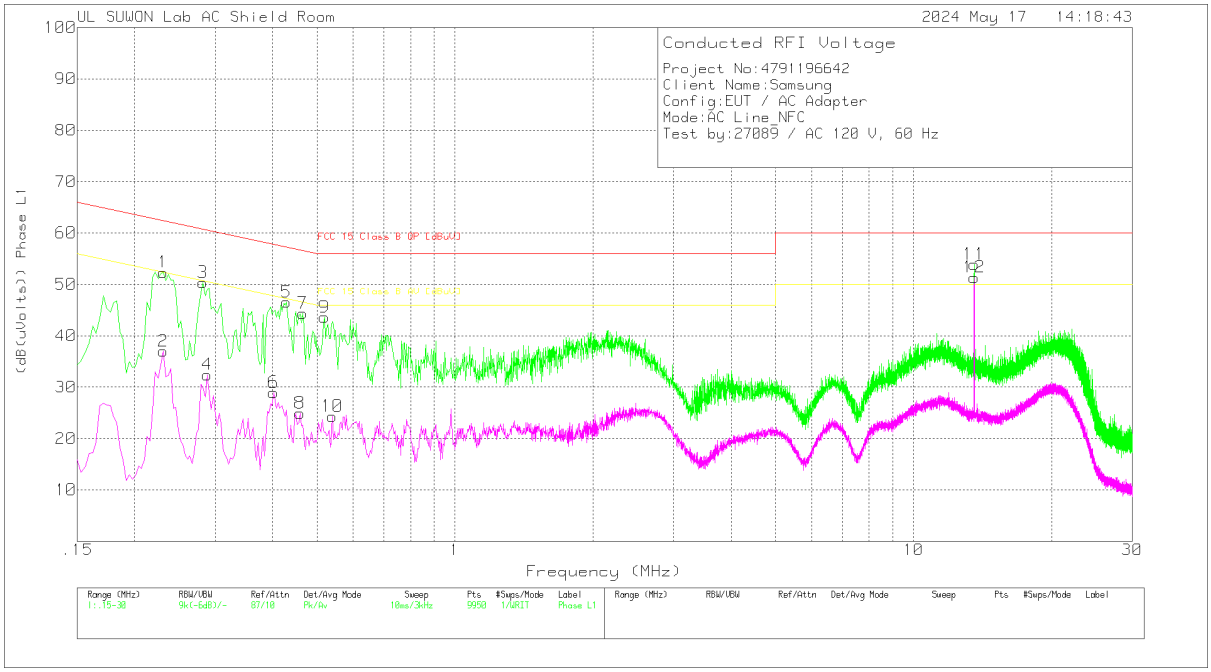
WORST EMISSIONS(non-Terminated)

LINE 1 PLOT



LINE 1 RESULTS

Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_L1 [dB]	Cable Loss [dB]	Corrected Reading (dB(uVolts))	FCC 15 Class B QP [dBuV]	Margin (dB)	FCC 15 Class B AV [dBuV]	Margin (dB)
1	.231	42.56	Pk	9.7	.1	52.36	62.41	-10.05	-	-
2	.231	27.2	Av	9.7	.1	37	-	-	52.41	-15.41
3	.282	40.56	Pk	9.7	.1	50.36	60.76	-10.4	-	-
4	.288	22.63	Av	9.7	.1	32.43	-	-	50.58	-18.15
5	.429	36.66	Pk	9.8	.1	46.56	57.27	-10.71	-	-
6	.402	19.08	Av	9.8	.1	28.98	-	-	47.81	-18.83
7	.465	34.49	Pk	9.8	.1	44.39	56.6	-12.21	-	-
8	.459	15.05	Av	9.8	.1	24.95	-	-	46.71	-21.76
9	.519	33.61	Pk	9.9	.1	43.61	56	-12.39	-	-
10	.54	14.33	Av	9.9	.1	24.33	-	-	46	-21.67
11	13.56	43.64	Pk	10	.3	53.94	60	-6.06	-	-
12	13.56	41.09	Av	10	.3	51.39	-	-	**50**	**1.39**

