



CERTIFICATION TEST REPORT

Report Number. : 4789754188-E10V1

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

Model : SCG10

FCC ID : A3LSMG996JPN

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

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

Date Of Issue:
February 05, 2021

Prepared by:
UL Korea, Ltd.
26th floor, 152, Teheran-ro, Gangnam-gu Seoul, 06236, Korea

Suwon Test Site: UL Korea, LTD. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu
Suwon-si, Gyeonggi-do, 16675, Korea
TEL: (031) 337-9902
FAX: (031) 213-5433



Testing Laboratory
TL-637

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	02/05/21	Initial issue	Sungeun Lee

TABLE OF CONTENTS

REPORT REVISION HISTORY	2
TABLE OF CONTENTS	3
1. ATTESTATION OF TEST RESULTS	4
2. SUMMARY TABLE	5
3. TEST METHODOLOGY	5
4. FACILITIES AND ACCREDITATION	5
5. CALIBRATION AND UNCERTAINTY	6
5.1. <i>MEASURING INSTRUMENT CALIBRATION.....</i>	6
5.2. <i>SAMPLE CALCULATION.....</i>	6
5.3. <i>MEASUREMENT UNCERTAINTY.....</i>	6
5.4. <i>DECISION RULE.....</i>	6
6. EQUIPMENT UNDER TEST.....	7
6.1. <i>EUT DESCRIPTION.....</i>	7
6.2. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i>	7
6.3. <i>WORST-CASE CONFIGURATION AND MODE.....</i>	8
6.4. <i>DESCRIPTION OF TEST SETUP.....</i>	9
7. MEASUREMENT METHOD.....	10
8. TEST AND MEASUREMENT EQUIPMENT	10
9. ANTENNA PORT TEST RESULTS.....	11
9.1. <i>10 dB BANDWIDTH.....</i>	11
9.1.1. <i>10dB BANDWIDTH MEASUREMENT</i>	12
9.1.2. <i>10dB BANDWIDTH PLOT</i>	13
9.2. <i>PEAK POWER AND MAXIMUM AVERAGE EMISSIONS.....</i>	14
9.2.1. <i>MAXIMUM PEAK AND AVERAGE POWER</i>	15
9.3. <i>CESSATION TIME.....</i>	19
10. RADIATED TEST RESULTS	22
10.1. <i>LIMITS AND PROCEDURE</i>	22
10.2. <i>TRANSMITTER ABOVE 1 GHz</i>	25
10.2.1. <i>SPURIOUS EMISSION 1 GHz – 6 GHz</i>	25
10.2.2. <i>SPURIOUS EMISSION 9 GHz – 18 GHz.....</i>	29
10.2.3. <i>SPURIOUS EMISSION 1164 MHz – 1240 MHz</i>	33
10.2.4. <i>SPURIOUS EMISSION 1559 MHz – 1610 MHz</i>	37
10.3. <i>WORST CASE BELOW 1 GHz.....</i>	41
11. AC POWER LINE CONDUCTED EMISSIONS	43
11.1.1. <i>AC Power Line.....</i>	44

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax UWB, WPT and NFC
MODEL: SCG10
SERIAL NUMBER: R3CNC02X3TX (RADIATED)
DATE TESTED: JAN 12, 2021 – JAN 29, 2021;

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart F	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:



Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Sungeun Lee
Suwon Lab Engineer
UL Korea, Ltd.

2. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
15.503(a)	10dB Bandwidth	≥ 500 MHz	Radiated	Pass
15.517(e) 15.521(g)	Maximum Peak Power Spectral Density	< 0dBm EIRP in 50 MHz BW		Pass
15.517(c)	Radiated Emissions Above 960 MHz	See table in 15.517(c) for details		Pass
15.517(d)	Radiated Emissions un the 1164 - 1240 MHz and 1559 - 1610 MHz GPS Bands	See table in 15.517(d) for details		Pass
15.209	Radiated Emssions Below 960 MHz	Emissions in restriced bands must meet the radiated limits detailed in 15.209		Pass
15.207,15.251(j)	AC Line Conducted Emssions 150 kHz - 30 MHz	< FCC 15.207 limits	Power Line conducted	Pass
15.519(a)(1)	Shutdown Timing Requirements	< 10s	Radiated	Pass

3. TEST METHODOLOGY

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. ANSI C63.10-2013.
4. KDB 393764 D01 UWB FAQ v02

4. 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 <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

5. CALIBRATION AND UNCERTAINTY

5.1. 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.

5.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

$$P \text{ (dBm EIRP)} = E \text{ (dBuV/m)} - 95.2 \text{ dB}$$

5.3. 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	3.01 dB
Radiated Disturbance, 9 kHz to 30 MHz	1.72 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.26 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.90 dB
Radiated Disturbance, Above 18 GHz	5.49 dB

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

5.4. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 1, Clause 4.4.2 in IEC Guide 115:2007.

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, WPT and NFC. This test report addresses the WWAN Uplink Carrier Aggregation operational mode. This report covers the Samsung models SCG09 and SC-51B. There is no difference SCG09 and SC-51B. Model name difference by business operator.

The EUT is a UWB transceiver with 2 TX antennas (Ant1 & 2) installed in a smart phone host and operates on 8 GHz (Channel 9). Three signal configurations (CONFIG SP0, SP1, SP3) are available for each ANT setting. CONFIG 2 is not supported.

Worst Case Preamble ID (BPRF: 9 – 24 / HPRF: 25 – 32): BPRF: 9 / HPRF: 25

ANT	Channel	CONFIG	PRF Mode	Packet Length
Ant1	9	SP0	BPRF	4
			HPRF	127
			HPRF	127
		SP1	BPRF	4
			HPRF	127
			HPRF	127
		SP3	BPRF	4
			HPRF	127
			HPRF	127
Ant2	9	SP0	BPRF	4
			HPRF	127
			HPRF	127
		SP1	BPRF	4
			HPRF	127
			HPRF	127
		SP3	BPRF	4
			HPRF	127
			HPRF	127

6.2. DESCRIPTION OF AVAILABLE ANTENNAS

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

**The internal antenna was Permanently attached.
 Therefore this E.U.T Complies with the requirement of §15.203.**

The radio utilizes an internal antennas, with Antenna 1's maximum gain of

Frequency Band [MHz]	ANT1 Gain [dBi]	ANT2 Gain [dBi]
CH9 8000	-1.26	0.11

“PATCH ANTENNA” and “LDS ANTENNA” as indicated in antenna specification are written as ANT 1 and ANT 2 in this report.

6.3. WORST-CASE CONFIGURATION AND MODE

Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

For ANT 1 (Patch) CH9, the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

For ANT 2 (LDS) CH9, the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

MIMO does not support.

Note : All radiated and power line conducted tests were performed attached with travel adapter for the worst case condition mode.

