



FCC 47 CFR PART 15 SUBPART B

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER : SM-A8050

FCC ID: A3LSMA8050

REPORT NUMBER: 4788886237-E9V1

ISSUE DATE: APR 22, 2019

Prepared for
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129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
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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	04/18/19	Initial issue	Sangyun Kim
V2	04/22/19	Updated to address TCB 's question	Sangyun Kim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: CDMA/GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac, ANT+ and NFC
MODEL NUMBER: SM-A8050
SERIAL NUMBER: R38M30952GW
DATE TESTED: APR 17, 2019 – APR 18, 2019

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART B	Pass

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:



Changyoung Choi
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Sangyun Kim
Suwon Lab Engineer
UL Korea, Ltd.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2014, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

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 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
Radiated Disturbance, Above 1 GHz	5.97 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a CDMA/GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac, ANT+ and NFC.

GENERAL INFORMATION

Type of device	Class B personal computers and peripherals Other Class B digital devices & peripherals FM Broadcast Receiver
Laptop PC power requirements	100-240 VAC / 50-60 Hz, 1.8 A
Travel Adapter power requirements	100-240 VAC / 50-60 Hz, 0.7 A
List of frequencies generated or used by the EUT	30 GHz (5 th harmonic of the frequency of 5GHz UNII)

5.2. PRELIMINARY TEST CONFIGURATIONS

This EUT have a camera pop up function when user operate front camera function. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was normal mode and camera pop up mode. It was determined that Z on normal mode orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation with data transfer.

5.3. MODE(S) OF OPERATION INVESTIGATED

Mode	Description
Test Case 1	Camera(Rear) + FM Radio Low Ch
Test Case 2	Camera(Rear) + FM Radio Mid Ch
Test Case 3	Camera(Front) + FM Radio High Ch
Test Case 4	Video and Audio Play + Charging
Test Case 5	USB Data Communication with PC
Test Case 6	Receiver Mode (Licensed Band within 30-960MHz)

Note: Receiver Mode (Licensed Band within 30-960MHz) radiated test result refer to WWAN test report Appendix B.

Receiver Mode (Licensed Band within 30-960MHz) AC mains line conducted test was tested to high power licensed band(GSM850).

5.4. MODIFICATIONS

No modifications were made during testing.

5.5. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT & PERIPHERALS

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID/DoC
Laptop PC	Lenovo	L480	PF-18QBWC	DoC
AC/DC Adapter	Lenovo	ADLX65YDC3A	8SSA10M13946-1SG85B05SR	N/A
Mouse	Logitech	U0026	1451HS05S6G8	DoC
Data Cable	SAMSUNG	EP-DA905BBE	N/A	N/A
Earphone	SAMSUNG	GHSS028-W4	N/A	N/A
Charger	SAMSUNG	EP-TA800	R37M1E50KV1SE3	N/A

I/O CABLES

[DIAGRAM 1]

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length(m)	Remarks
1	Earphone	1	Type-C	Shielded	1.2m	From EUT to Earphone

* Radiated Test Only

[DIAGRAM 2]

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length(m)	Remarks
1	AC Power	1	Power	Direct	-	From Charger to AC Main
2	USB	1	Type-C	Shielded	1.1m	From Charger to EUT

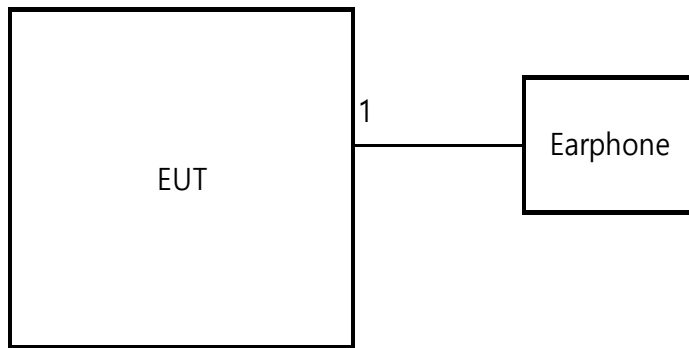
[DIAGRAM 3]

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length(m)	Remarks
1	AC Power	1	Power	Unshielded	1.0m	From AC/DC Adapter to AC Main
2	DC Power	1	Power	Unshielded	1.5m	From AD/DC Adapter to Laptop PC
3	USB	1	Type-C	Shielded	1.1m	From EUT to PC
4	USB	1	USB	Shielded	1.5m	From Mouse to PC
5	LAN	1	RJ-45	Shielded	1.0m	From Laptop PC to Ethernet (Outside of test site)

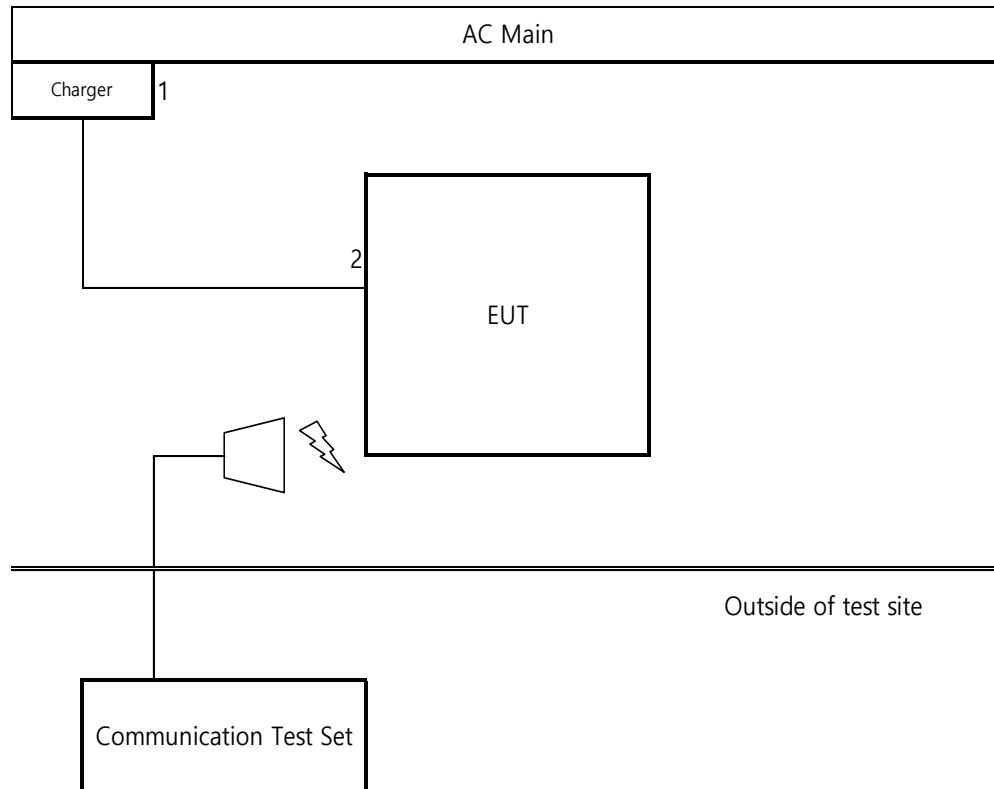
TEST SETUP

The EUT is installed in a typical configuration. Copy files from PC to EUT.

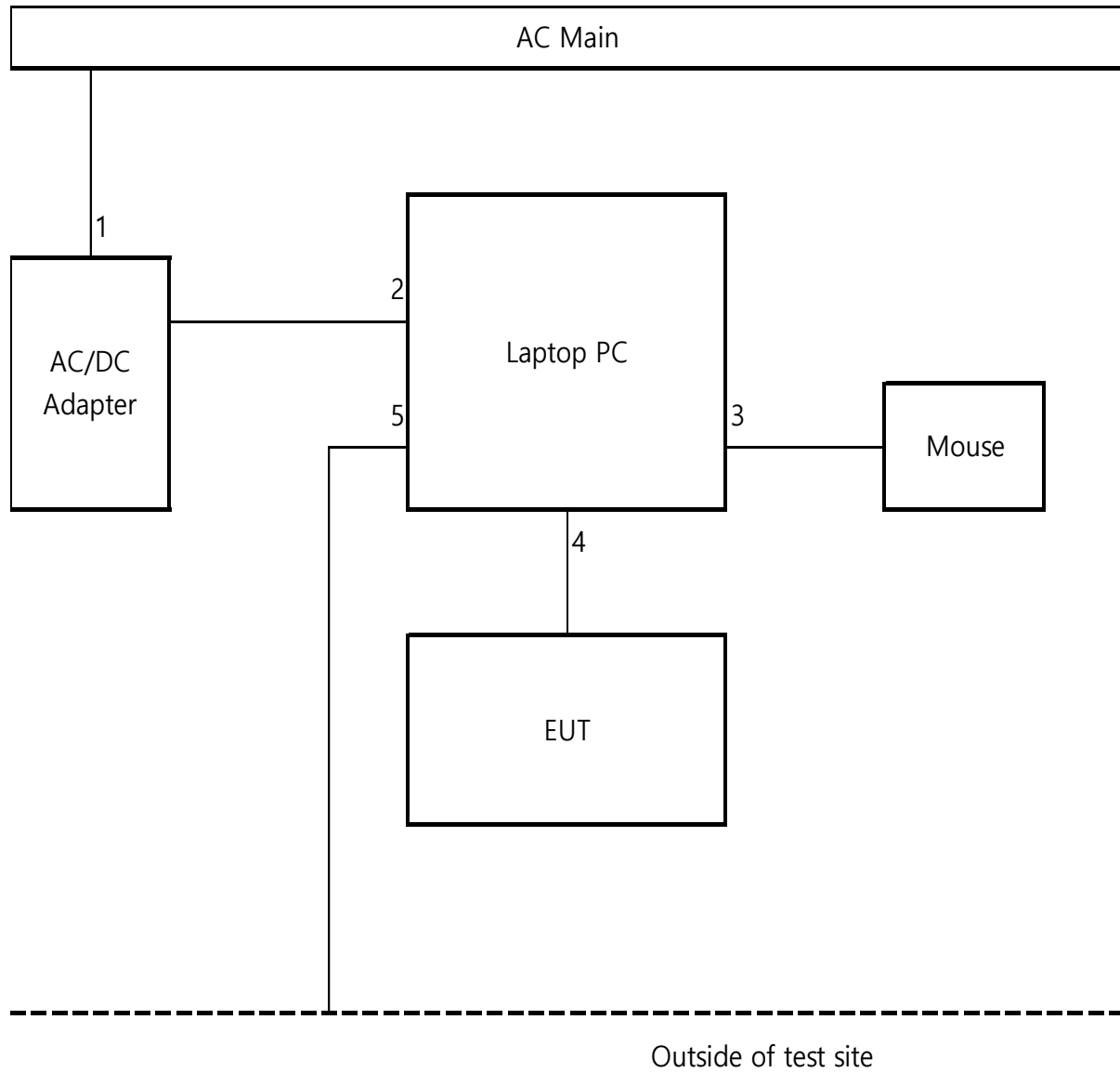
TEST SETUP DIAGRAM 1 for Test Case 1 to 3



TEST SETUP DIAGRAM 2 for Test Case 4 and 6



TEST SETUP DIAGRAM 3 for Test case 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	750	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00167211	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00161451	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168724	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00205959	08-04-20
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-14-20
Antenna, Horn, 40 GHz	ETS	3116C	00168645	12-04-19
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	08-09-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	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
Communications Test Set	R&S	CMW500	115331	08-07-19
LISN	R&S	ENV-216	101837	08-09-19
LISN	R&S	ENV-216	101837	08-09-19
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

6. APPLICABLE LIMITS AND TEST RESULTS

6.1. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4: 2014

The highest clock frequency generated or used in the EUT is 5.8GHz therefore the frequency range was investigated from 30 MHz to 30 GHz.

LIMIT

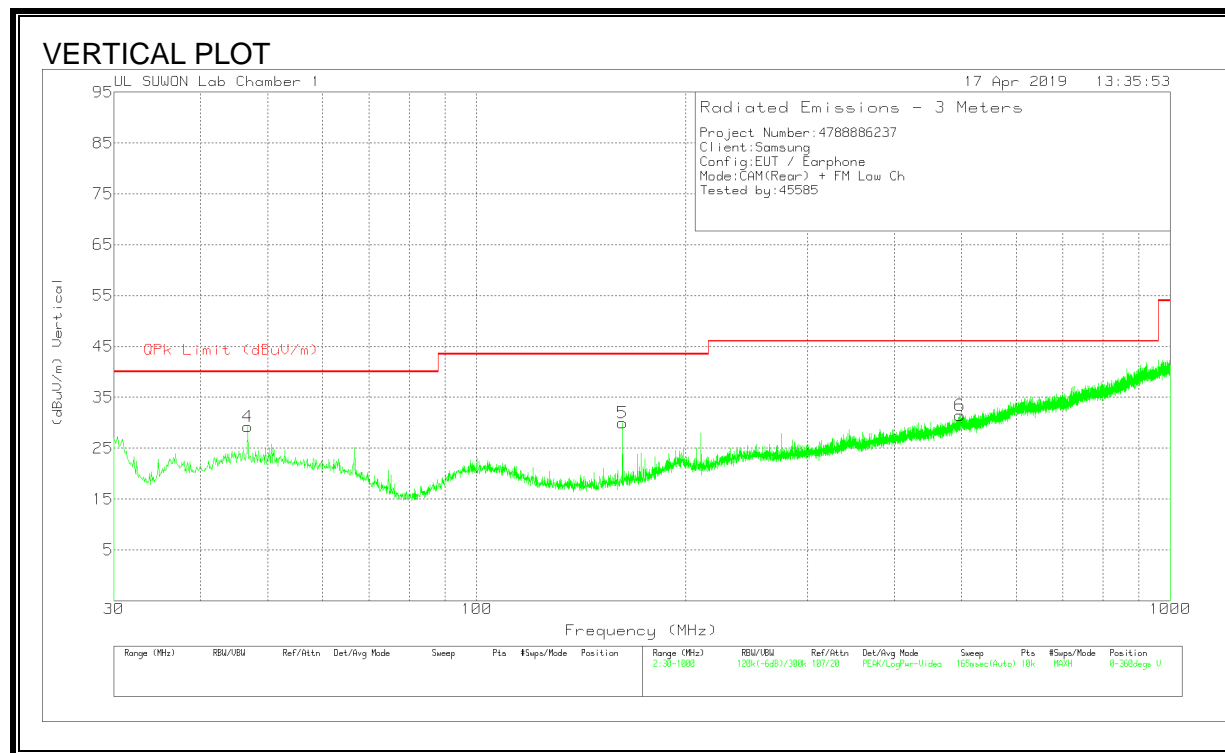
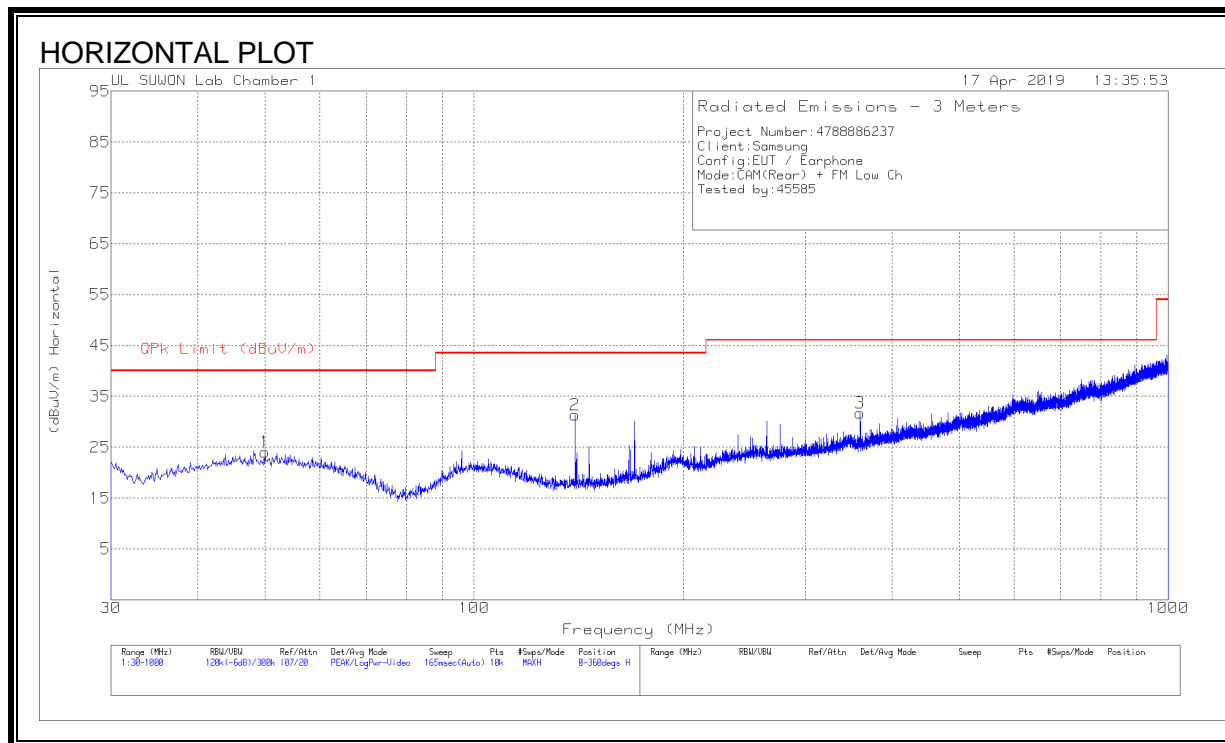
§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dB μ V/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54

Note: The lower limit shall apply at the transition frequency.