Pk - Peak detector
Av - Average detection

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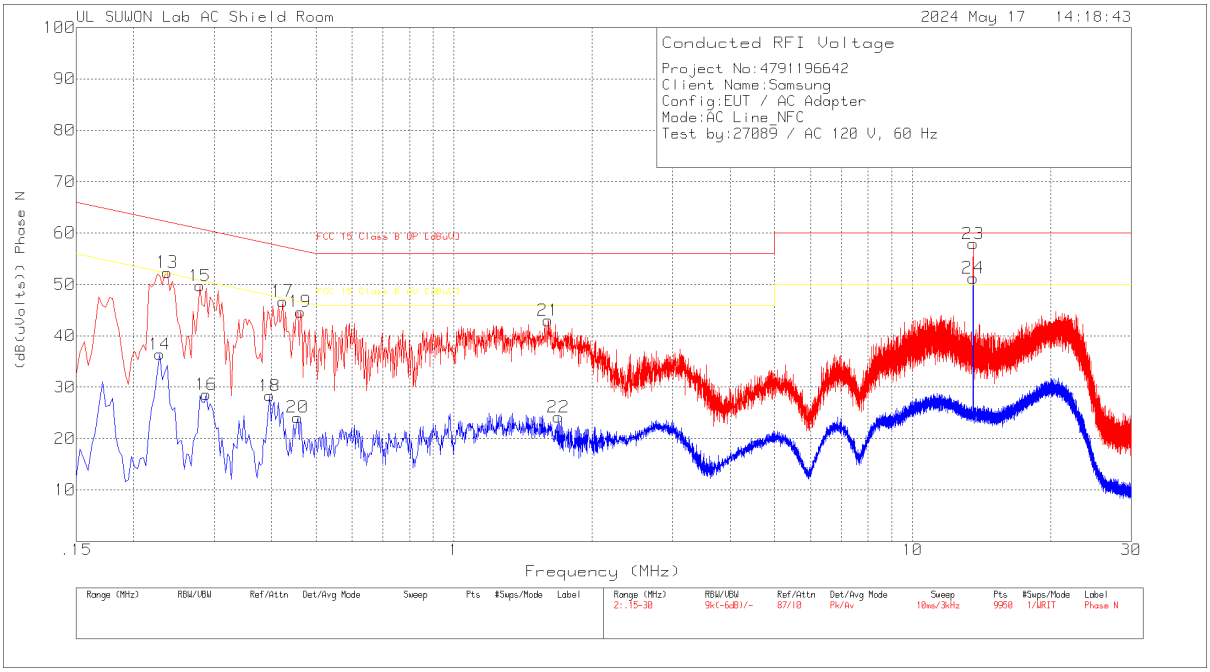
LINE 2 PLOT



LINE 2 RESULTS

Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N [dB]	Cable Loss [dB]	Corrected Reading (dB(uVolts))	FCC 15 Class B QP [dBuV]	Margin (dB)	FCC 15 Class B AV [dBuV]	Margin (dB)
13	.237	42.52	Pk	9.7	.1	52.32	62.2	-9.88	-	-
14	.228	26.61	Av	9.7	.1	36.41	-	-	52.52	-16.11
15	.279	39.91	Pk	9.7	.1	49.71	60.85	-11.14	-	-
16	.288	18.78	Av	9.7	.1	28.58	-	-	50.58	-22
17	.423	36.79	Pk	9.8	.1	46.69	57.39	-10.7	-	-
18	.396	18.41	Av	9.8	.1	28.31	-	-	47.94	-19.63
19	.462	34.76	Pk	9.8	.1	44.66	56.66	-12	-	-
20	.456	14.22	Av	9.8	.1	24.12	-	-	46.77	-22.65
21	1.605	33.16	Pk	9.7	.1	42.96	56	-13.04	-	-
22	1.689	14.38	Av	9.7	.1	24.18	-	-	46	-21.82
23	13.56	47.62	Pk	10	.3	57.92	60	-2.08	-	-
24	13.56	40.95	Av	10	.3	51.25	-	-	**50**	**1.25**