6.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA200	N/A	N/A
Data Cable	SAMSUNG	EP-DR140AWE	N/A	N/A

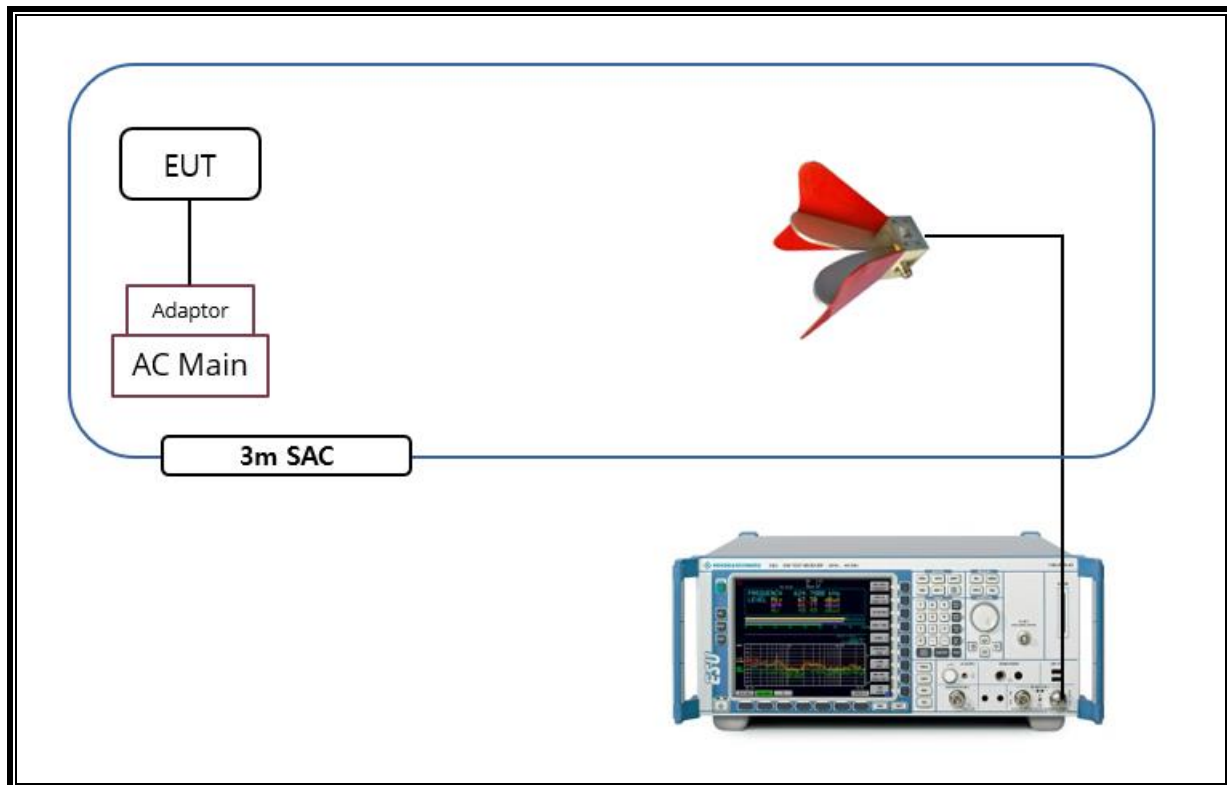
I/O CABLE

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length(m)	Remarks
1	DC Power	1	C Type	Shielded	1.1m	N/A

TEST SETUP

The EUT is a stand-alone unit during the tests.
 Test software in hidden menu exercised the EUT to enable UWB mode.

SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP) 50cm for Spurious, 3m for EIRP.



7. MEASUREMENT METHOD

10 dB BW : ANSI C63.10-2013, Section 10.1 / FCC Part §15.503(a)

Peak power and maximum average emissions: ANSI C63.10-2013 Section 10.3, 15.519(c)(e)

Cessation time: 15.519(a)(1)

Radiated measurement procedure: ANSI C63.10-2013, Section 10.3

AC Power Line Conducted Emission: ANSI C63.10-2013, Section 6.2

8. 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	Next Cal. Date
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-19-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-13-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-13-22
Antenna, Horn, 18 GHz	ETS	3117	00168724	07-27-22
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-15-22
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-04-22
Antenna, Horn, 40 GHz	ETS	3116C	00168645	10-02-21
Preamplifier	ETS	3116C-PA	00168841	10-02-21
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-03-21
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-03-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-03-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-03-21
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-05-21
Attenuator	PASTERNAK	PE7087-10	A001	08-03-21
Attenuator	PASTERNAK	PE7087-10	A008	08-03-21
Attenuator	PASTERNAK	PE7004-10	2	08-03-21
Attenuator	PASTERNAK	PE7087-10	A009	08-05-21
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-03-21
Low Pass Filter CH5	Wainwright Instruments	WLKX12-5400-5940-18000-60ST	1	05-14-21
Low Pass Filter CH9	Wainwright Instruments	WLKX10-6400-7424-18000-60ST	1	05-14-21
High Pass Filter CH5	Wainwright Instruments	WHW2-7100-10000-18000-40CD	2	05-14-21
High Pass Filter CH9	Wainwright Instruments	WHW2-8165-11500-21000-40CD	11	05-14-21
LISN	R&S	ENV-216	101837	08-06-21
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-02-21
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

9. ANTENNA PORT TEST RESULTS

9.1. 10 dB BANDWIDTH

LIMITS

FCC §15.503

(a) UWB bandwidth. For the purpose of this subpart, the UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated f_H and the lower boundary is designated f_L . The frequency at which the highest radiated emission occurs is designated f_M .

(b) Center frequency. The center frequency, f_c , equals $(f_H + f_L)/2$.

(c) Fractional bandwidth. The fractional bandwidth equals $2(f_H - f_L) / (f_H + f_L)$.

(d) Ultra-wideband (UWB) transmitter. An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

FCC §15.519

(b) The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

Test Procedure

ANSI C63.10-2013 – Section 10.1

Test settings

1. RBW = 1MHz
2. VBW = 3MHz
3. Span was set wide enough to capture the 10dB points of the signal
4. Sweep = auto couple
5. Detector = Peak
6. Trace mode = Max hold
7. The trace was allowed to stabilize

RESULTS

Plots: worst cases were reported.