RESULTS Test Case 1

RADIATED EMISSIONS 30 TO 1000 MHz



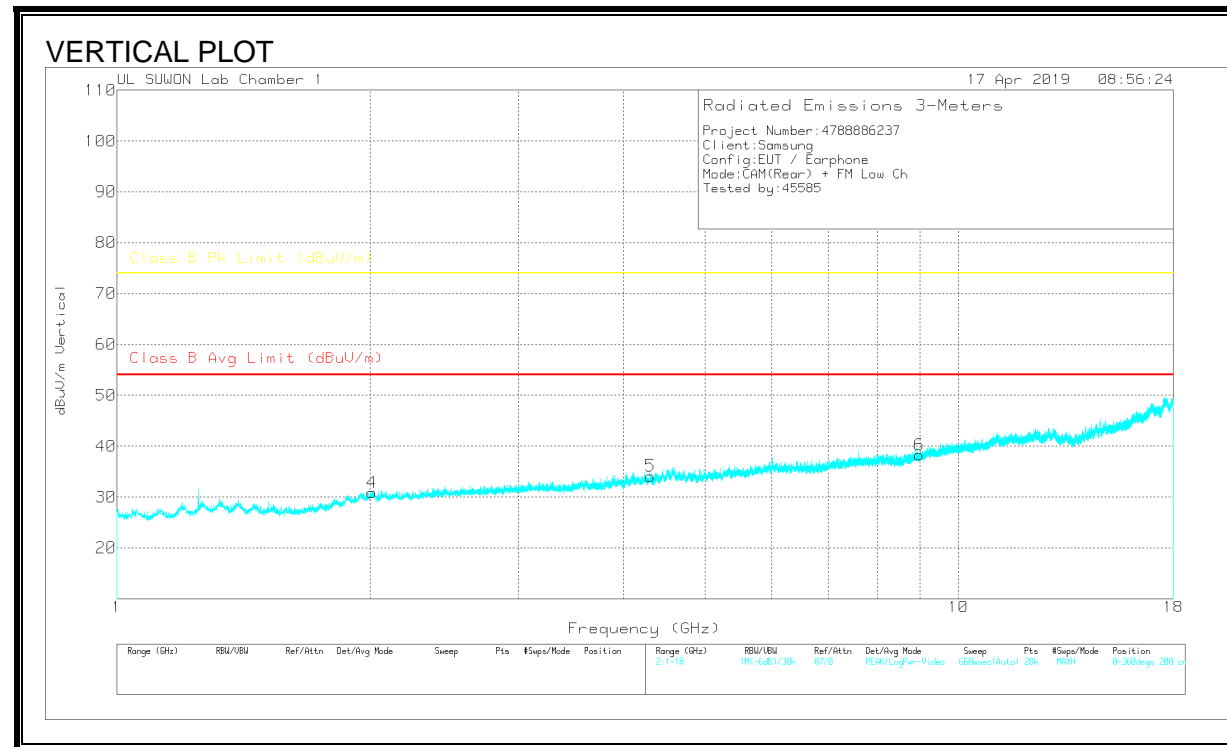
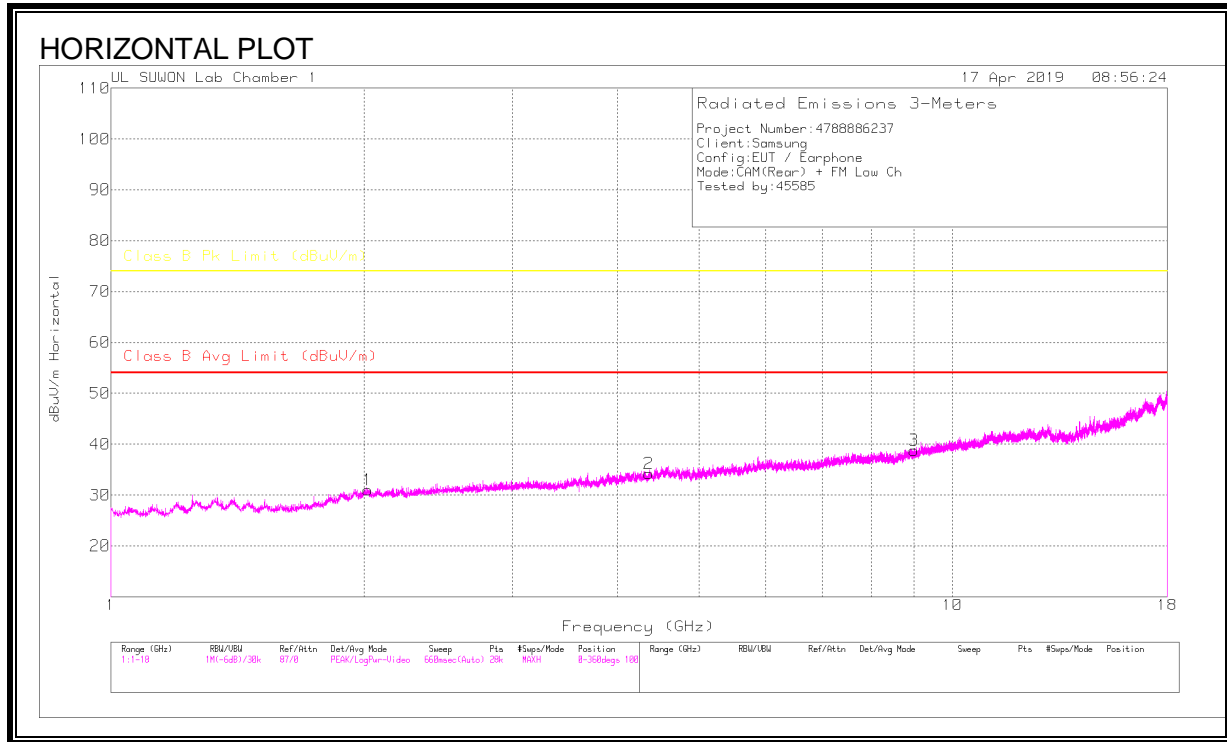
HORIZONTAL AND VERTICAL DATA

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	49.982	34.87	Pk	19.7	-30.5	24.07	40	-15.93	0-360	400	H
2	139.804	46.48	Pk	14.1	-29.2	31.38	43.52	-12.14	0-360	300	H
3	359.994	38.56	Pk	20.3	-27.2	31.66	46.02	-14.36	0-360	100	H
4	46.781	40	Pk	19.8	-30.6	29.2	40	-10.8	0-360	200	V
5	162.308	44.2	Pk	14.7	-28.9	30	43.52	-13.52	0-360	100	V
6	497.54	34.54	Pk	23.4	-26.5	31.44	46.02	-14.58	0-360	300	V

Pk - Peak detector

RADIATED EMISSIONS 1GHz to 18GHz



HORIZONTAL AND VERTICAL DATA

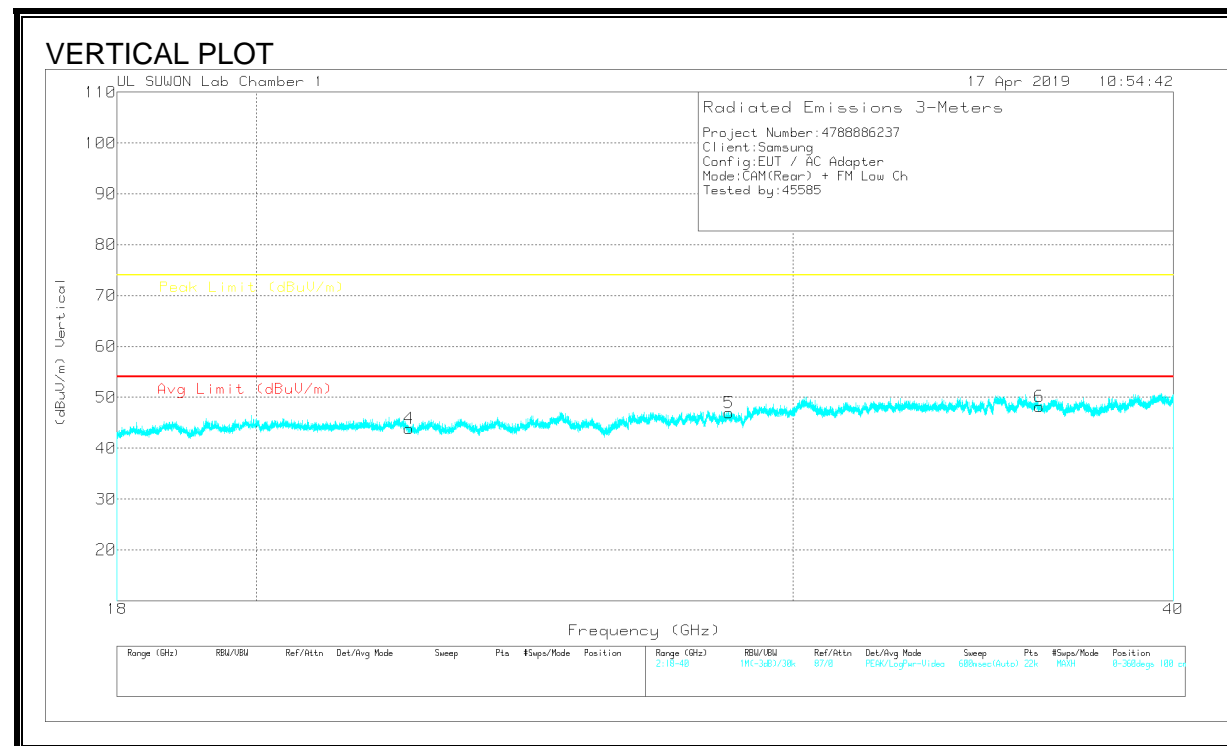
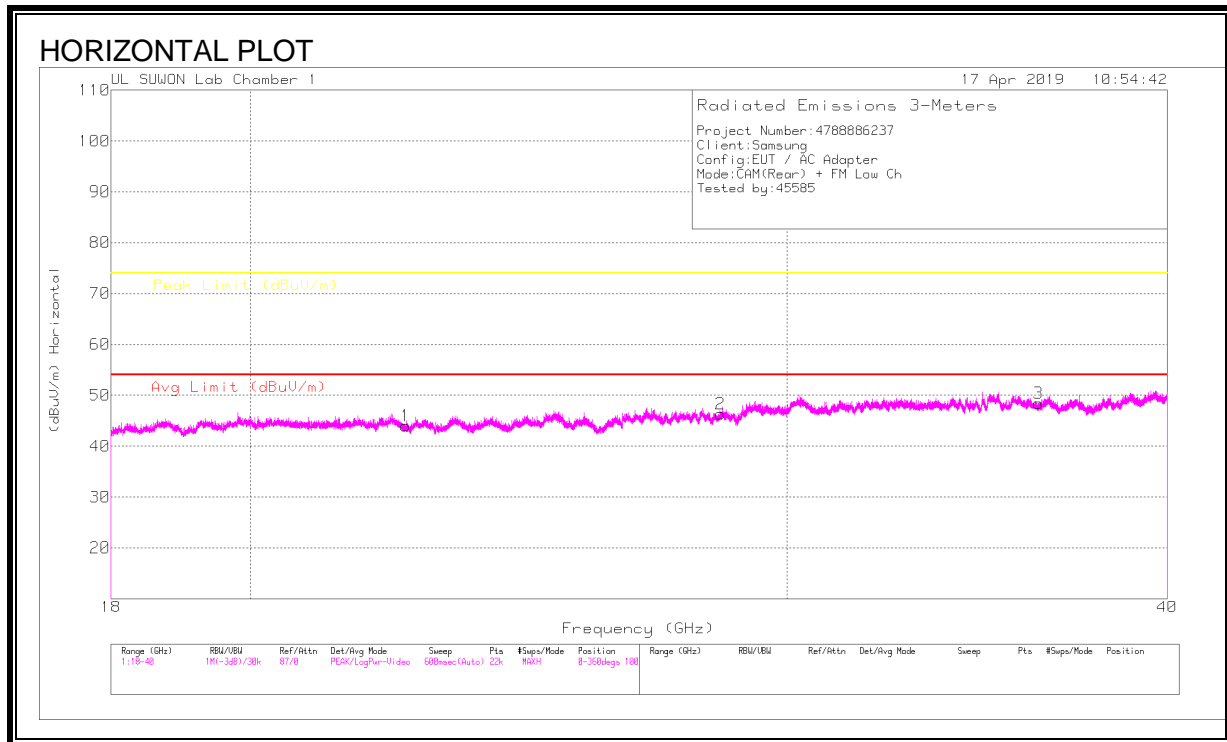
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	1-18GHz[dB]	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CISPR)Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.02	35.24	PK	31.3	-35.5	31.04	-	-	74	-42.96	0-360	100	H
2	4.357	32.51	PK	34	-32.3	34.21	-	-	74	-39.79	0-360	200	H
3	8.997	27.15	PK	36.6	-25	38.75	-	-	74	-35.25	0-360	200	H
4	2.01	35.08	PK	31.3	-35.5	30.88	-	-	74	-43.12	0-360	200	V
5	4.306	32.65	PK	33.9	-32.4	34.15	-	-	74	-39.85	0-360	100	V
6	8.985	26.68	PK	36.6	-25	38.28	-	-	74	-35.72	0-360	200	V

PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

RADIATED EMISSIONS 18GHz to 30GHz



HORIZONTAL AND VERTICAL DATA

Trace Markers

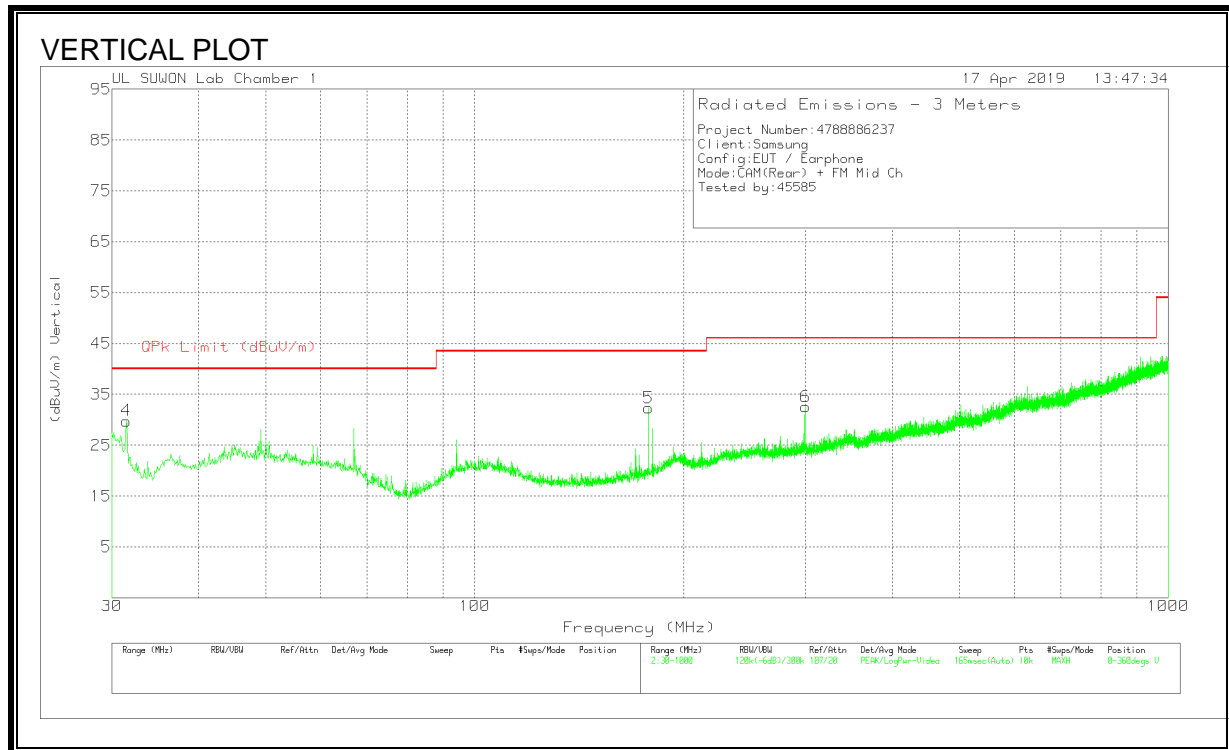
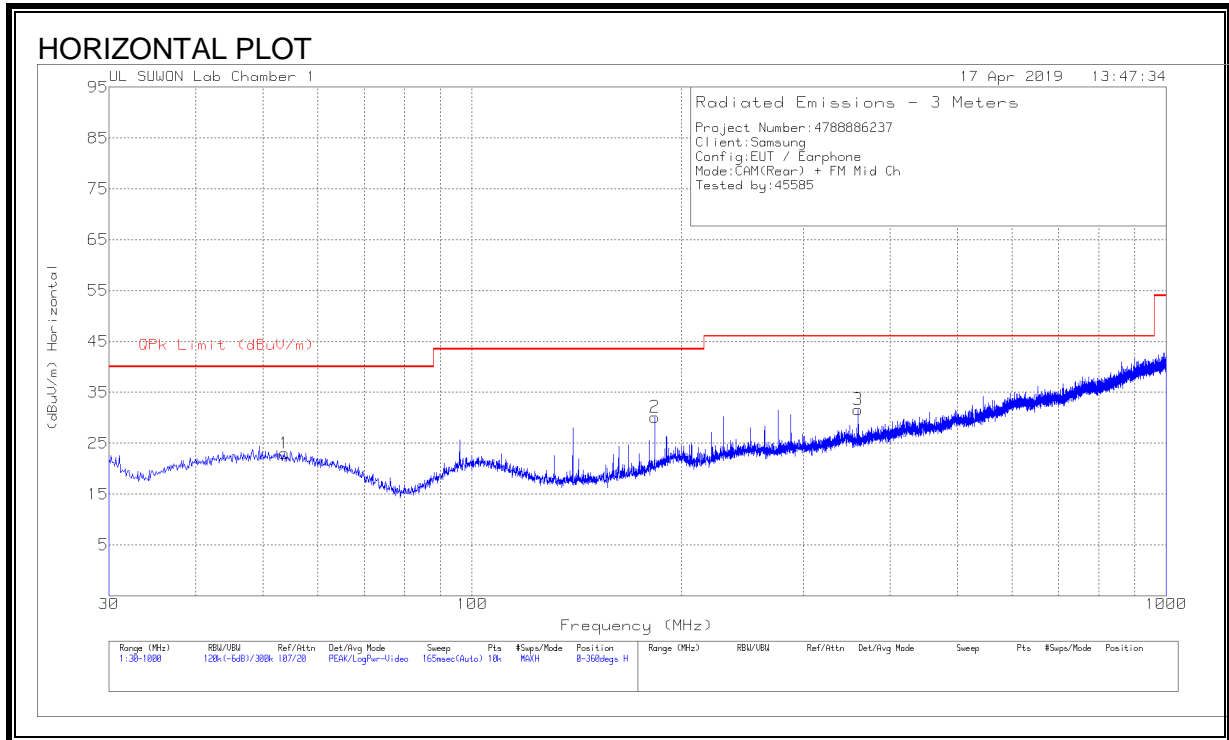
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3116C-PA	18-40GHz[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	22.494	15.93	PK	11.3	16.7	43.93	-	-	74	-30.07	0-360	100	H
2	28.533	14.76	PK	12.5	19.1	46.36	-	-	74	-27.64	0-360	100	H
3	36.285	15.12	PK	11.6	21.7	48.42	-	-	74	-25.58	0-360	100	H
4	22.448	15.9	PK	11.3	16.7	43.9	-	-	74	-30.1	0-360	100	V
5	28.592	15.29	PK	12.6	19.1	46.99	-	-	74	-27.01	0-360	100	V
6	36.145	14.82	PK	11.7	21.7	48.22	-	-	74	-25.78	0-360	100	V

PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

RESULTS Test Case 2

RADIATED EMISSIONS 30 TO 1000 MHz



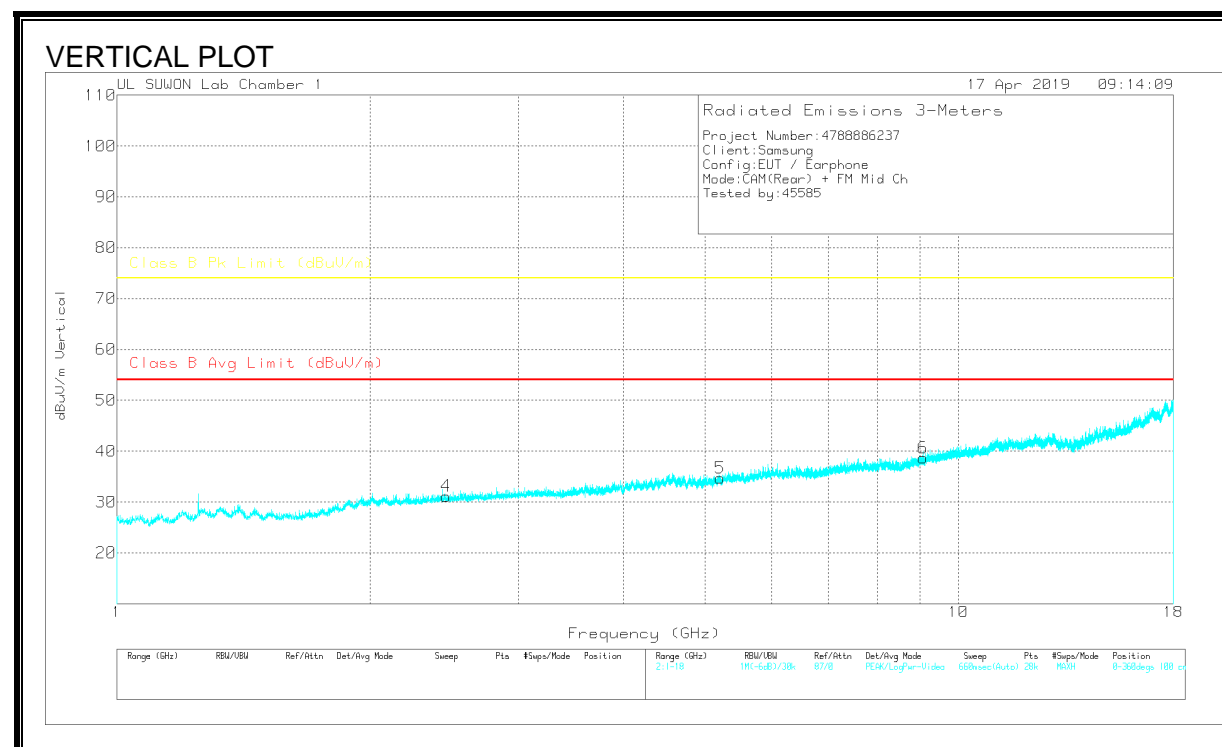
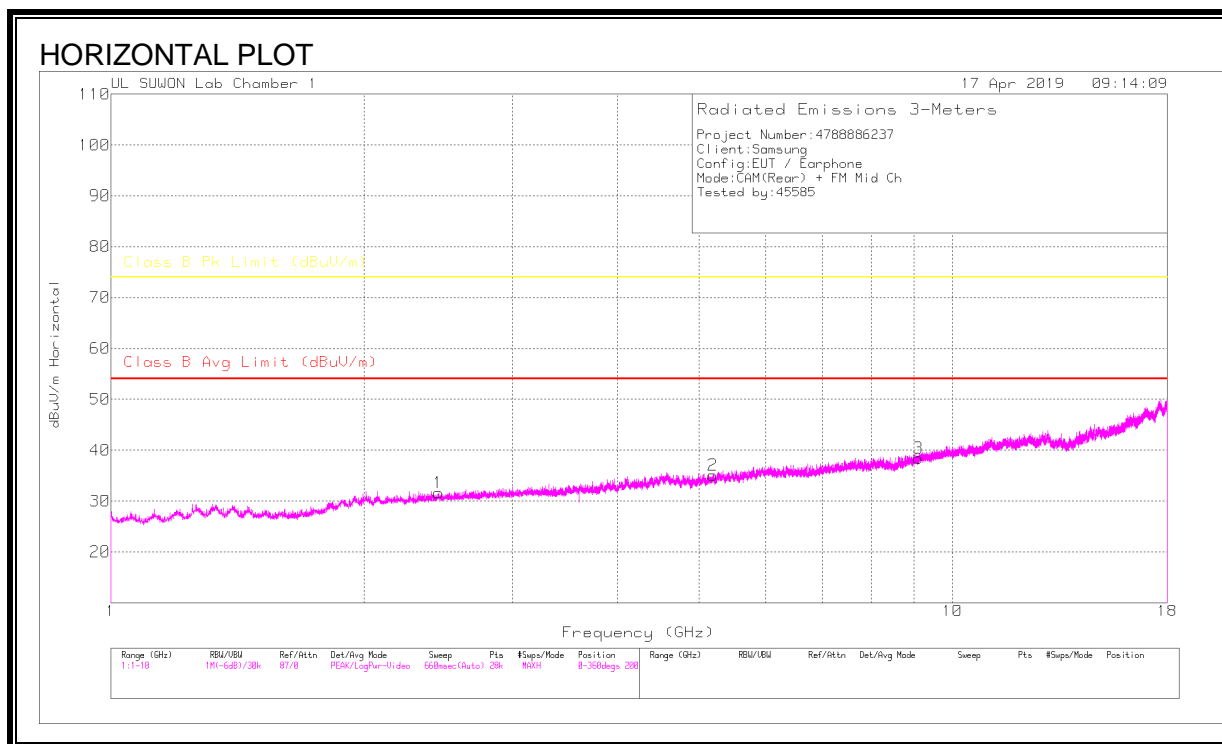
HORIZONTAL AND VERTICAL DATA

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	53.668	33.99	Pk	19.5	-30.5	22.99	40	-17.01	0-360	100	H
2	183.357	42.76	Pk	16.1	-28.7	30.16	43.52	-13.36	0-360	400	H
3	359.994	38.54	Pk	20.3	-27.2	31.64	46.02	-14.38	0-360	100	H
4	31.455	44.99	Pk	15.7	-30.9	29.79	40	-10.21	0-360	100	V
5	178.119	45.68	Pk	15.4	-28.7	32.38	43.52	-11.14	0-360	200	V
6	299.951	40.92	Pk	19.3	-27.6	32.62	46.02	-13.4	0-360	100	V

Pk - Peak detector

RADIATED EMISSIONS 1GHz to 18GHz



HORIZONTAL AND VERTICAL DATA

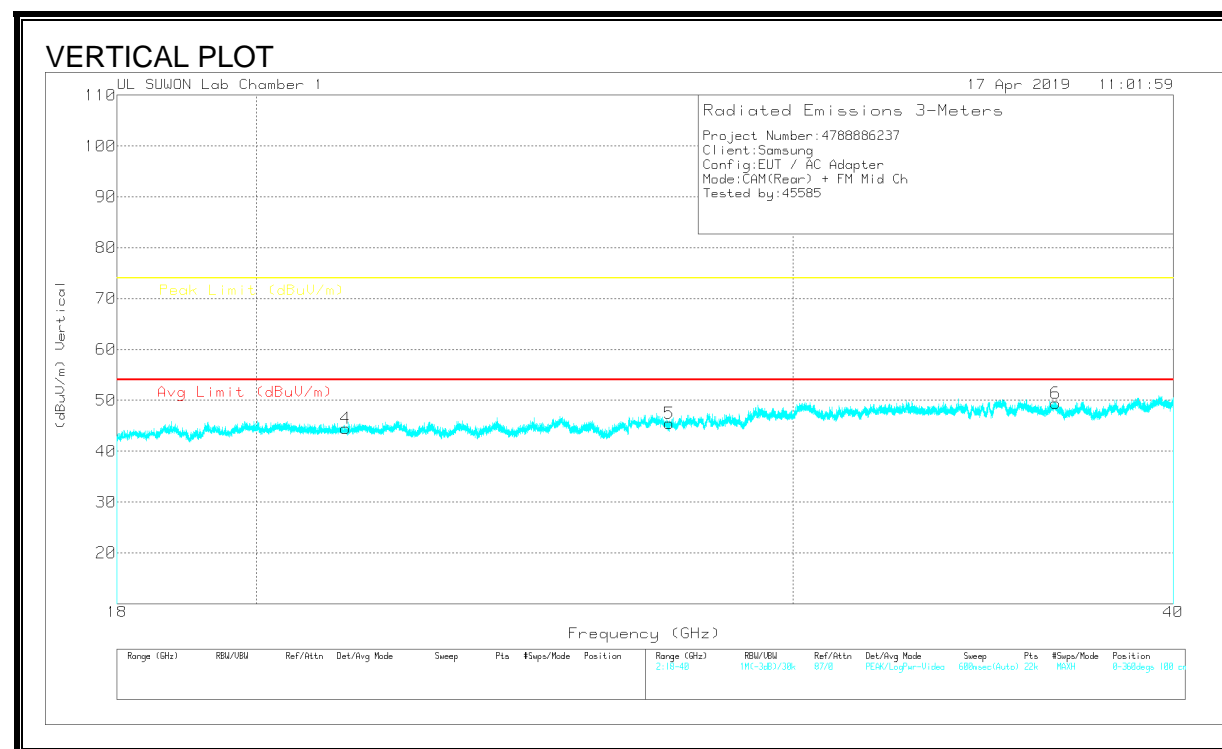
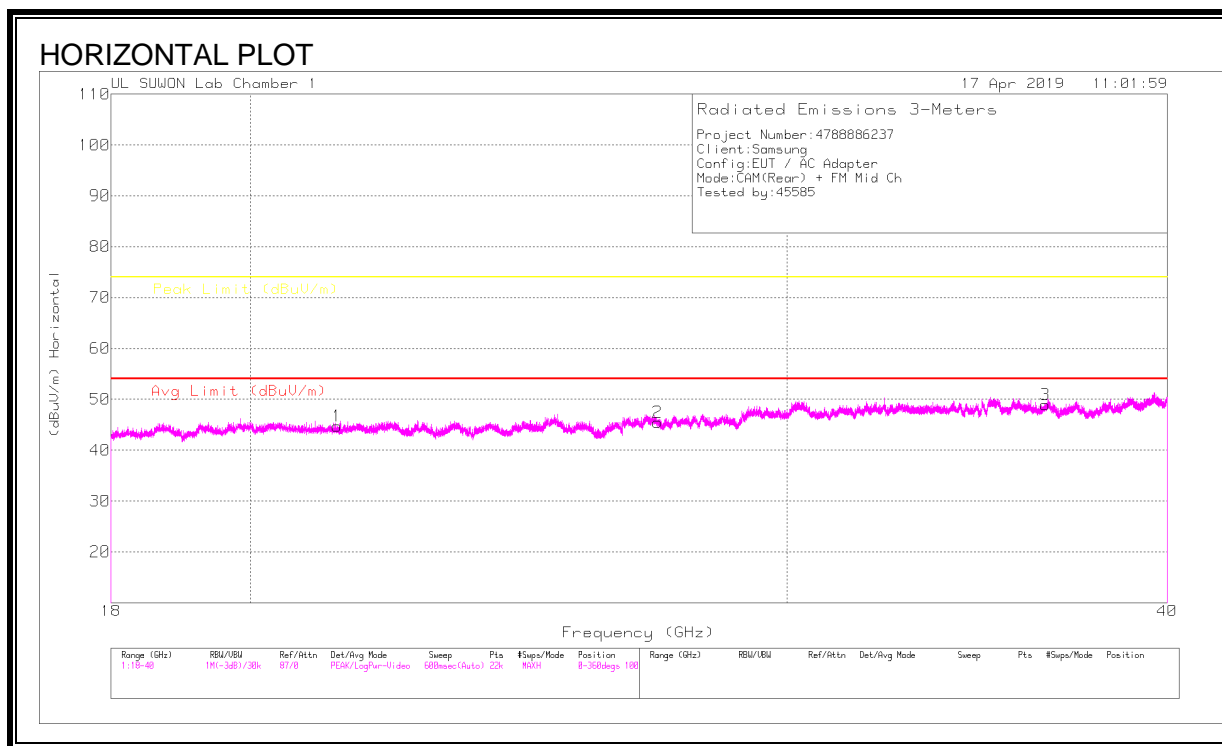
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	1-18GHz[dB]	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CISPR)Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.451	34.5	PK	31.9	-34.8	31.6	-	-	74	-42.4	0-360	100	H
2	5.193	32.08	PK	34.5	-31.5	35.08	-	-	74	-38.92	0-360	100	H
3	9.112	27.14	PK	36.6	-25.3	38.44	-	-	74	-35.56	0-360	100	H
4	2.462	33.98	PK	31.9	-34.7	31.18	-	-	74	-42.82	0-360	200	V
5	5.212	31.72	PK	34.5	-31.5	34.72	-	-	74	-39.28	0-360	200	V
6	9.074	27.18	PK	36.6	-25.1	38.68	-	-	74	-35.32	0-360	100	V

PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

RADIATED EMISSIONS 18GHz to 30GHz



HORIZONTAL AND VERTICAL DATA

Trace Markers

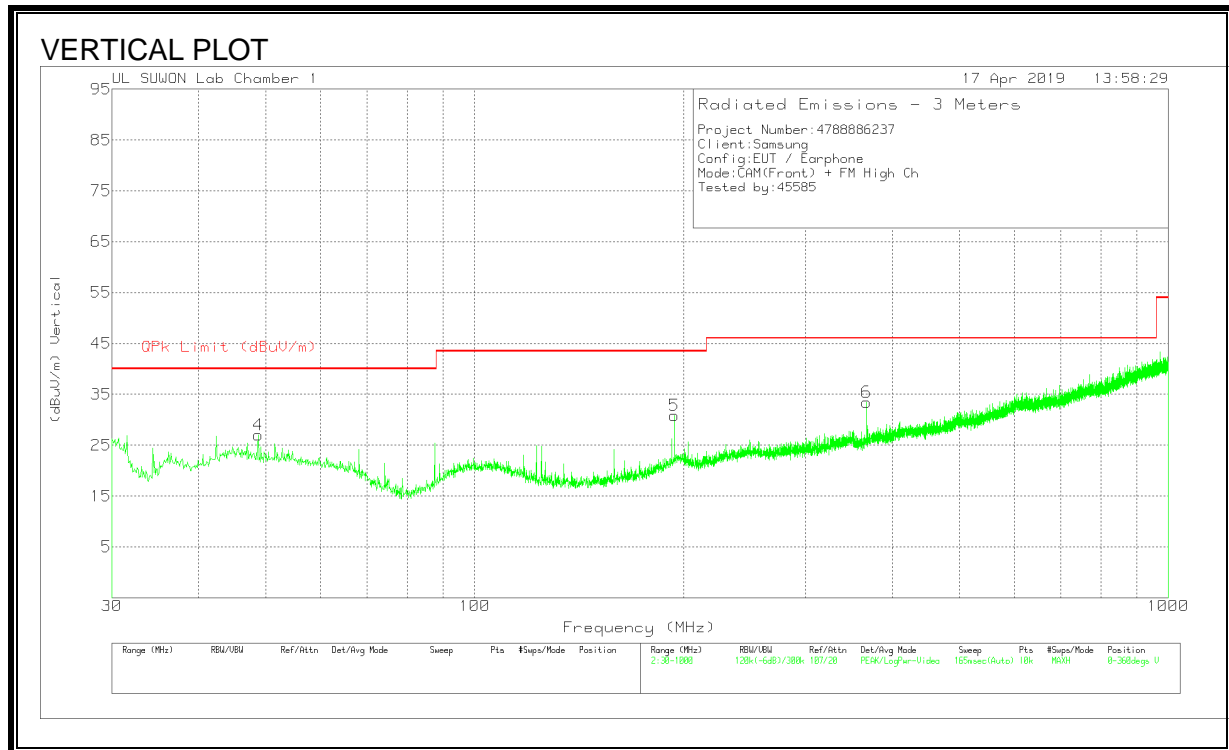
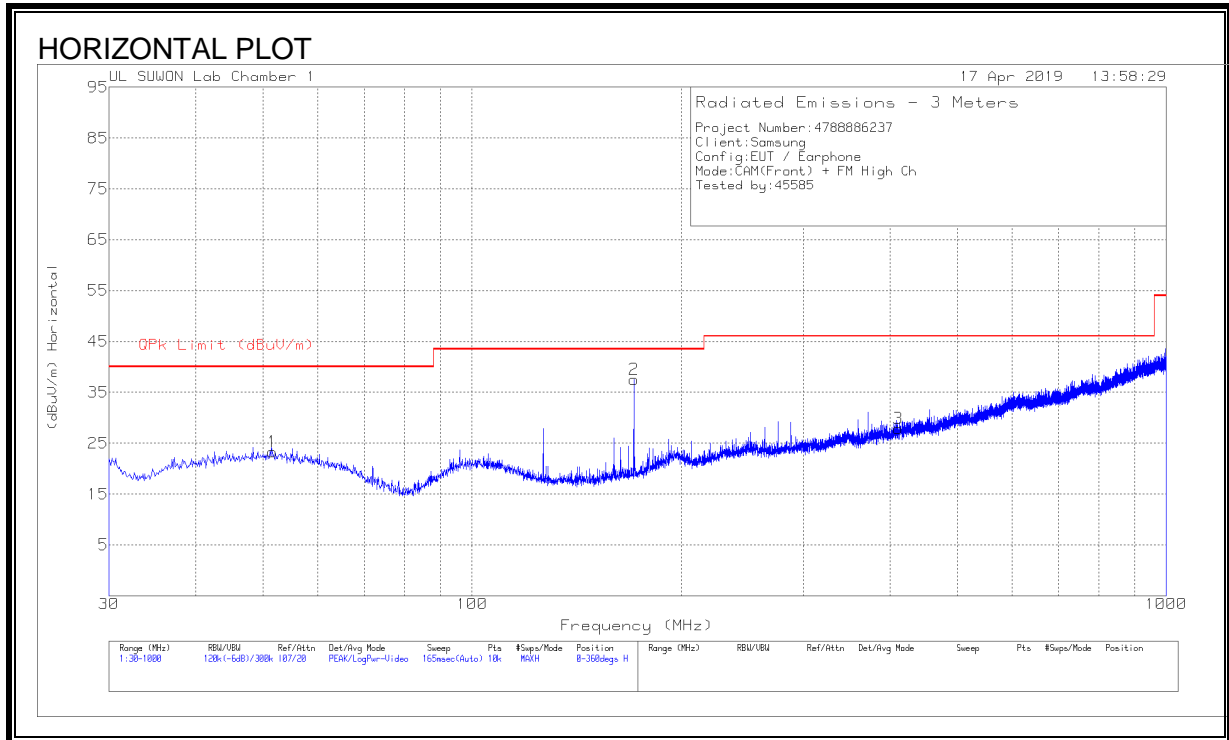
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3116C-PA	18-40GHz[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	21.351	17.91	PK	10.6	16.2	44.71	-	-	74	-29.29	0-360	100	H
2	27.205	16.52	PK	10.5	18.5	45.52	-	-	74	-28.48	0-360	100	H
3	36.476	15.6	PK	11.5	21.8	48.9	-	-	74	-25.1	0-360	100	H
4	21.393	17.66	PK	10.6	16.2	44.46	-	-	74	-29.54	0-360	100	V
5	27.331	16.12	PK	10.7	18.6	45.42	-	-	74	-28.58	0-360	100	V
6	36.595	16.28	PK	11.4	21.8	49.48	-	-	74	-24.52	0-360	100	V

PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

RESULTS Test Case 3

RADIATED EMISSIONS 30 TO 1000 MHz



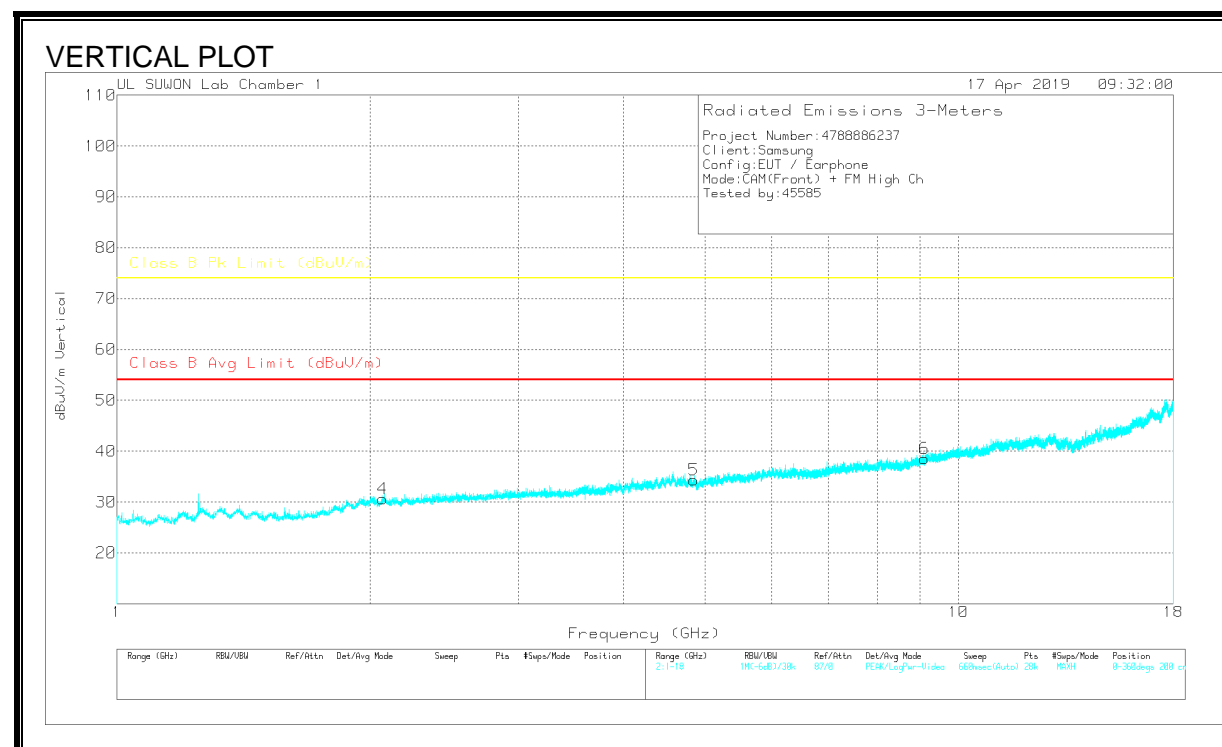
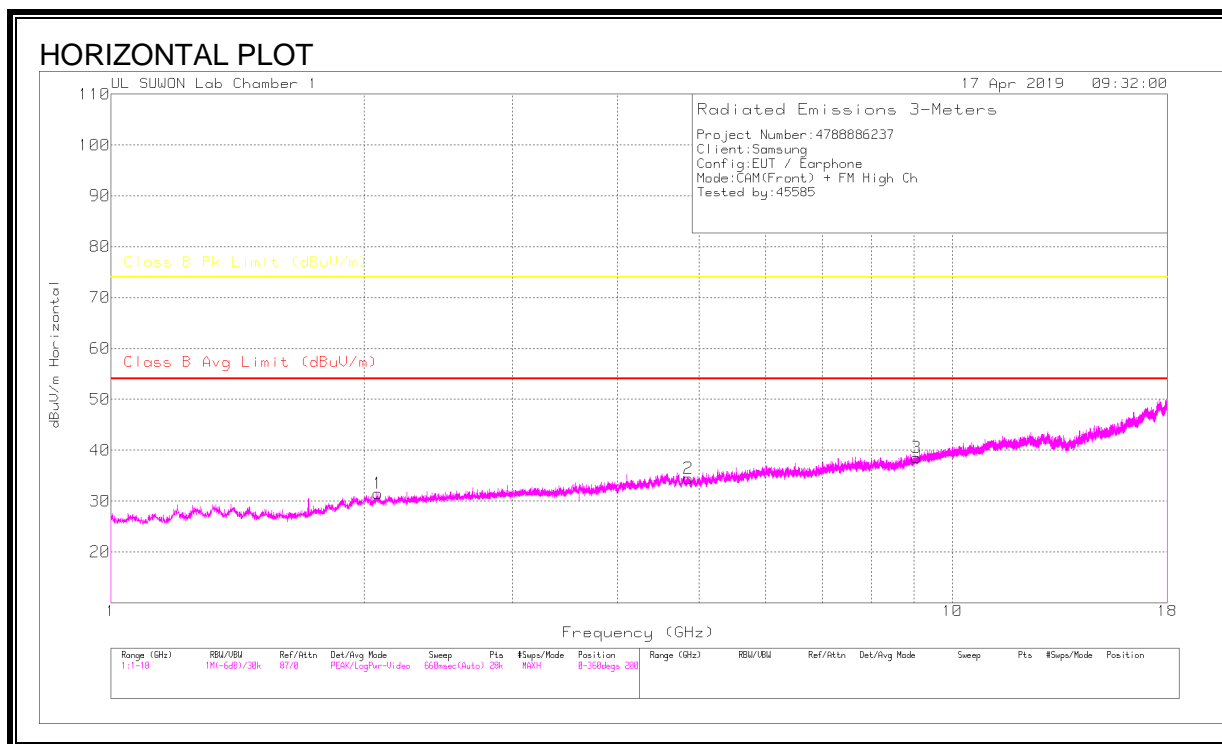
HORIZONTAL AND VERTICAL DATA

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	51.631	34.06	Pk	19.7	-30.5	23.26	40	-16.74	0-360	300	H
2	171.038	51.49	Pk	14.8	-28.8	37.49	43.52	-6.03	0-360	100	H
3	411.404	32.88	Pk	21.8	-26.8	27.88	46.02	-18.14	0-360	100	H
4	48.721	37.73	Pk	19.8	-30.5	27.03	40	-12.97	0-360	100	V
5	193.93	41.61	Pk	17.8	-28.6	30.81	43.52	-12.71	0-360	300	V
6	367.172	39.98	Pk	20.7	-27.2	33.48	46.02	-12.54	0-360	200	V

Pk - Peak detector

RADIATED EMISSIONS 1GHz to 18GHz



HORIZONTAL AND VERTICAL DATA

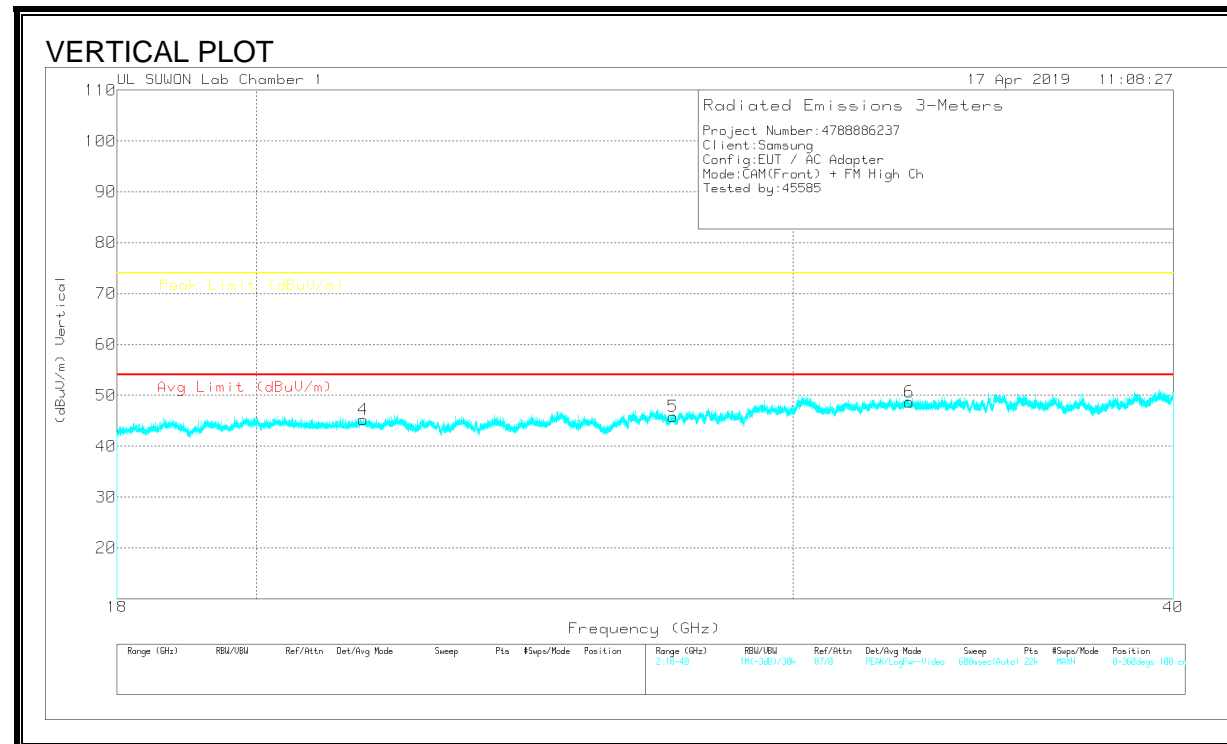
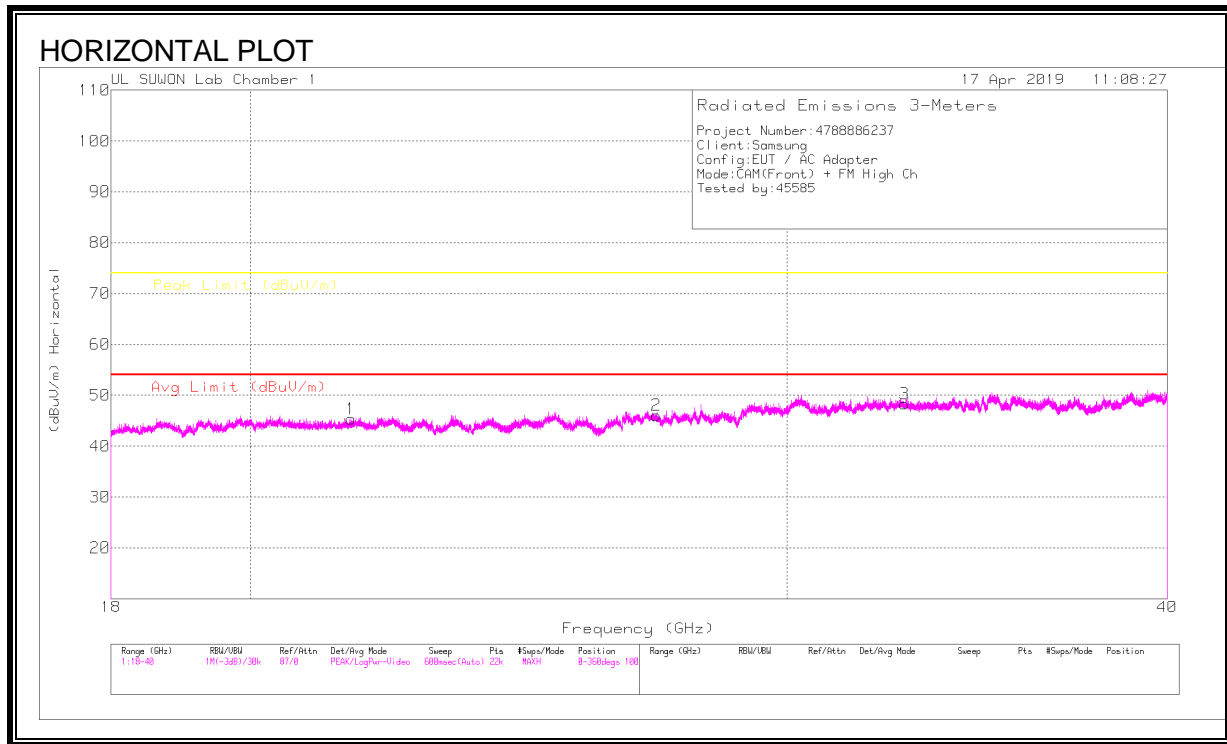
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	1-18GHz[dB]	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CISPR)Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.076	35.45	PK	31.3	-35.3	31.45	-	-	74	-42.55	0-360	100	H
2	4.856	32.17	PK	34.2	-31.9	34.47	-	-	74	-39.53	0-360	100	H
3	9.064	27.07	PK	36.6	-25.1	38.57	-	-	74	-35.43	0-360	100	H
4	2.07	34.7	PK	31.3	-35.4	30.6	-	-	74	-43.4	0-360	100	V
5	4.843	31.94	PK	34.2	-31.8	34.34	-	-	74	-39.66	0-360	200	V
6	9.11	27.11	PK	36.6	-25.2	38.51	-	-	74	-35.49	0-360	200	V

PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

RADIATED EMISSIONS 18GHz to 30GHz



HORIZONTAL AND VERTICAL DATA

Trace Markers

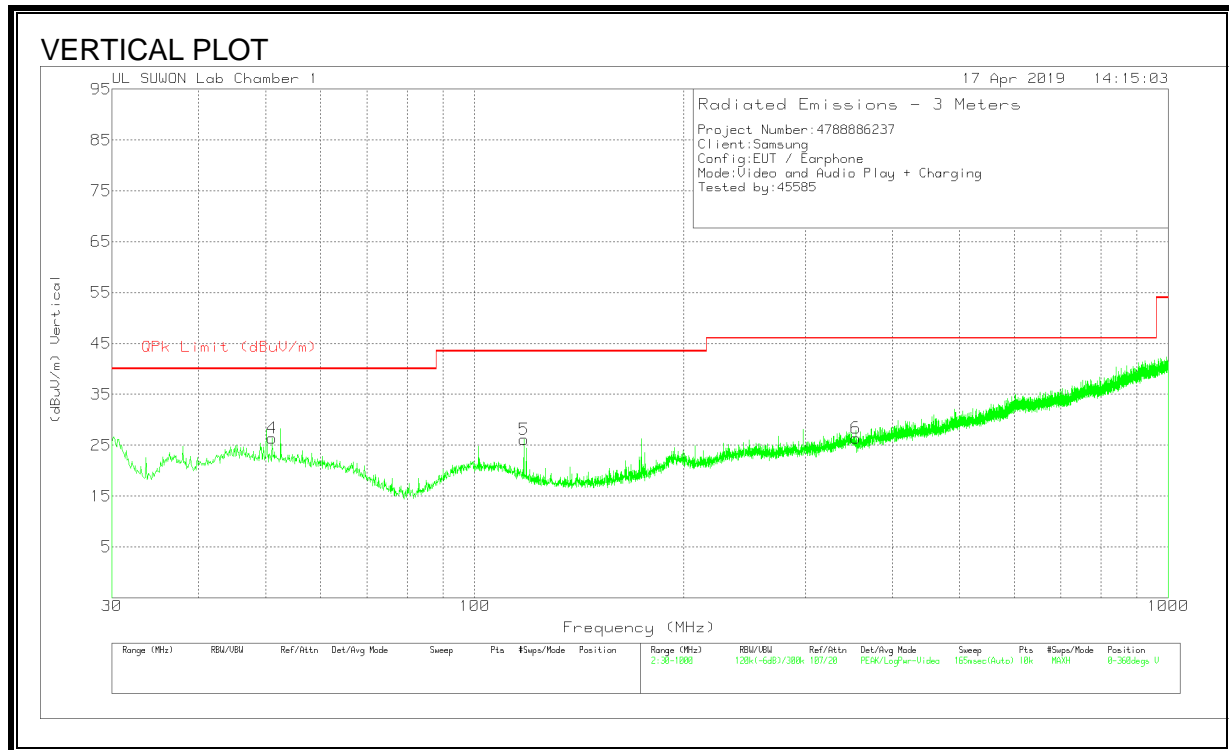
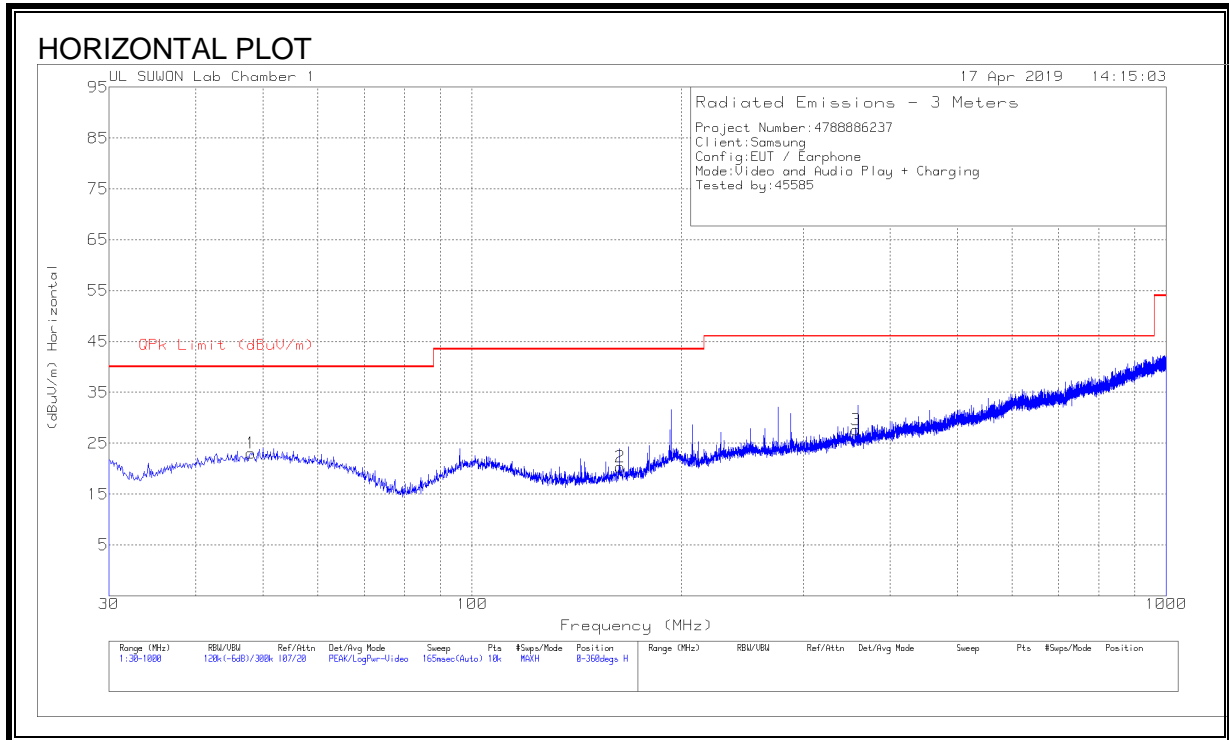
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3116C-PA	18-40GHz[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	21.578	18.18	PK	10.9	16.3	45.38	-	-	74	-28.62	0-360	100	H
2	27.18	17.02	PK	10.5	18.6	46.12	-	-	74	-27.88	0-360	100	H
3	32.79	14.43	PK	13.4	20.5	48.33	-	-	74	-25.67	0-360	100	H
4	21.687	17.7	PK	11.1	16.4	45.2	-	-	74	-28.8	0-360	100	V
5	27.403	16.4	PK	10.8	18.6	45.8	-	-	74	-28.2	0-360	100	V
6	32.761	14.75	PK	13.4	20.5	48.65	-	-	74	-25.35	0-360	100	V

PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

RESULTS Test Case 4

RADIATED EMISSIONS 30 TO 1000 MHz



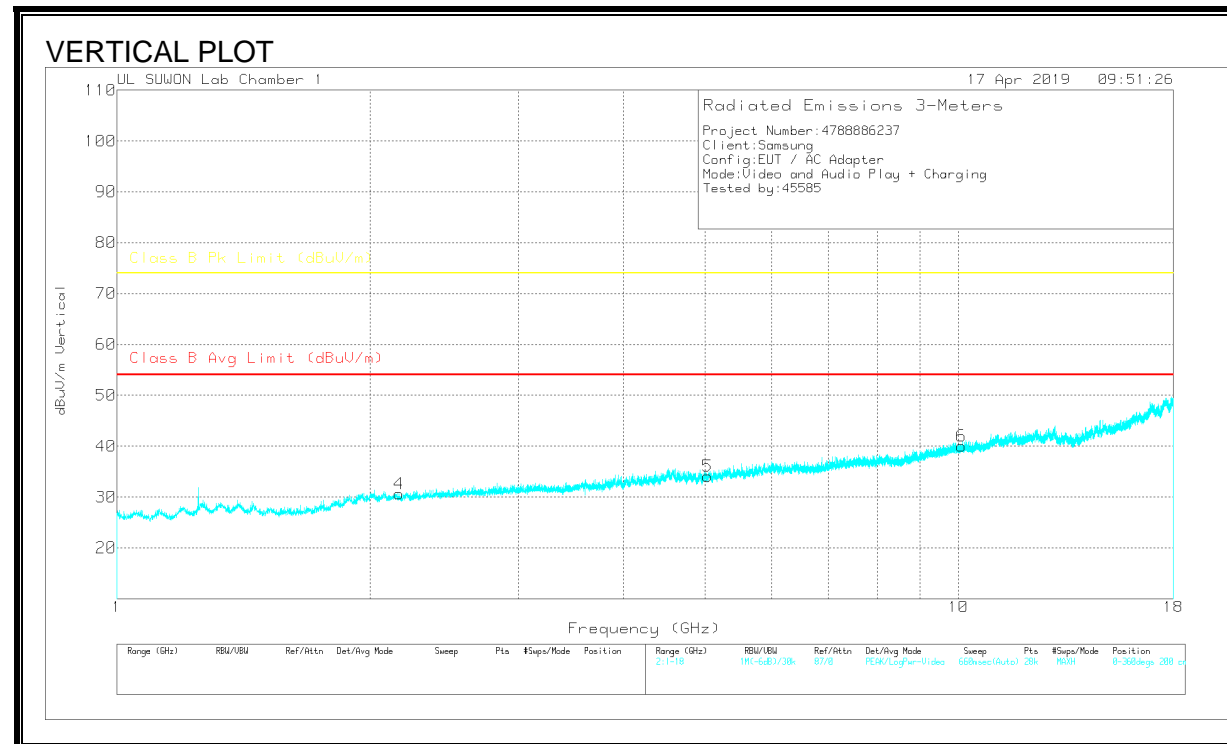
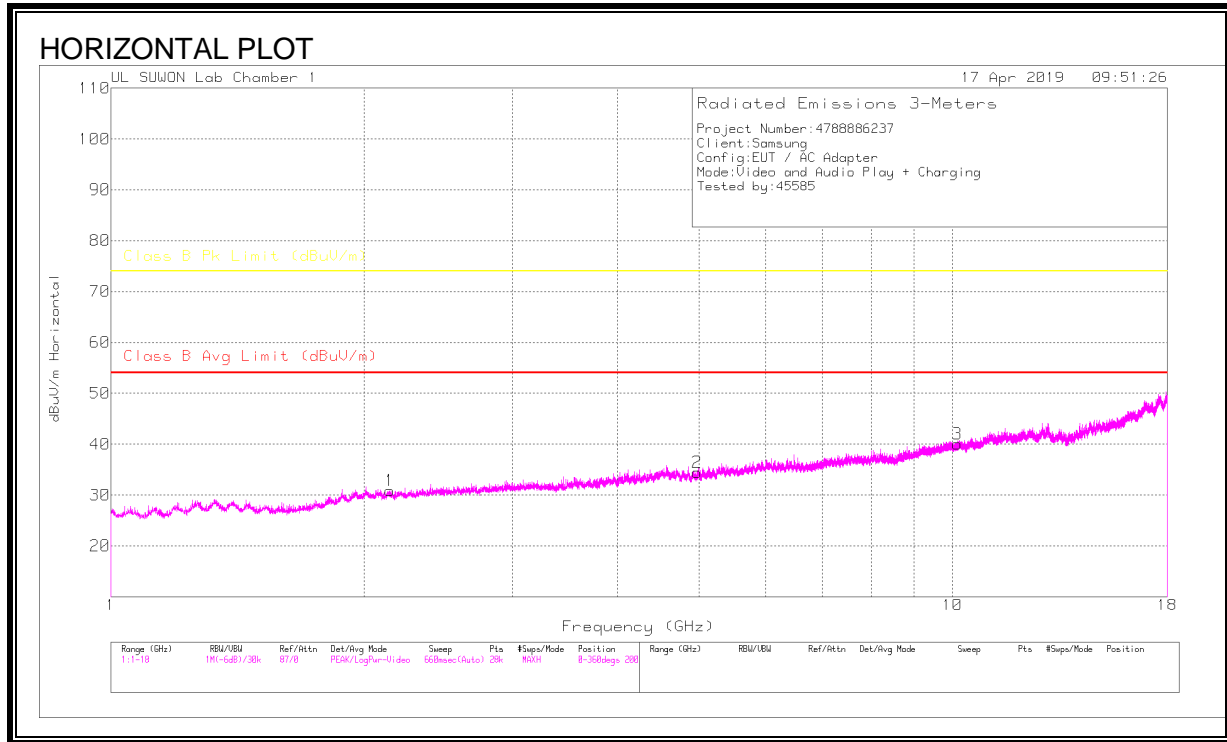
HORIZONTAL AND VERTICAL DATA

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	48.042	33.75	Pk	19.8	-30.5	23.05	40	-16.95	0-360	300	H
2	163.666	34.54	Pk	14.7	-28.9	20.34	43.52	-23.18	0-360	300	H
3	357.763	34.49	Pk	20.3	-27.2	27.59	46.02	-18.43	0-360	300	H
4	51.049	37.09	Pk	19.8	-30.5	26.39	40	-13.61	0-360	300	V
5	117.785	39.72	Pk	15.8	-29.4	26.12	43.52	-17.4	0-360	200	V
6	354.853	33.4	Pk	20.3	-27.3	26.4	46.02	-19.62	0-360	300	V