Pk - Peak detector
Av - Average detection

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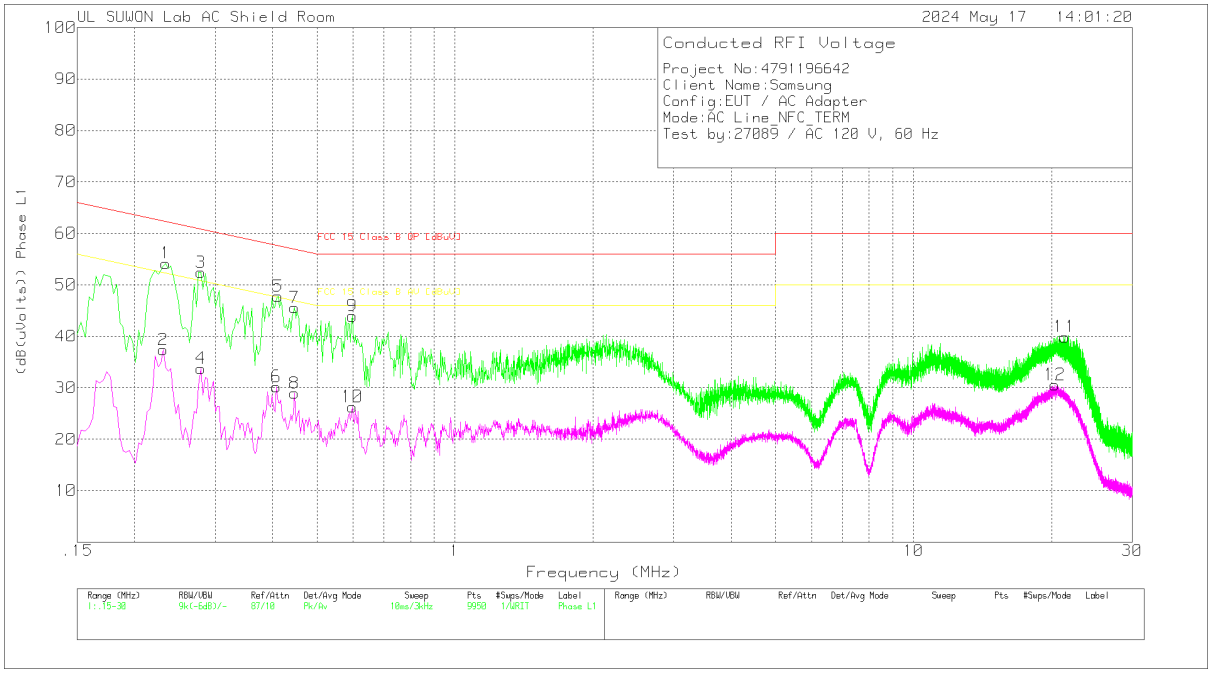
WORST EMISSIONS(Terminated)

LINE 1 PLOT



LINE 1 RESULTS

Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_L1 [dB]	Cable Loss [dB]	Corrected Reading (dB(uVolts))	FCC 15 Class B QP [dBuV]	Margin (dB)	FCC 15 Class B AV [dBuV]	Margin (dB)
1	.234	44.4	Pk	9.7	.1	54.2	62.31	-8.11	-	-
2	.231	27.56	Av	9.7	.1	37.36	-	-	52.41	-15.05
3	.279	42.6	Pk	9.7	.1	52.4	60.85	-8.45	-	-
4	.279	23.96	Av	9.7	.1	33.76	-	-	50.85	-17.09
5	.411	37.88	Pk	9.8	.1	47.78	57.63	-9.85	-	-
6	.408	20.28	Av	9.8	.1	30.18	-	-	47.69	-17.51
7	.447	35.68	Pk	9.8	.1	45.58	56.93	-11.35	-	-
8	.447	19.02	Av	9.8	.1	28.92	-	-	46.93	-18.01
9	.597	34.04	Pk	9.8	.1	43.94	56	-12.06	-	-
10	.597	16.38	Av	9.8	.1	26.28	-	-	46	-19.72
11	21.369	29.39	Pk	10.2	.3	39.89	60	-20.11	-	-
12	20.337	20.09	Av	10.2	.3	30.59	-	-	50	-19.41