9.1.1. 10dB BANDWIDTH MEASUREMENT

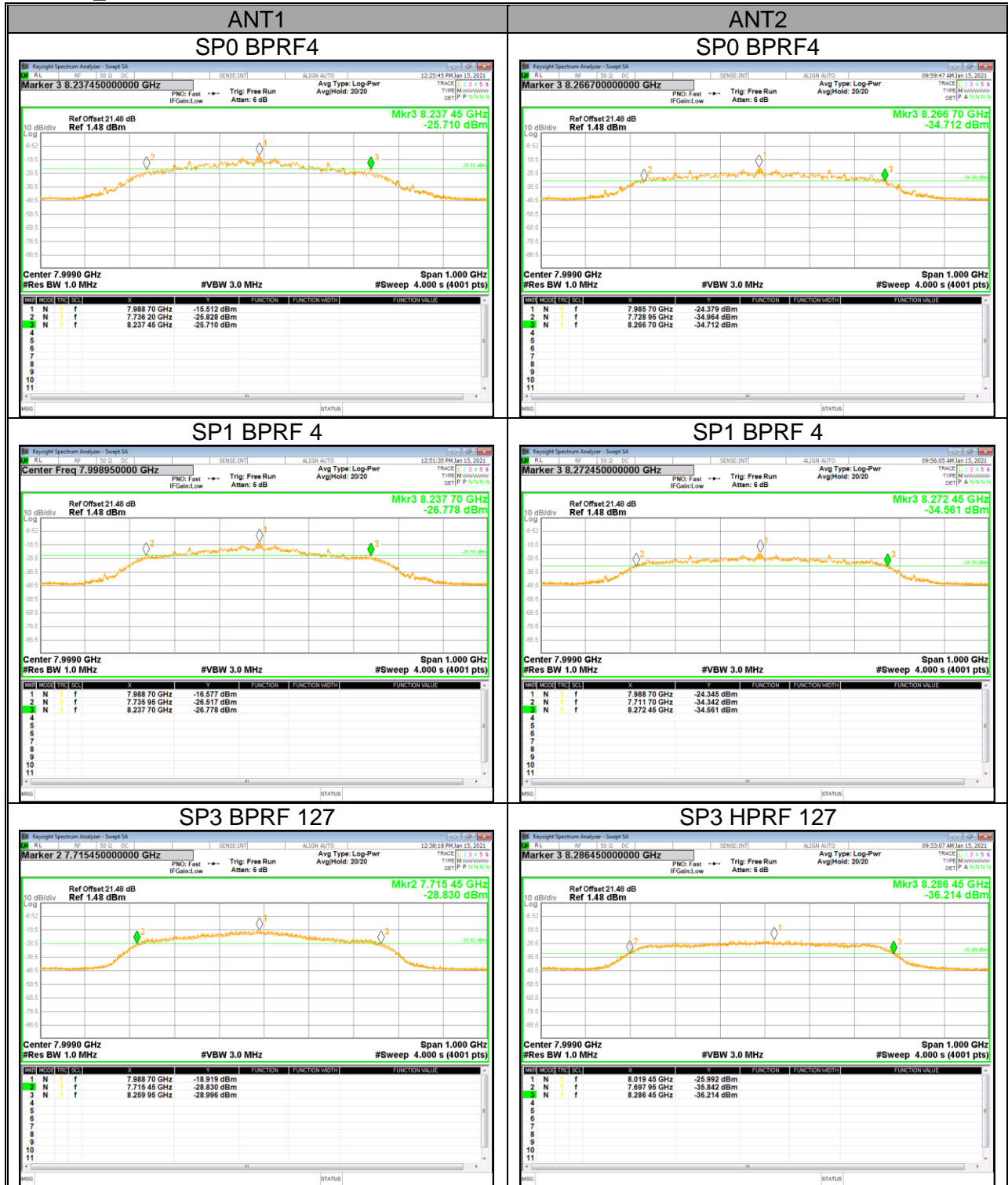
ANT	Channel	CONFIG	PRF Mode	f _L (MHz)	f _H (MHz)	f _M (MHz)	f _C (MHz)	BW (MHz)
Ant1 Patch	CH9	SP0	BPRF4	7736.20	8237.45	7988.70	7986.83	501.25
			BPRF127	7737.20	8238.95	7987.20	7988.08	501.75
			HPRF127	7741.45	8249.20	7991.45	7995.33	507.75
		SP1	BPRF4	7735.95	8237.70	7988.70	7986.83	501.75
			BPRF127	7736.95	8238.95	7987.20	7987.95	502.00
			HPRF127	7729.70	8247.45	7991.45	7988.58	517.75
		SP3	BPRF4	7716.95	8264.20	7988.70	7990.58	547.25
			BPRF127	7715.45	8259.95	7988.70	7987.70	544.50
			HPRF127	7723.95	8269.20	7955.20	7996.58	545.25
Ant2 LDS	CH9	SP0	BPRF4	7728.95	8266.70	7985.70	7997.83	537.75
			BPRF127	7714.95	8268.20	7987.45	7991.58	553.25
			HPRF127	7703.20	8280.20	7991.45	7991.70	577.00
		SP1	BPRF4	7711.70	8272.45	7988.70	7992.08	560.75
			BPRF127	7704.45	8276.45	7990.20	7990.45	572.00
			HPRF127	7699.20	8286.20	7991.45	7992.70	587.00
		SP3	BPRF4	7692.45	8290.95	7999.20	7991.70	598.50
			BPRF127	7694.95	8285.95	7988.70	7990.45	591.00
			HPRF127	7697.95	8286.45	8019.45	7992.20	588.50

9.1.2. 10dB BANDWIDTH PLOT

RESULTS

worst cases were reported.

- ANT1_Patch



9.2. PEAK POWER AND MAXIMUM AVERAGE EMISSIONS

LIMITS

FCC §15.519

(c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
3100-10600	-41.3

(e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fm. That limit is 0 dBm EIRP.

TEST PROCEDURE

ANSI C63.10 Clause 10.3.

Peak EIRP power is measured using RBW of 50 MHz.

The radiated emissions of 6 – 9 GHz frequency band are performed at 3meter test distance.

Test Notes

The EIRP in dBm was calculated from the measurement Field Strength in dBuV/m by applying a -95.2dB correction factor to the Field Strength level.

RESULTS

Plots: worst cases were reported.

9.2.1. MAXIMUM PEAK AND AVERAGE POWER

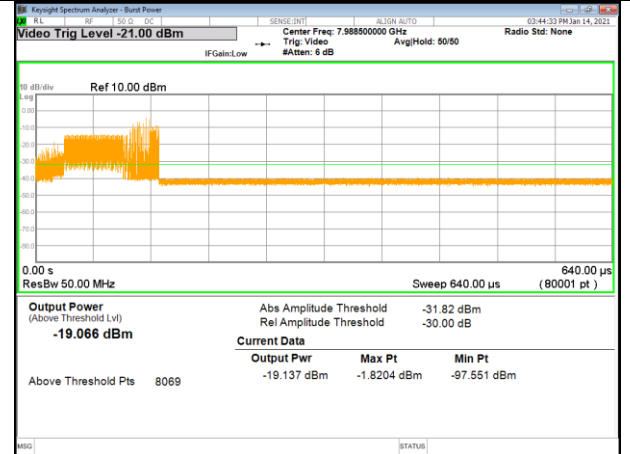
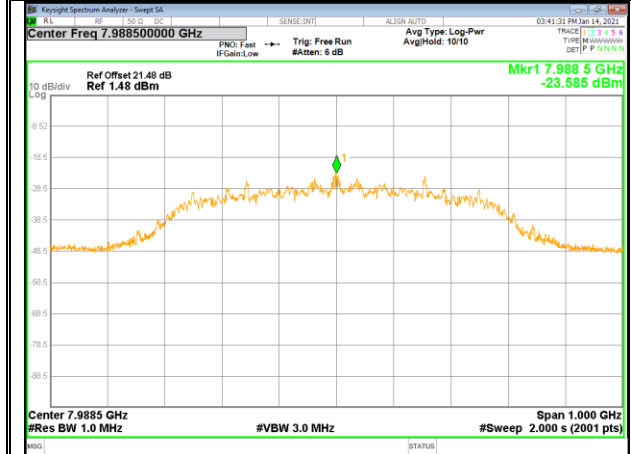
ANT	Channel	CONFIG	PRF Mode	Peak Power (dBm/50MHz)	Peak Limit (dBm/50MHz)	Margin	AV Power (dBm/MHz)	AV Limit (dBm/MHz)	Margin
Ant1 Patch	CH9	SP0	BPRF4	-1.71	0.00	1.71	-44.45	-41.30	3.15
			BPRF127	-3.68	0.00	3.68	-43.86	-41.30	2.56
			HPRF127	-11.47	0.00	11.47	-44.25	-41.30	2.95
		SP1	BPRF4	-1.64	0.00	1.64	-43.28	-41.30	1.98
			BPRF127	-4.61	0.00	4.61	-43.47	-41.30	2.17
			HPRF127	-13.19	0.00	13.19	-44.52	-41.30	3.22
		SP3	BPRF4	-12.70	0.00	12.70	-43.02	-41.30	1.72
			BPRF127	-12.90	0.00	12.90	-42.86	-41.30	1.56
			HPRF127	-16.47	0.00	16.47	-44.42	-41.30	3.12
Ant2 LDS	CH9	SP0	BPRF4	-1.82	0.00	1.82	-44.68	-41.30	3.38
			BPRF127	-3.95	0.00	3.95	-43.85	-41.30	2.55
			HPRF127	-11.76	0.00	11.76	-44.36	-41.30	3.06
		SP1	BPRF4	-2.00	0.00	2.00	-42.89	-41.30	1.59
			BPRF127	-5.40	0.00	5.40	-43.54	-41.30	2.24
			HPRF127	-12.46	0.00	12.46	-43.95	-41.30	2.65
		SP3	BPRF4	-12.54	0.00	12.54	-42.86	-41.30	1.56
			BPRF127	-12.36	0.00	12.36	-42.90	-41.30	1.60
			HPRF127	-14.05	0.00	14.05	-44.07	-41.30	2.77