Pk - Peak detector

RADIATED EMISSIONS 1GHz to 18GHz



HORIZONTAL AND VERTICAL DATA

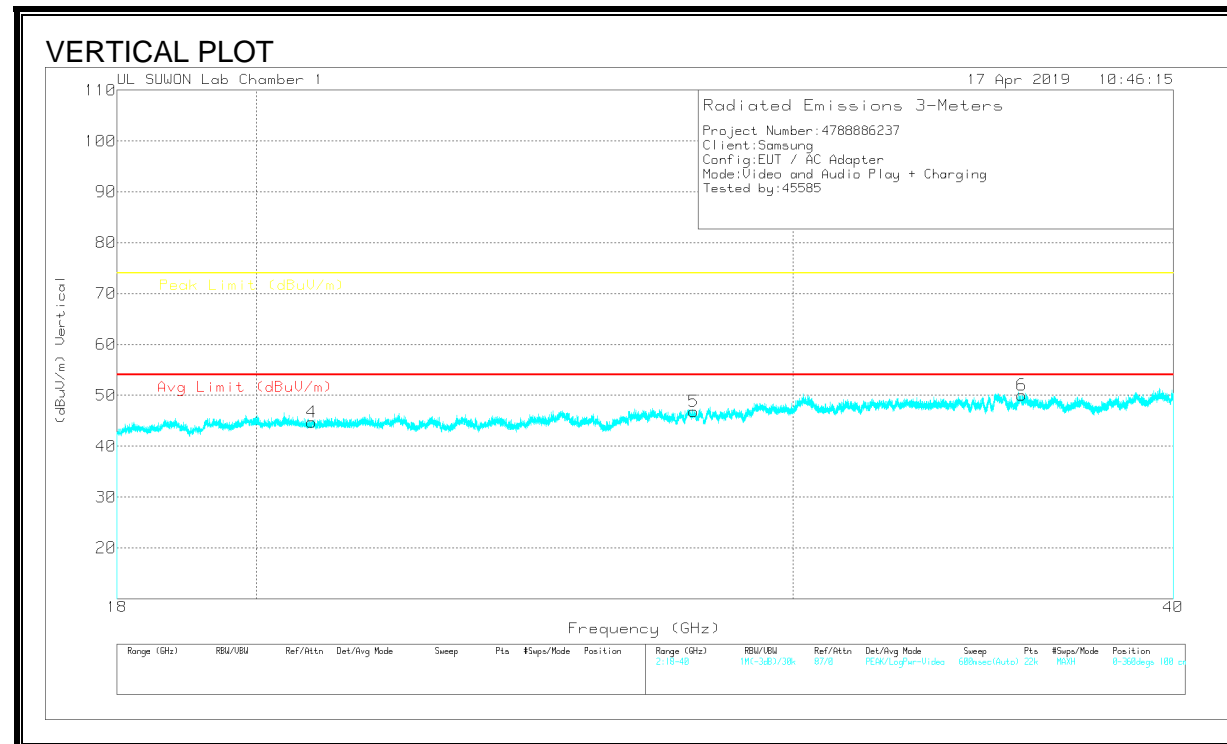
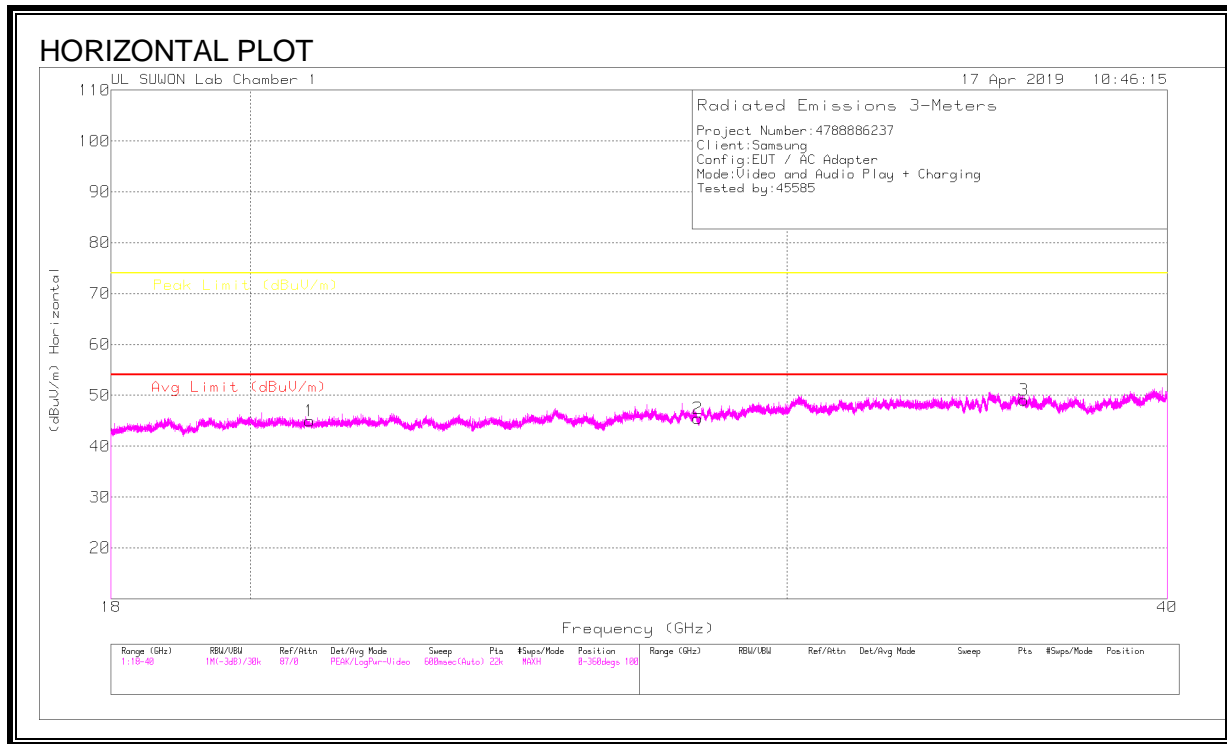
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	1-18GHz[dB]	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CISPR)Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.146	34.83	PK	31.3	-35.2	30.93	-	-	74	-43.07	0-360	100	H
2	4.975	31.66	PK	34.2	-31.4	34.46	-	-	74	-39.54	0-360	200	H
3	10.131	25.57	PK	37.5	-23	40.07	-	-	74	-33.93	0-360	100	H
4	2.162	34.49	PK	31.3	-35.2	30.59	-	-	74	-43.41	0-360	200	V
5	5.036	31.4	PK	34.3	-31.6	34.1	-	-	74	-39.9	0-360	100	V
6	10.084	25.96	PK	37.5	-23.4	40.06	-	-	74	-33.94	0-360	100	V

PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

RADIATED EMISSIONS 18GHz to 30GHz



HORIZONTAL AND VERTICAL DATA

Trace Markers

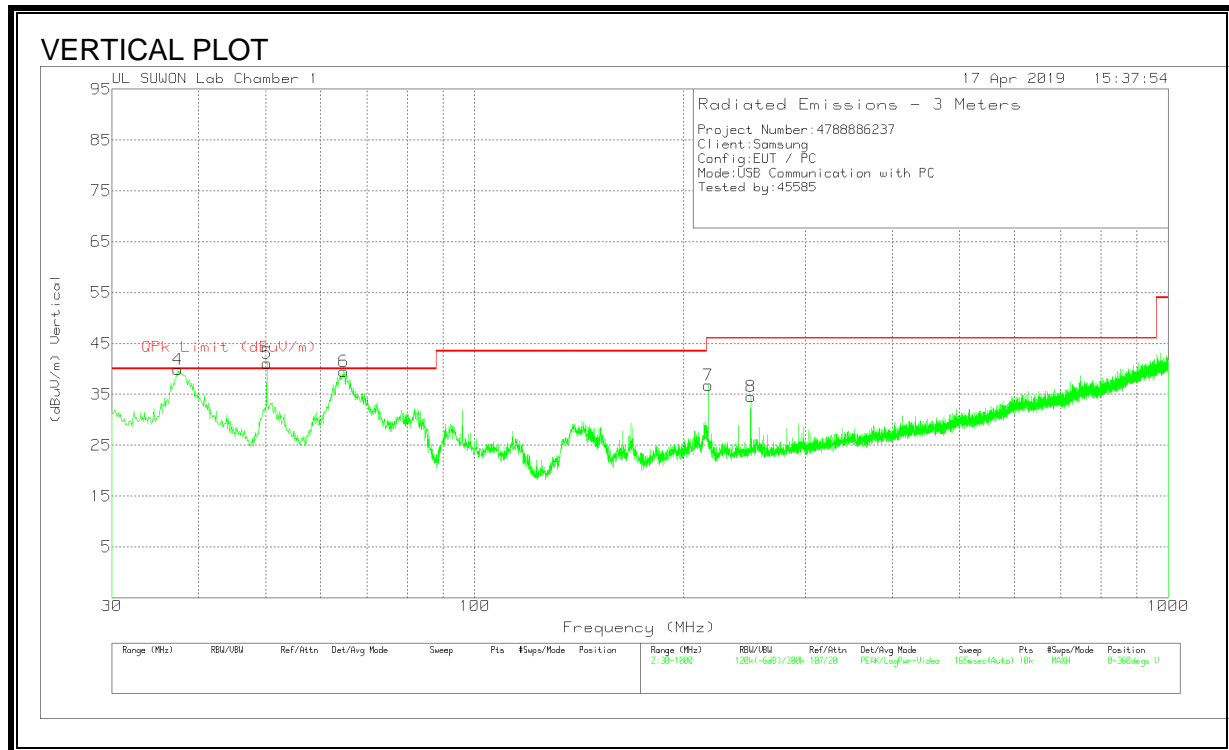
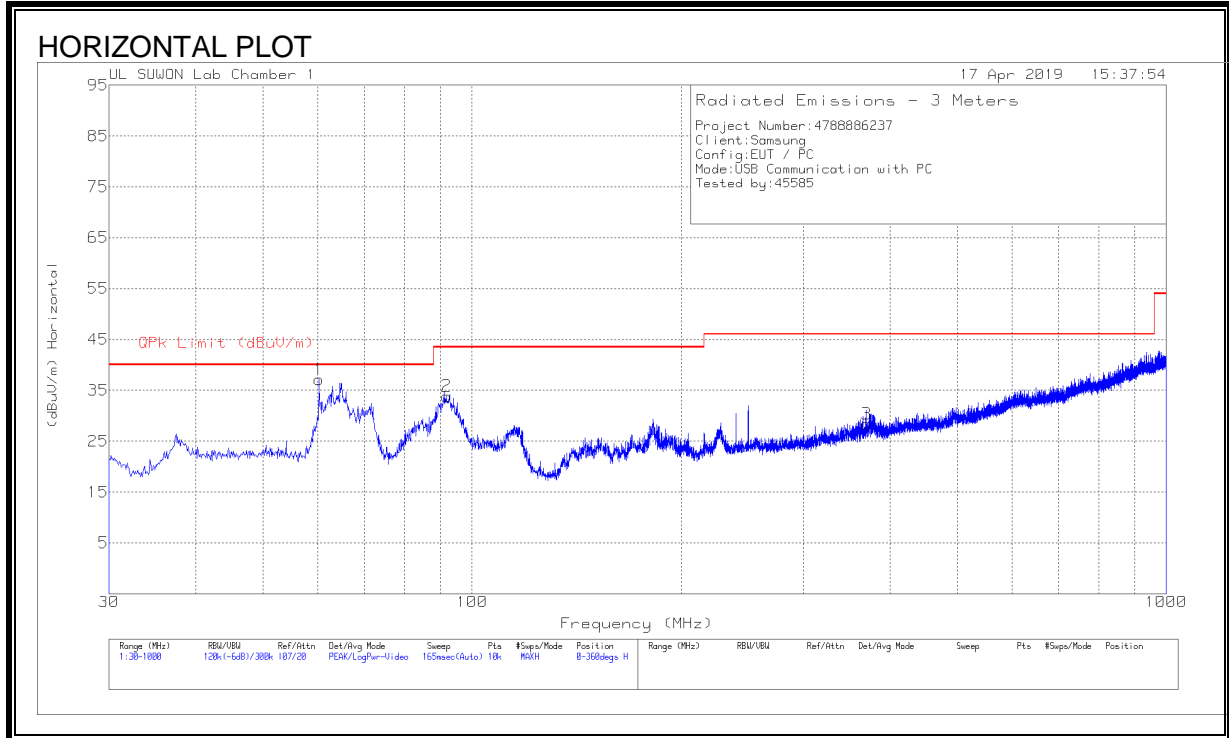
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3116C-PA	18-40GHz[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	20.919	19.19	PK	9.8	16	44.99	-	-	74	-29.01	0-360	100	H
2	28.047	14.74	PK	11.8	18.9	45.44	-	-	74	-28.56	0-360	100	H
3	35.888	15.4	PK	11.9	21.7	49	-	-	74	-25	0-360	100	H
4	20.851	18.96	PK	9.7	16.1	44.76	-	-	74	-29.24	0-360	100	V
5	27.843	16.53	PK	11.5	18.8	46.83	-	-	74	-27.17	0-360	100	V
6	35.665	16.47	PK	12.1	21.5	50.07	-	-	74	-23.93	0-360	100	V

PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

RESULTS Test Case 5

RADIATED EMISSIONS 30 TO 1000 MHz



HORIZONTAL AND VERTICAL DATA

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	60.167	48.99	Pk	18.5	-30.3	37.19	40	-2.81	0-360	400	H
2	91.886	47.27	Pk	16.4	-29.8	33.87	43.52	-9.65	0-360	300	H
3	369.985	34.72	Pk	20.8	-27.1	28.42	46.02	-17.6	0-360	100	H
4	37.372	53.04	Pk	17.6	-30.8	39.84	40	-.16	0-360	100	V
5	50.176	51.88	Pk	19.7	-30.5	41.08	40	1.08	0-360	300	V
6	64.823	52.46	Pk	17.3	-30.3	39.46	40	-.54	0-360	100	V
7	217.113	47.95	Pk	17.2	-28.4	36.75	46.02	-9.27	0-360	100	V
8	249.996	43.42	Pk	19.1	-28	34.52	46.02	-11.5	0-360	100	V

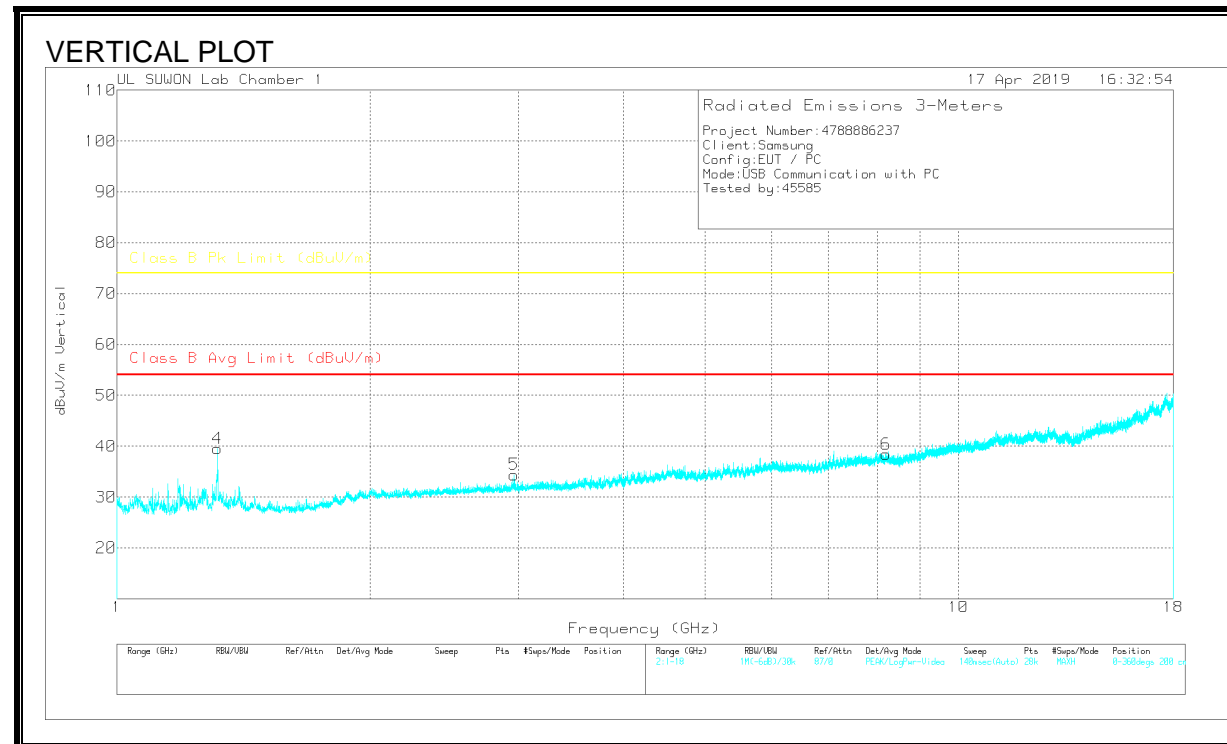
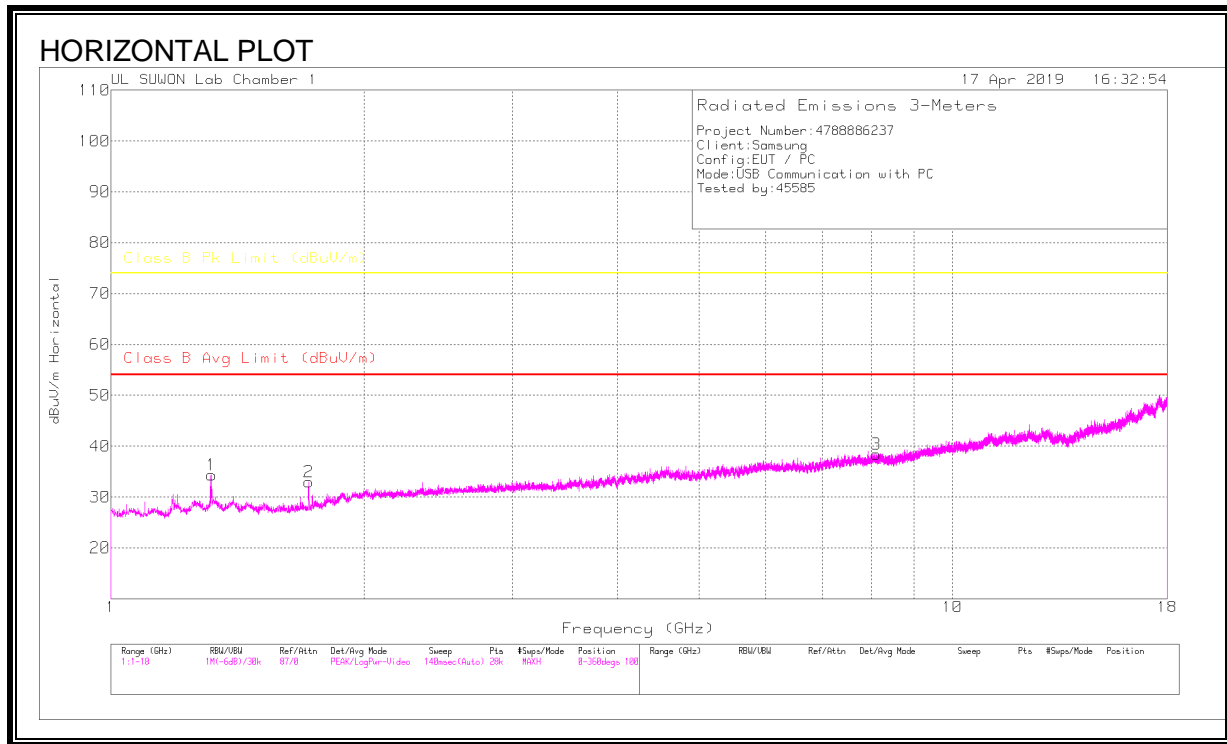
Pk - Peak detector