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]	Cable Loss [dB]	Corrected Reading (dB(uVolts))	FCC 15 Class B QP [dBuV]	Margin (dB)	FCC 15 Class B AV [dBuV]	Margin (dB)
.23415	39.76	Qp	9.7	.1	49.56	62.3	-12.74	-	-
.27975	36.59	Qp	9.7	.1	46.39	60.82	-14.43	-	-
.41175	32.27	Qp	9.8	.1	42.17	57.61	-15.44	-	-

Qp - Quasi-Peak detector

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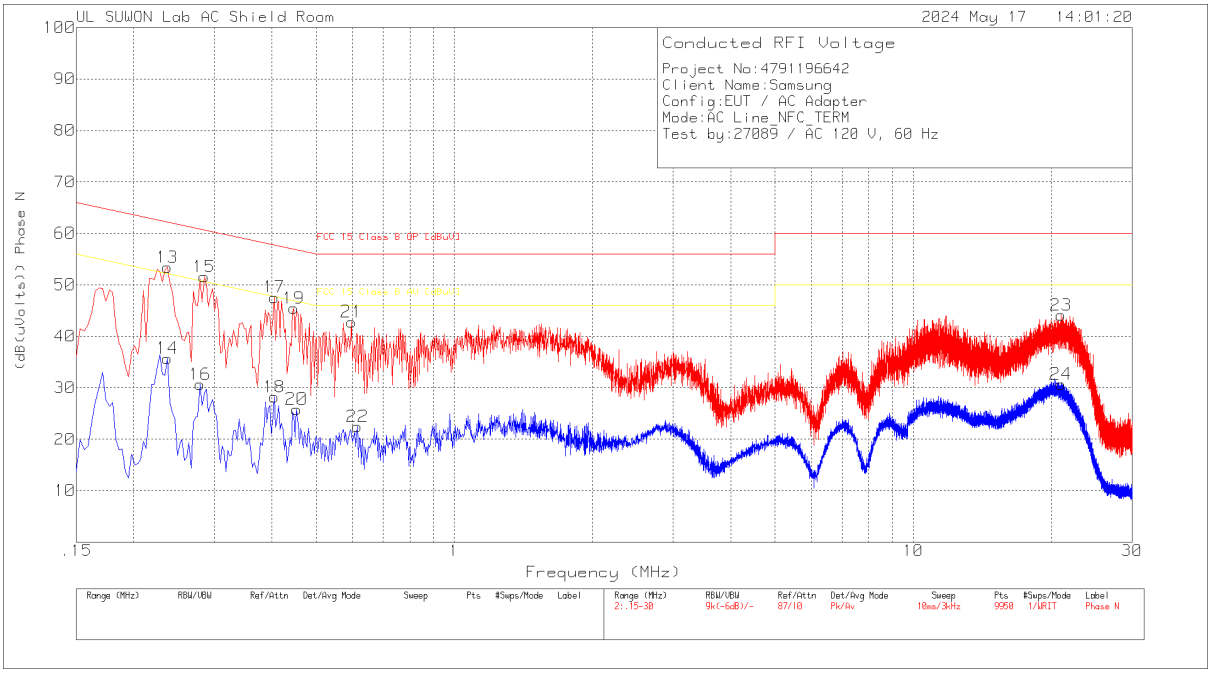
LINE 2 PLOT