MAXIMUM PEAK AND AVERAGE POWER PLOTS

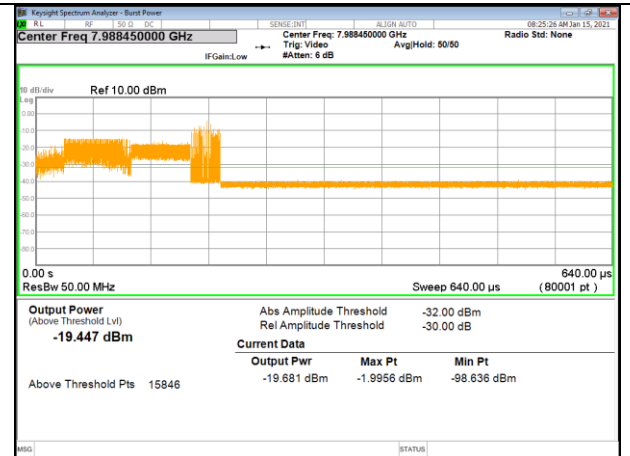
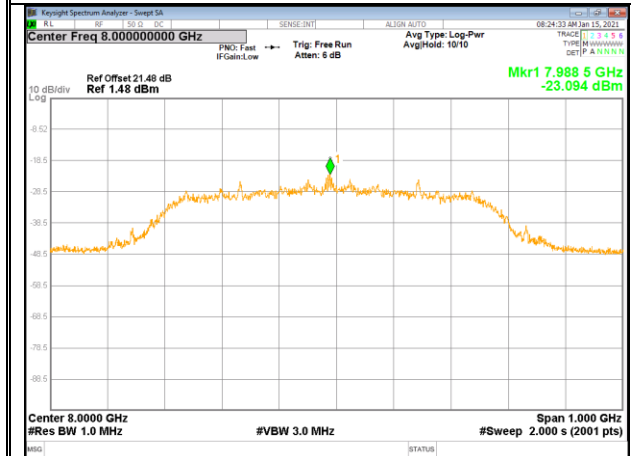
- PEAK POWER



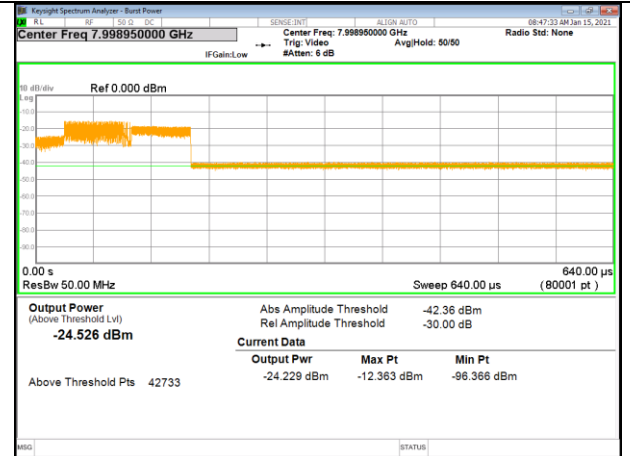
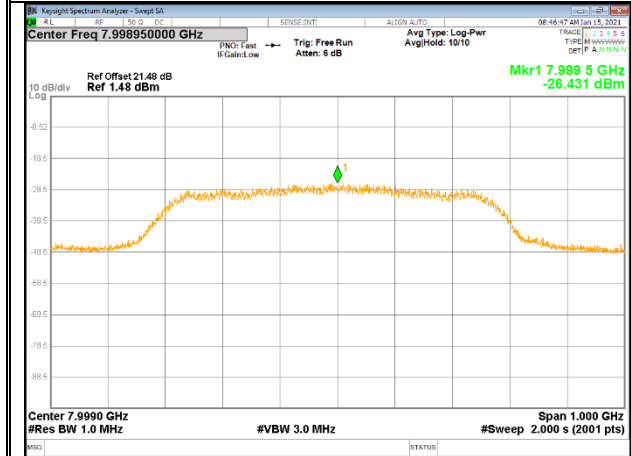
ANT2_CH9
 SP0 BPRF4