Radiated Emissions

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
59.927	38.86	Qp	18.6	-30.3	27.16	40	-12.84	338	390	H
37.4631	49.6	Qp	17.6	-30.8	36.4	40	-3.6	64	100	V
50.7726	40.16	Qp	19.8	-30.5	29.46	40	-10.54	121	101	V
63.936	47.95	Qp	17.7	-30.3	35.35	40	-4.65	66	101	V

Qp - Quasi-Peak detector

RADIATED EMISSIONS 1GHz to 18GHz



HORIZONTAL AND VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	1-18GHz[dB]	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CISPR)Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.318	41.6	PK	29.5	-36.8	34.3	-	-	74	-39.7	0-360	200	H
2	1.718	40.33	PK	28.7	-36	33.03	-	-	74	-40.97	0-360	200	H
3	8.118	28.91	PK	36.2	-26.7	38.41	-	-	74	-35.59	0-360	100	H
4	1.317	46.87	PK	29.5	-36.8	39.57	-	-	74	-34.43	0-360	200	V
5	2.963	35.9	PK	32.4	-33.9	34.4	-	-	74	-39.6	0-360	100	V
6	8.199	28.61	PK	36.3	-26.5	38.41	-	-	74	-35.59	0-360	200	V

PK – Peak Detector

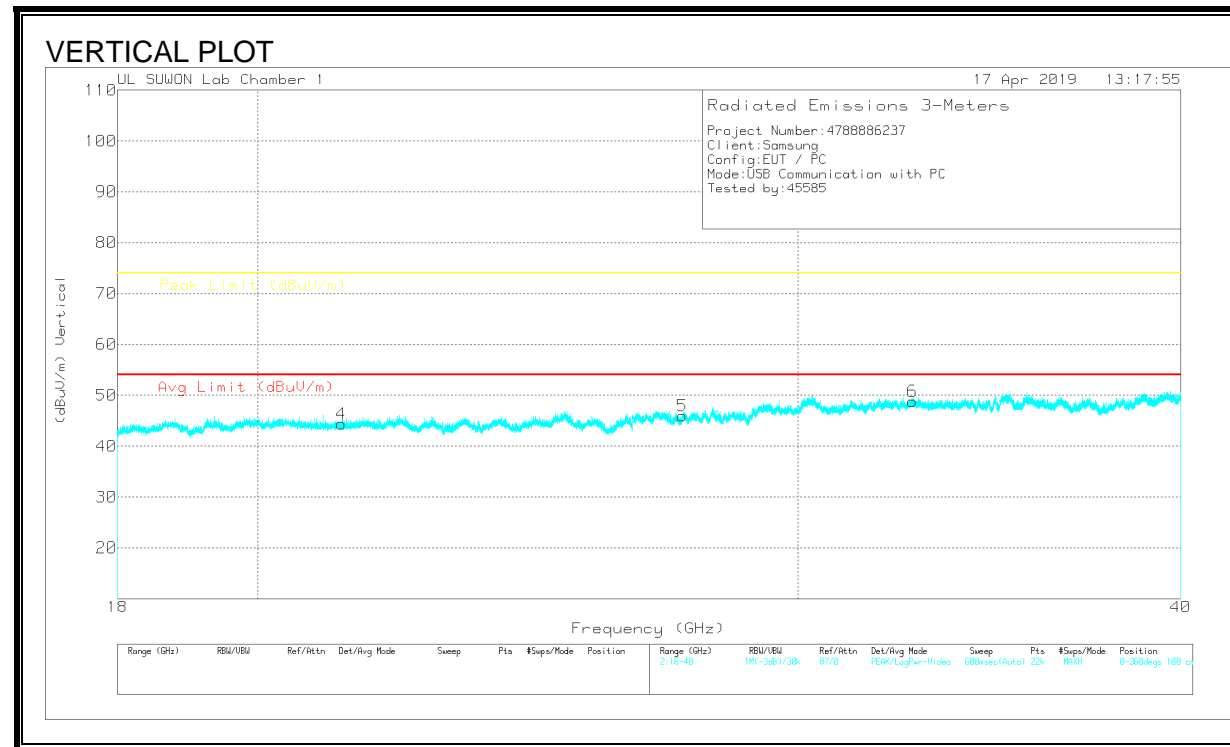
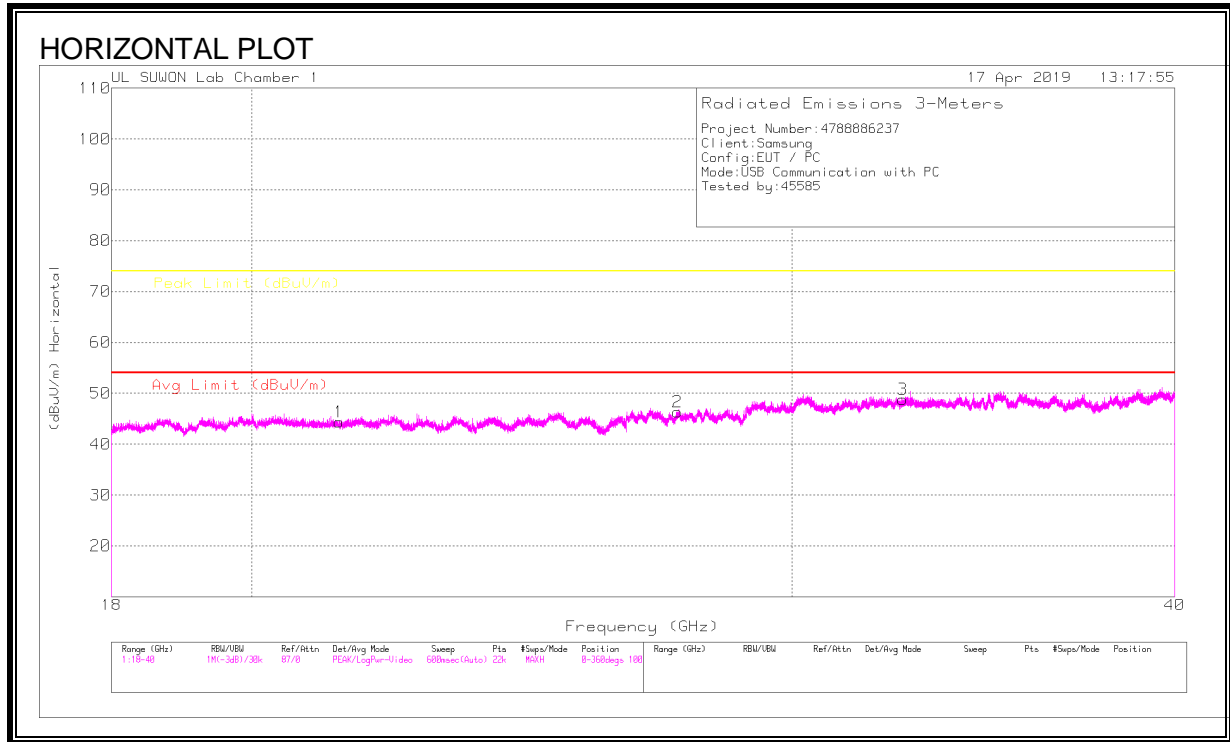
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	1-18GHz[dB]	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CISPR)Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.311	45.12	Pk	29.5	-36.8	37.82	-	-	74	-36.18	0	167	V
1.311	30.86	Ca	29.5	-36.8	23.56	54	-30.44	-	-	0	167	V
1.311	44.46	Pk	29.5	-36.8	37.16	-	-	74	-36.84	50	163	H
1.311	30.99	Ca	29.5	-36.8	23.69	54	-30.31	-	-	50	163	H

Pk - Peak detector

Ca - CISPR average detection

RADIATED EMISSIONS 18GHz to 30GHz



HORIZONTAL AND VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3116C-PA	18-40GHz[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	21.351	17.61	PK	10.6	16.2	44.41	-	-	74	-29.59	0-360	100	H
2	27.532	16.61	PK	11	18.7	46.31	-	-	74	-27.69	0-360	100	H
3	32.612	14.94	PK	13.5	20.4	48.84	-	-	74	-25.16	0-360	100	H
4	21.296	17.62	PK	10.5	16.2	44.32	-	-	74	-29.68	0-360	100	V
5	27.508	16.22	PK	11	18.7	45.92	-	-	74	-28.08	0-360	100	V
6	32.706	14.85	PK	13.5	20.5	48.85	-	-	74	-25.15	0-360	100	V

PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

6.2. CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4: 2014

LIMIT

§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

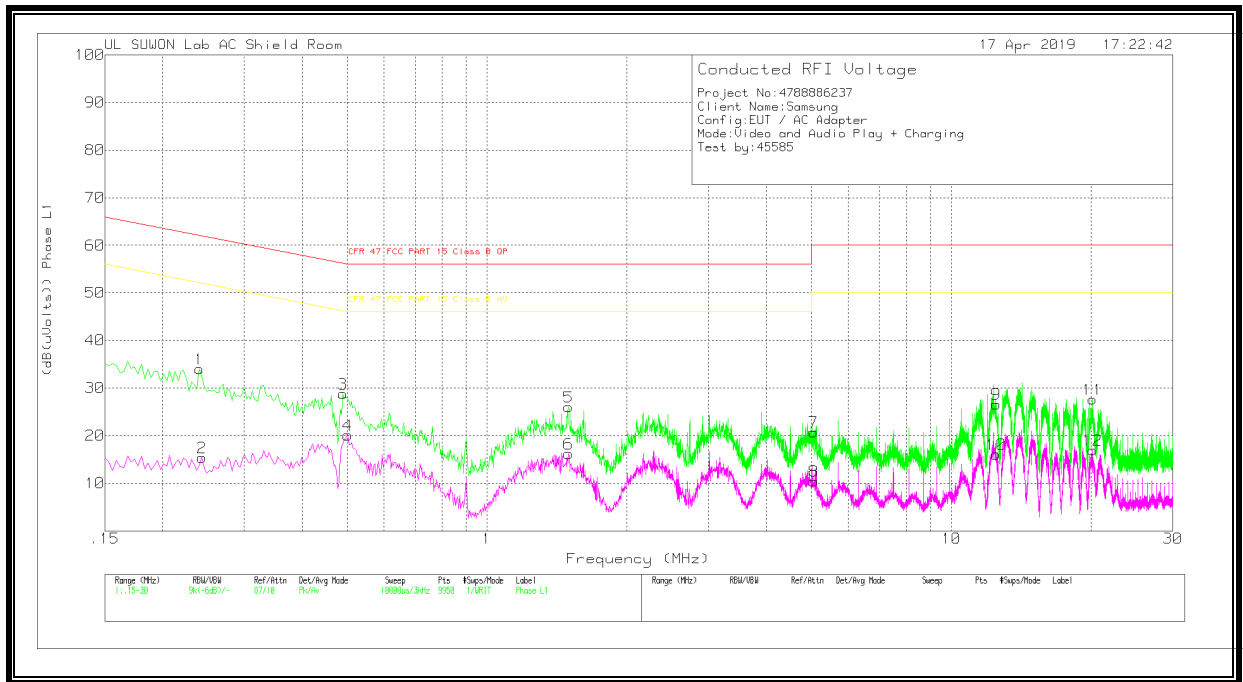
Frequency range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Notes:
 1. The lower limit shall apply at the transition frequencies
 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

RESULTS

6 WORST EMISSIONS Test Case 4

Line-L1 .15 - 30MHz



LINE 1 RESULTS

Trace Markers

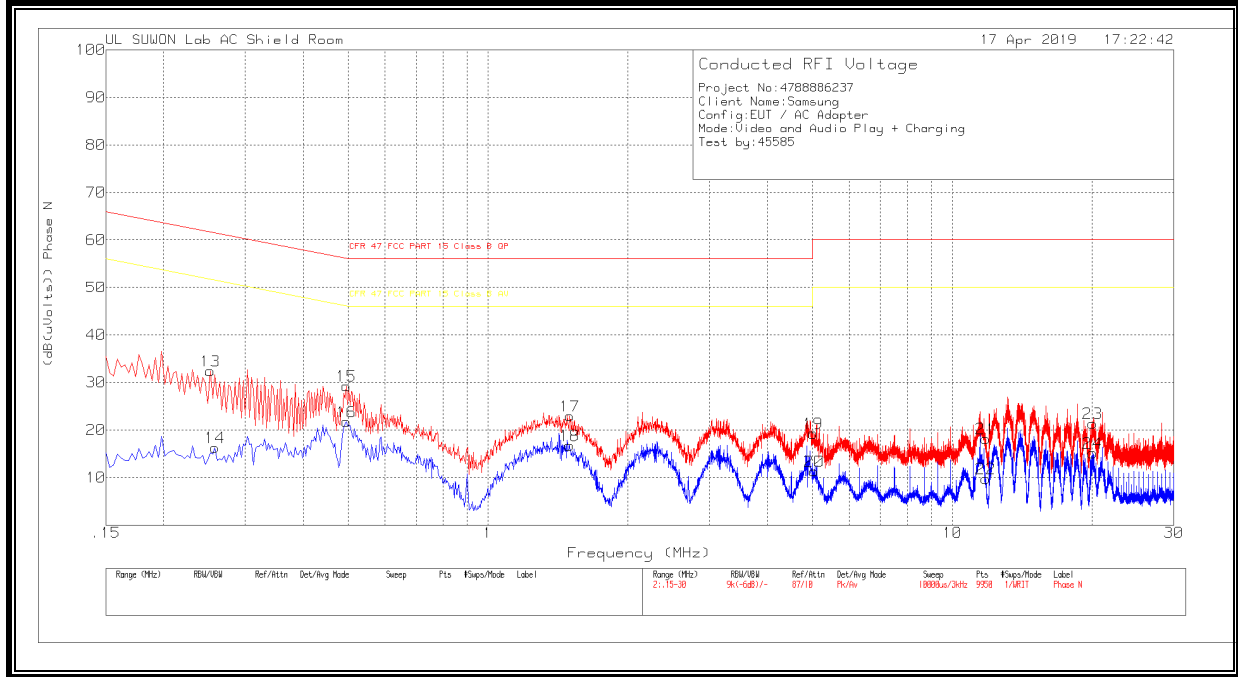
Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_10183 6_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	.24	24.14	Pk	9.7	.2	34.04	62.1	-28.06	-	-
2	.243	5.51	Av	9.7	.2	15.41	-	-	51.99	-36.58
3	.489	18.72	Pk	9.9	.2	28.82	56.18	-27.36	-	-
4	.501	10.01	Av	9.9	.2	20.11	-	-	46	-25.89
5	1.497	16.04	Pk	9.7	.3	26.04	56	-29.96	-	-
6	1.497	6.23	Av	9.7	.3	16.23	-	-	46	-29.77
7	5.052	10.76	Pk	9.7	.3	20.76	60	-39.24	-	-
8	5.058	.48	Av	9.7	.3	10.48	-	-	50	-39.52
9	12.489	16.63	Pk	9.7	.3	26.63	60	-33.37	-	-
10	12.48	6.11	Av	9.7	.3	16.11	-	-	50	-33.89
11	20.136	17.44	Pk	9.8	.4	27.64	60	-32.36	-	-
12	20.136	6.75	Av	9.8	.4	16.95	-	-	50	-33.05