LINE 2 RESULTS

Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N [dB]	Cable Loss [dB]	Corrected Reading (dB(uVolts))	FCC 15 Class B QP [dBuV]	Margin (dB)	FCC 15 Class B AV [dBuV]	Margin (dB)
13	.237	43.6	Pk	9.7	.1	53.4	62.2	-8.8	-	-
14	.237	25.9	Av	9.7	.1	35.7	-	-	52.2	-16.5
15	.285	41.74	Pk	9.7	.1	51.54	60.67	-9.13	-	-
16	.279	20.84	Av	9.7	.1	30.64	-	-	50.85	-20.21
17	.405	37.7	Pk	9.8	.1	47.6	57.75	-10.15	-	-
18	.405	18.29	Av	9.8	.1	28.19	-	-	47.75	-19.56
19	.447	35.53	Pk	9.8	.1	45.43	56.93	-11.5	-	-
20	.453	15.91	Av	9.8	.1	25.81	-	-	46.82	-21.01
21	.597	32.88	Pk	9.8	.1	42.78	56	-13.22	-	-
22	.615	12.57	Av	9.8	.1	22.47	-	-	46	-23.53
23	20.988	33.49	Pk	10.3	.3	44.09	60	-15.91	-	-
24	20.973	20.07	Av	10.3	.3	30.67	-	-	50	-19.33

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]	Cable Loss [dB]	Corrected Reading (dB(uVolts))	FCC 15 Class B QP [dBuV]	Margin (dB)	FCC 15 Class B AV [dBuV]	Margin (dB)
.23775	39.27	Qp	9.7	.1	49.07	62.17	-13.1	-	-
.28425	37.67	Qp	9.7	.1	47.47	60.69	-13.22	-	-

Qp - Quasi-Peak detector

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10. FREQUENCY STABILITY

LIMIT

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

TEST PROCEDURE

ANSI C63.10 §6.8

RESULTS

Test Date	2024-5-29
Test Engineer	51078

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz										
Power Supply	Envir.	Frequency Deviation Measureed with Time Elapse								
(Vdc)	Temp (°C)	Start up (MHz)	Delta (ppm)	@ 2mins (MHz)	Delta (ppm)	@ 5mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
3.88	50	13.559953384	-2.654	13.559953262	-2.663	13.559953182	-2.669	13.559953074	-2.677	100
3.88	40	13.559967223	-1.634	13.559964982	-1.799	13.559964646	-1.824	13.559964175	-1.859	100
3.88	30	13.559983713	-0.418	13.559983729	-0.417	13.559983845	-0.408	13.559984245	-0.379	100
3.88	***20***	***13.559989378***	***0.000***	***13.559995217***	***0.431***	***13.559997161***	***0.574***	***13.559998562***	***0.677***	***100***
3.88	10	13.560056146	4.924	13.560053704	4.744	13.560049141	4.407	13.560046427	4.207	100
3.88	0	13.560076722	6.441	13.560075552	6.355	13.560072505	6.130	13.560072505	6.130	100
3.88	-10	13.560078426	6.567	13.560078723	6.589	13.560078875	6.600	13.560078967	6.607	100
3.88	-20	13.560063651	5.477	13.560063762	5.486	13.560063818	5.490	13.560063805	5.489	100
3.88	-30	13.560020786	2.316	13.560019140	2.195	13.560017821	2.098	13.560017213	2.053	100

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz										
Power Supply	Envir.	Frequency Deviation Measureed with Time Elapse								
(Vdc)	Temp (°C)	Start up (MHz)	Delta (ppm)	@ 2mins (MHz)	Delta (ppm)	@ 5mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
3.70	20	13.559989510	0.010	13.559994938	0.410	13.559997244	0.570	13.559998364	0.653	100
3.88	***20***	***13.559989378***	***0.000***	***13.559995217***	***0.431***	***13.559997161***	***0.564***	***13.559998562***	***0.668***	***100***
4.45	20	13.559989132	-0.018	13.559995439	0.447	13.559997334	0.577	13.559998641	0.673	100

No non-compliance noted.

END OF TEST REPORT

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