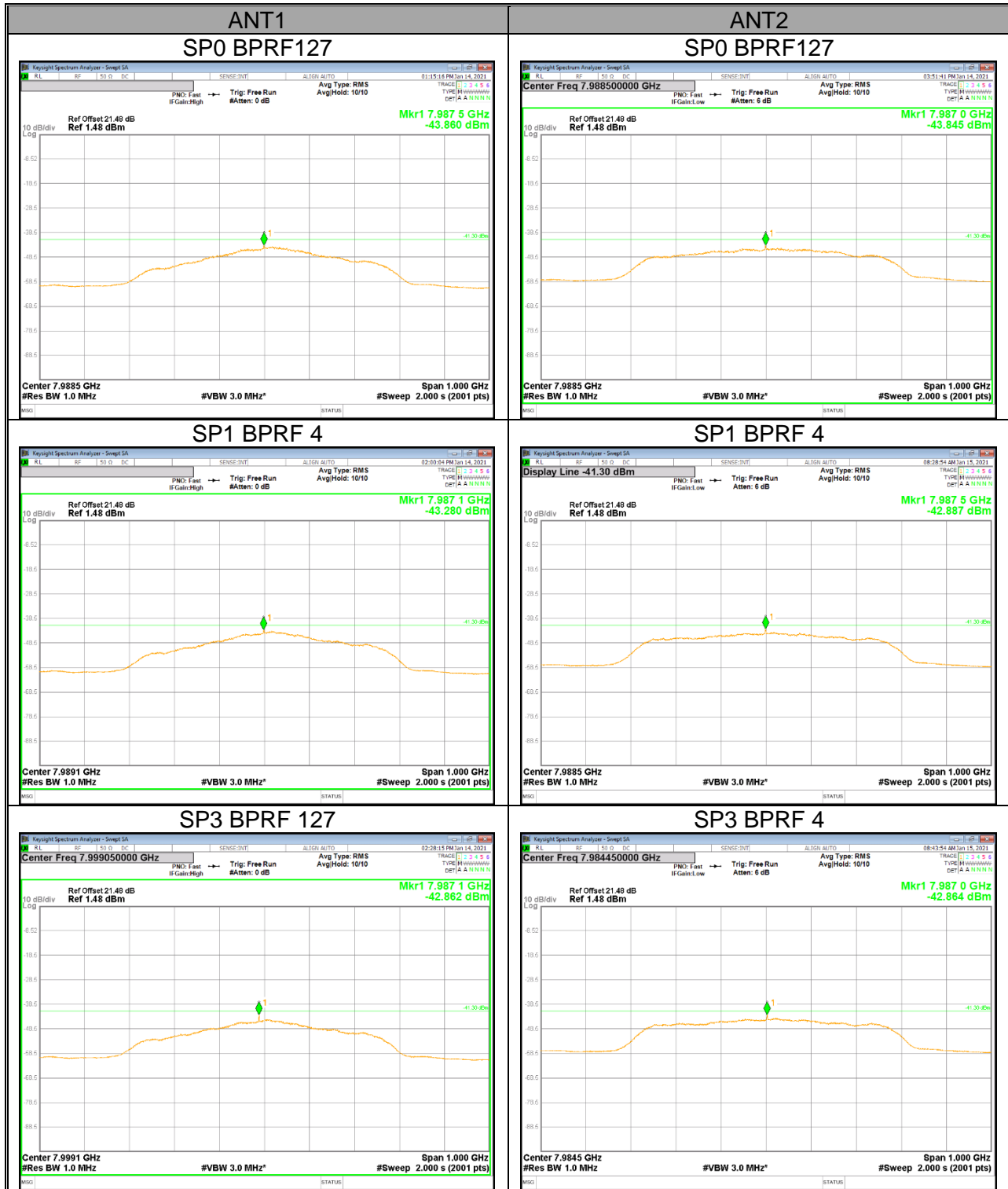
SP1 BPRF4



SP3 BPRF127



- AVERAGE POWER



9.3. CESSATION TIME

LIMITS

FCC §15.519(a)(1)

A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

TEST PROCEDURES

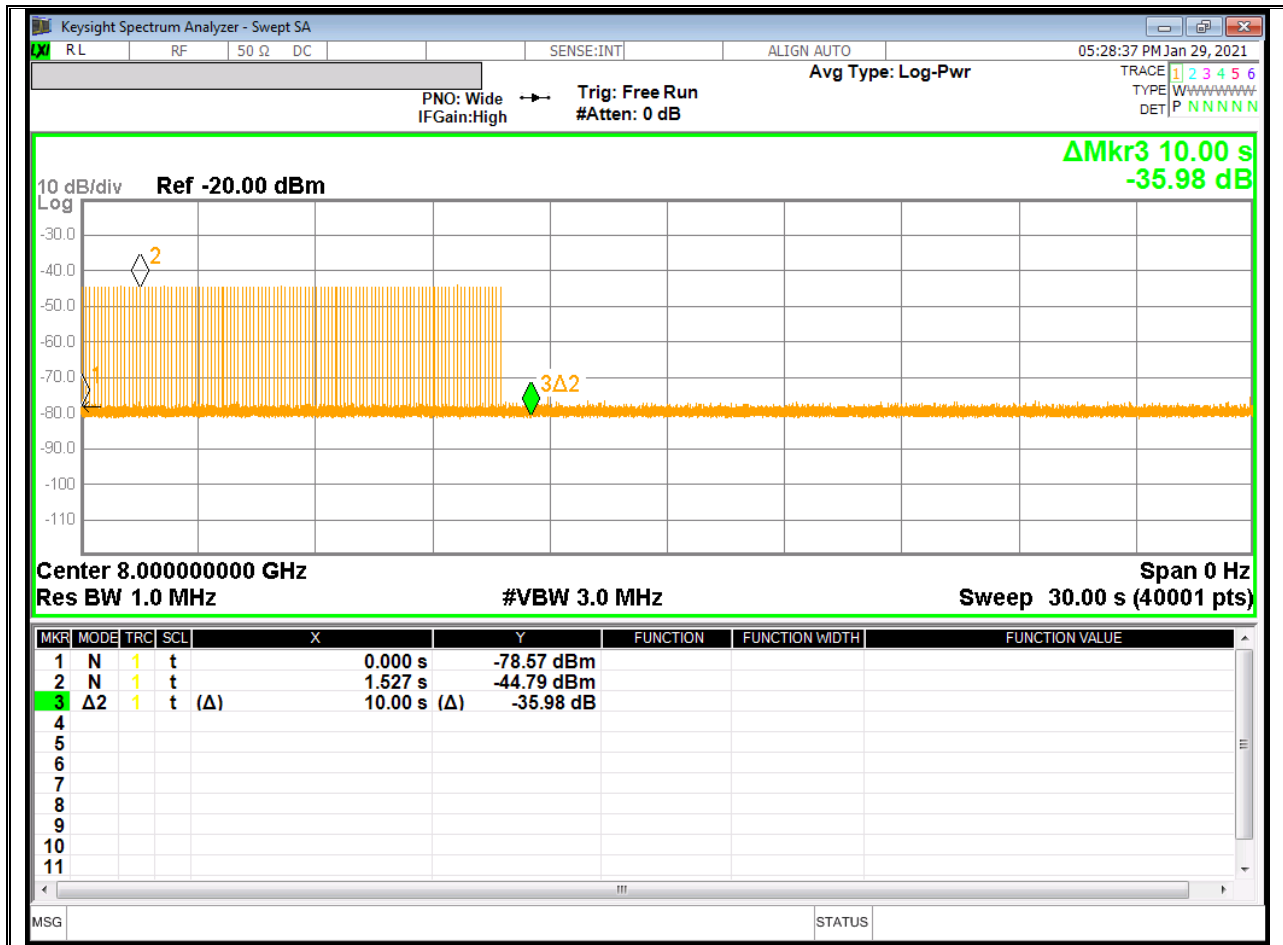
Transmissions are monitored for two cases:

1. The smart phone ends the UWB link.
2. The EUT ends the UWB link.

RESULTS

Please see the next page

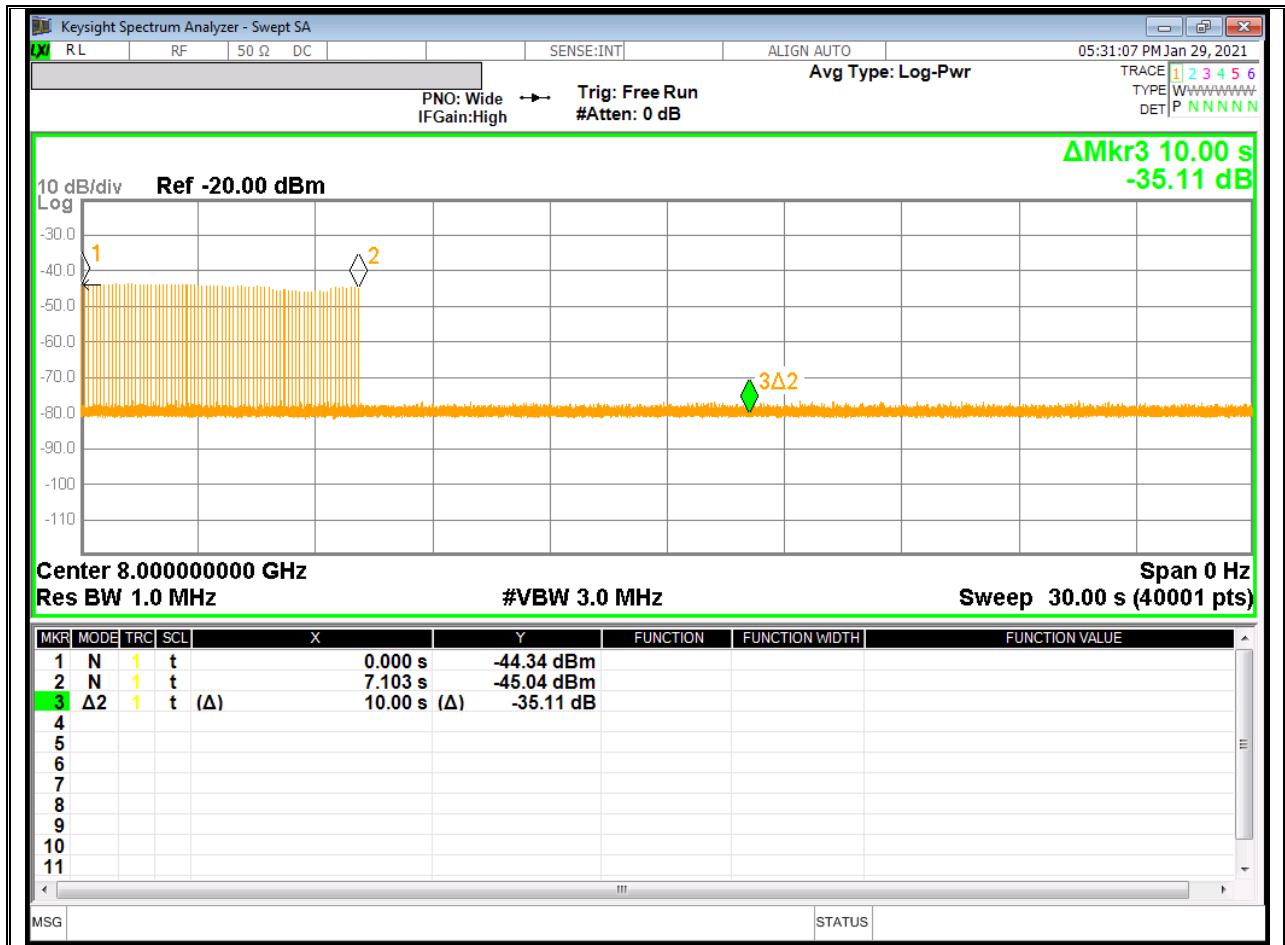
Case 1: Smart Phone ends the UWB link



Marker 1: EUT and smart phone are linked.
 Marker 2: Smart phone ends UWB link.
 Marker 3Δ2: “10s” after EUT ends UWB link.

EUT detects “Smart Phone ends UWB link” and ceases transmitting within 10 seconds.

Case 2: EUT ends the UWB link



- Marker 1: EUT and smart phone are linked.
- Marker 2: EUT ends UWB link.
- Marker 3Δ2: "10s" after EUT ends UWB link.

EUT ceases transmitting within 10 seconds.

10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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.

FCC Part 15.205 (a): Only spurious emissions are permitted in any of the frequency bands listed below :

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	162.0125 ~	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	167.17	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	167.72 ~ 173.2	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	240 ~ 285	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	322 ~ 335.4	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	399.90 ~ 410	3345.8 ~ 3358		
		608 ~ 614	3600 ~ 4400		
		960 ~ 1240			

▪ FCC Part 15.205(b) : The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

▪ FCC Part 15.519 (c): The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency range (MHz)	EIRP in dBm
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-10600	-41.3
Above 10600	-61.3

▪ FCC Part 15.519 (d): In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency range (MHz)	EIRP in dBm
1164-1240	-85.3
1559-1610	-85.3

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for above 1GHz. The antenna to EUT distance is 0.5 or 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz (120kHz for emissions in the GPS), then the video bandwidth is set to 3 MHz (500kHz for emissions in the GPS)

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Note : Emission was pre-scanned from 9kHz to 30MHz; No emissions were detected which was at least 20dB below the specification limit (consider distance correction factor).
Per FCC part 15.31(o), test results were not reported.

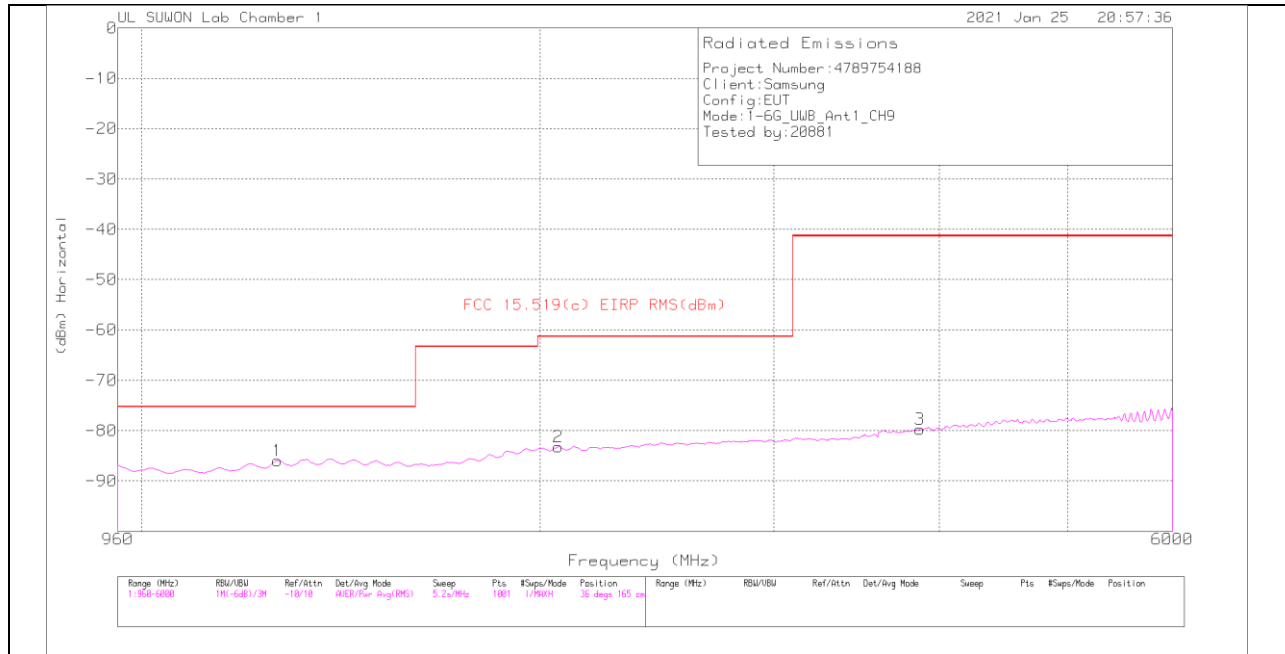
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field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