Pk - Peak detector

Av - Average detection

Line-L2 .15 - 30MHz



LINE 2 RESULTS

Trace Markers

Range 2: Phase N .15 - 30MHz

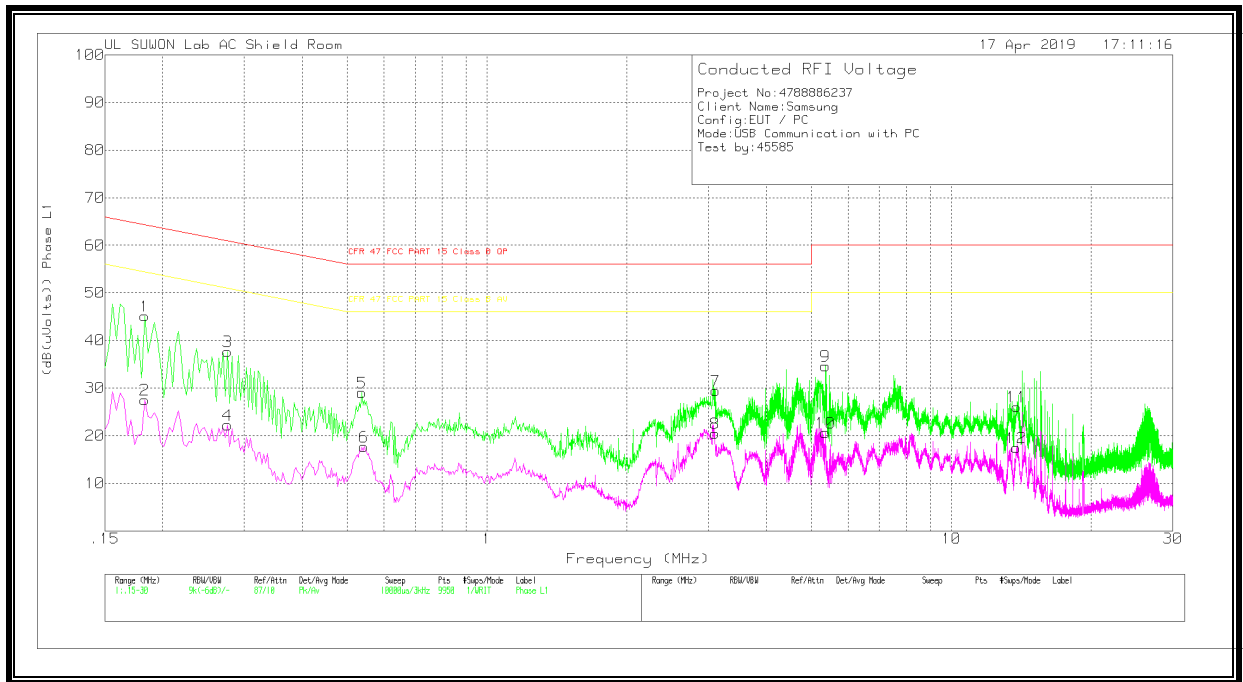
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_10183 6_N	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13	.252	22.64	Pk	9.6	.2	32.44	61.69	-29.25	-	-
14	.258	6.5	Av	9.6	.2	16.3	-	-	51.5	-35.2
15	.495	19.25	Pk	9.8	.2	29.25	56.08	-26.83	-	-
16	.495	11.75	Av	9.8	.2	21.75	-	-	46.08	-24.33
17	1.5	12.95	Pk	9.7	.3	22.95	56	-33.05	-	-
18	1.497	6.75	Av	9.7	.3	16.75	-	-	46	-29.25
19	5.013	9.43	Pk	9.6	.3	19.33	60	-40.67	-	-
20	5.037	1.44	Av	9.6	.3	11.34	-	-	50	-38.66
21	11.799	8.17	Pk	9.7	.3	18.17	60	-41.83	-	-
22	11.796	-.24	Av	9.7	.3	9.76	-	-	50	-40.24
23	20.052	11.17	Pk	9.8	.4	21.37	60	-38.63	-	-
24	20.052	4.98	Av	9.8	.4	15.18	-	-	50	-34.82

Pk - Peak detector

Av - Average detection

6 WORST EMISSIONS Test Case 5

Line-L1 .15 - 30MHz



LINE 1 RESULTS

Trace Markers

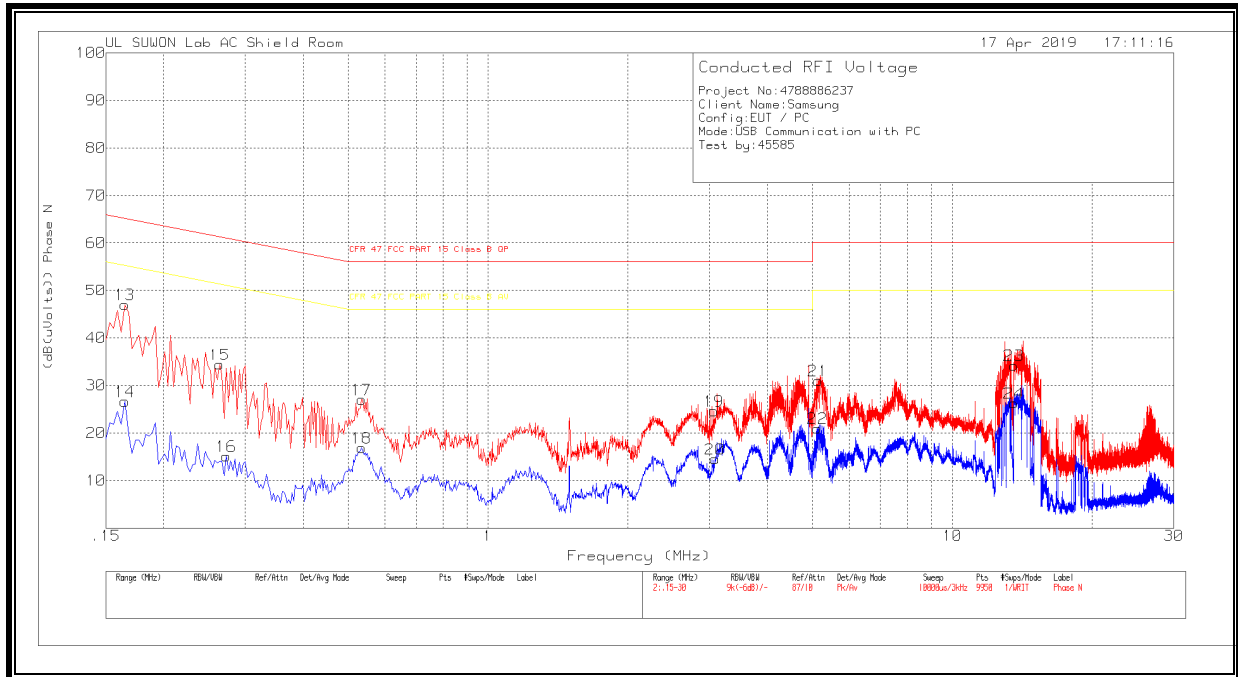
Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_10183 6_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	.183	35.03	Pk	9.9	.2	45.13	64.35	-19.22	-	-
2	.183	17.42	Av	9.9	.2	27.52	-	-	54.35	-26.83
3	.276	27.77	Pk	9.7	.2	37.67	60.94	-23.27	-	-
4	.276	12.37	Av	9.7	.2	22.27	-	-	50.94	-28.67
5	.537	18.96	Pk	9.9	.2	29.06	56	-26.94	-	-
6	.543	7.62	Av	9.9	.2	17.72	-	-	46	-28.28
7	3.105	19.44	Pk	9.7	.3	29.44	56	-26.56	-	-
8	3.096	10.48	Av	9.7	.3	20.48	-	-	46	-25.52
9	5.352	24.63	Pk	9.7	.3	34.63	60	-25.37	-	-
10	5.352	10.66	Av	9.7	.3	20.66	-	-	50	-29.34
11	13.821	15.96	Pk	9.7	.4	26.06	60	-33.94	-	-
12	13.794	7.38	Av	9.7	.4	17.48	-	-	50	-32.52

Pk - Peak detector

Av - Average detection

Line-L2 .15 - 30MHz



LINE 2 RESULTS

Trace Markers

Range 2: Phase N .15 - 30MHz

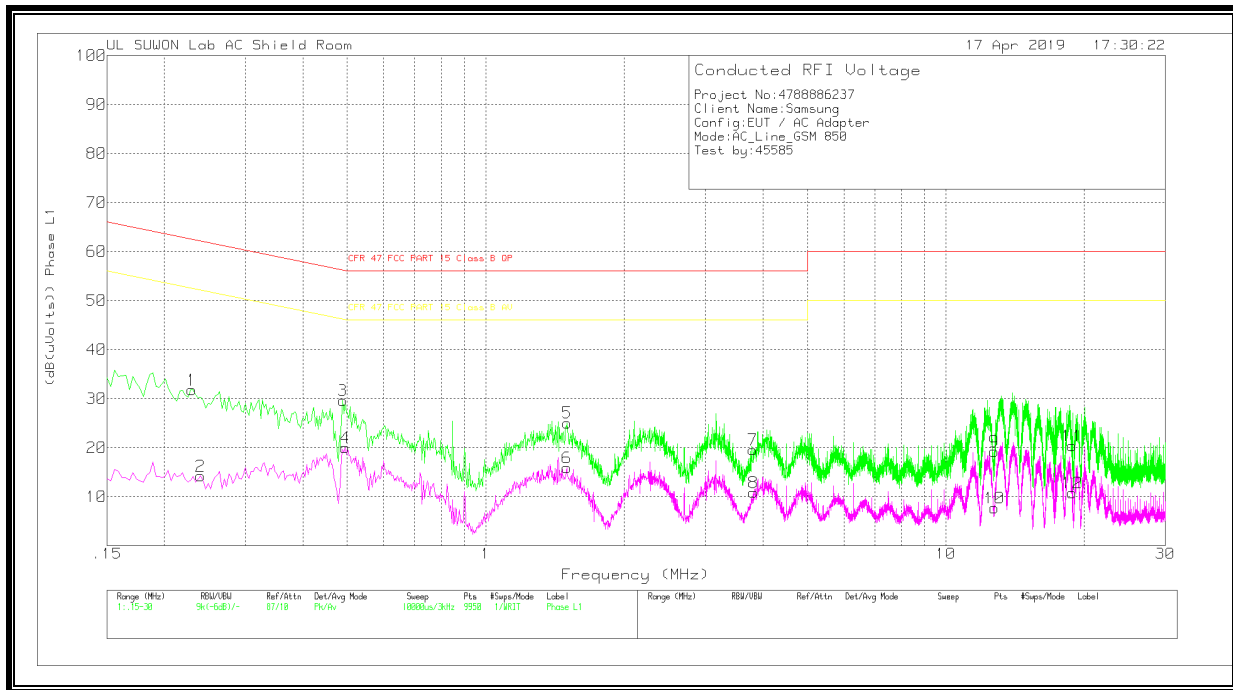
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_10183 6_N	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13	.165	37.01	Pk	9.9	.1	47.01	65.21	-18.2	-	-
14	.165	16.67	Av	9.9	.1	26.67	-	-	55.21	-28.54
15	.264	24.64	Pk	9.6	.2	34.44	61.3	-26.86	-	-
16	.273	5.34	Av	9.6	.2	15.14	-	-	51.03	-35.89
17	.534	17.08	Pk	9.8	.2	27.08	56	-28.92	-	-
18	.534	6.91	Av	9.8	.2	16.91	-	-	46	-29.09
19	3.063	14.77	Pk	9.6	.3	24.67	56	-31.33	-	-
20	3.081	4.64	Av	9.6	.3	14.54	-	-	46	-31.46
21	5.139	21.12	Pk	9.6	.3	31.02	60	-28.98	-	-
22	5.118	11.08	Av	9.6	.3	20.98	-	-	50	-29.02
23	13.566	24.11	Pk	9.7	.4	34.21	60	-25.79	-	-
24	13.566	16.2	Av	9.7	.4	26.3	-	-	50	-23.7

Pk - Peak detector

Av - Average detection

6 WORST EMISSIONS Test Case 6

Line-L1 .15 - 30MHz



LINE 1 RESULTS

Trace Markers

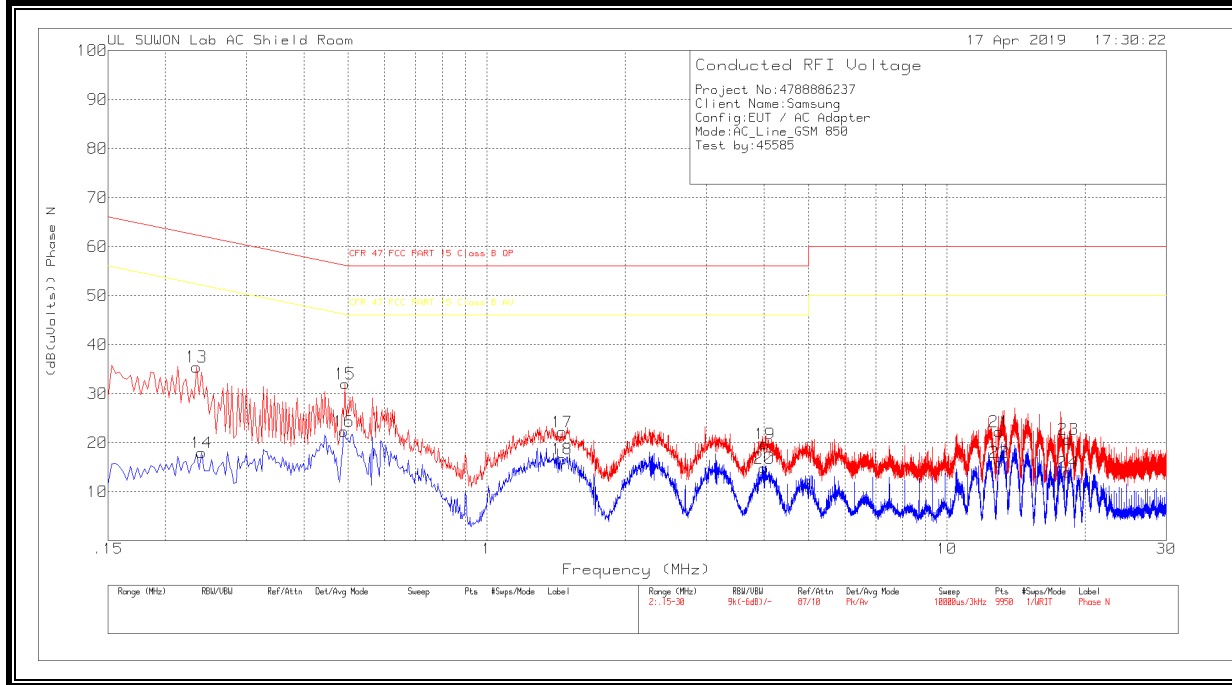
Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_10183 6_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	.2295	21.88	Pk	9.7	.2	31.78	62.47	-30.69	-	-
2	.24	4.32	Av	9.7	.2	14.22	-	-	52.1	-37.88
3	.489	19.56	Pk	9.9	.2	29.66	56.18	-26.52	-	-
4	.495	9.91	Av	9.9	.2	20.01	-	-	46.08	-26.07
5	1.503	15.07	Pk	9.7	.3	25.07	56	-30.93	-	-
6	1.5	5.91	Av	9.7	.3	15.91	-	-	46	-30.09
7	3.807	9.57	Pk	9.7	.3	19.57	56	-36.43	-	-
8	3.822	.87	Av	9.7	.3	10.87	-	-	46	-35.13
9	12.744	9.22	Pk	9.7	.3	19.22	60	-40.78	-	-
10	12.756	-2.29	Av	9.7	.3	7.71	-	-	50	-42.29
11	18.807	10.22	Pk	9.8	.4	20.42	60	-39.58	-	-
12	18.813	.59	Av	9.8	.4	10.79	-	-	50	-39.21

Pk - Peak detector

Av - Average detection

Line-L2 .15 - 30MHz



LINE 2 RESULTS

Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ENV216_10183 6_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	.234	25.55	Pk	9.7	.2	35.45	62.31	-26.86	-	-
14	.24	8.17	Av	9.6	.2	17.97	-	-	52.1	-34.13
15	.492	22	Pk	9.8	.2	32	56.13	-24.13	-	-
16	.489	12.35	Av	9.8	.2	22.35	-	-	46.18	-23.83
17	1.458	12.22	Pk	9.7	.3	22.22	56	-33.78	-	-
18	1.458	6.7	Av	9.7	.3	16.7	-	-	46	-29.3
19	4.023	9.87	Pk	9.6	.3	19.77	56	-36.23	-	-
20	4.008	4.92	Av	9.6	.3	14.82	-	-	46	-31.18
21	12.996	12.15	Pk	9.7	.4	22.25	60	-37.75	-	-
22	13.002	5.88	Av	9.7	.4	15.98	-	-	50	-34.02
23	18.363	10.6	Pk	9.7	.4	20.7	60	-39.3	-	-
24	18.363	3.91	Av	9.7	.4	14.01	-	-	50	-35.99

Pk - Peak detector

Av - Average detection