10.2. TRANSMITTER ABOVE 1 GHz

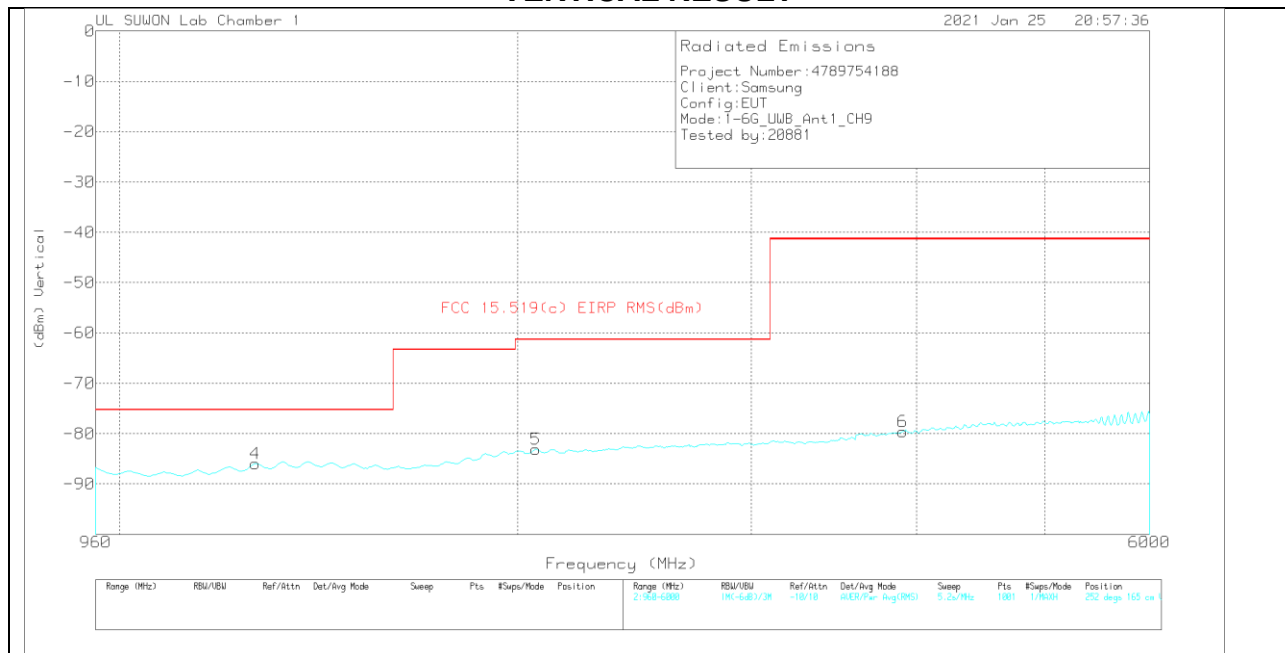
10.2.1. SPURIOUS EMISSION 1 GHz – 6 GHz TX Antenna 1 Patch

CHANNEL, CH 9

HORIZONTAL RESULT



VERTICAL RESULT



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

Trace Markers

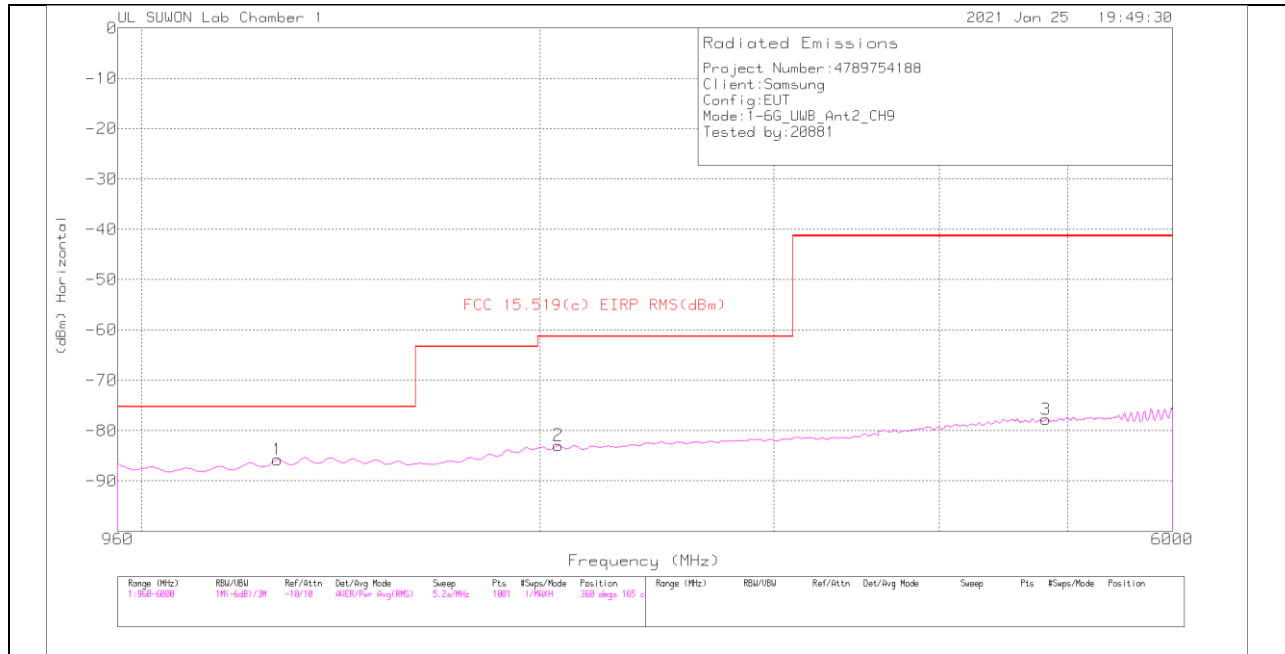
Marker	Frequency (MHz)	Meter Reading (dBm)	Det	3117_00168717	0.96-18GHz[dB]	Dist. Corr. (dB)	Conv. Fact. (dB)	UWB_CH9_LPF[dB]	Corrected Reading (dBm)	FCC 15.119(c) EIRP RMS(dBm)	Margin (dB)	Azimuth (Degrs)	Height (cm)	Polarity
1	1267.44	-74.97	RMS	29.2	-36.6	-15.6	11.8	.2	-85.97	-75.3	-10.67	216	165	H
2	2063.76	-76.28	RMS	31.6	-34.9	-15.6	11.8	.2	-83.18	-61.3	-21.88	252	165	H
3	3868.08	-77.4	RMS	33.3	-32.2	-15.6	11.8	.4	-79.7	-41.3	-38.4	360	165	H
4	1267.44	-75.01	RMS	29.2	-36.6	-15.6	11.8	.2	-86.01	-75.3	-10.71	216	165	V
5	2063.76	-76.22	RMS	31.6	-34.9	-15.6	11.8	.2	-83.12	-61.3	-21.82	288	165	V
6	3908.4	-77.47	RMS	33.4	-32.1	-15.6	11.8	.4	-79.57	-41.3	-38.27	324	165	V

RMS - RMS detection

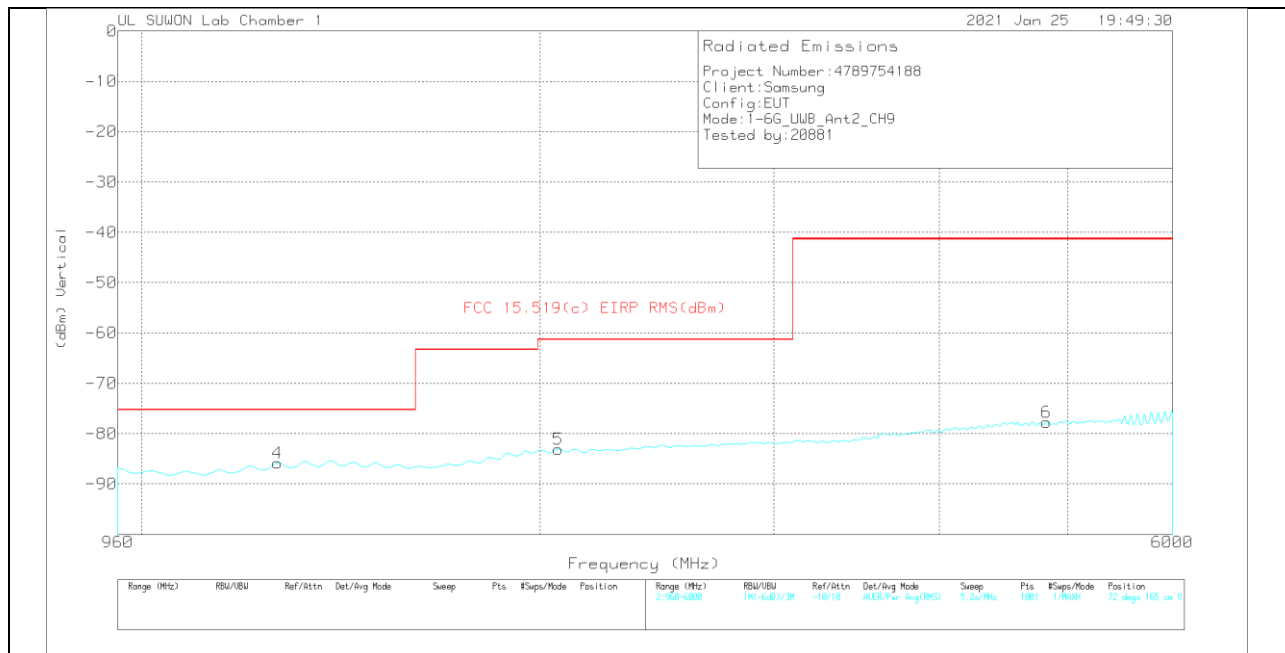
TX Antenna 2 LDS

CHANNEL, CH 9

HORIZONTAL RESULT



VERTICAL RESULT



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

Trace Markers

Marker	Frequency (MHz)	Meas. Reading (dBm)	Det	3117_00168717	0.96-18GHz[dB]	Dist. Corr. (dB)	Conv. Fact. (dB)	UWB_CH9_LPF[dB]	Corrected Reading (dBm)	FCC 15.119(c) ERP RMS(dBm)	Margin (dB)	Azimuth (Degs)	Height (m)	Polarity
1	1267.44	-74.77	RMS	29.2	-36.6	-15.6	11.8	.2	-85.77	-75.3	-10.47	324	165	H
2	2063.76	-76.01	RMS	31.6	-34.9	-15.6	11.8	.2	-82.91	-61.3	-21.61	216	165	H
3	4815.6	-77.11	RMS	34.1	-31.3	-15.6	11.8	.4	-77.71	-41.3	-36.41	324	165	H
4	1267.44	-74.78	RMS	29.2	-36.6	-15.6	11.8	.2	-85.78	-75.3	-10.48	0	165	V
5	2063.76	-76.14	RMS	31.6	-34.9	-15.6	11.8	.2	-83.04	-61.3	-21.74	324	165	V
6	4820.64	-77.12	RMS	34.1	-31.3	-15.6	11.8	.4	-77.72	-41.3	-36.42	108	165	V

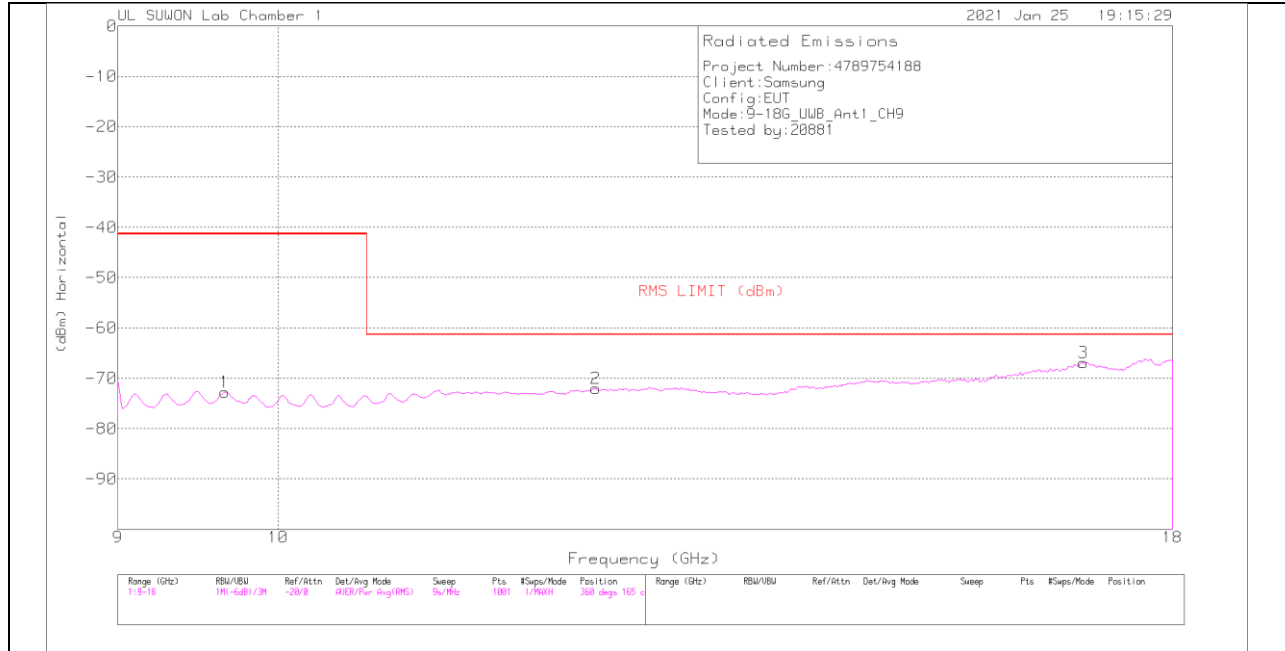
RMS - RMS detection

10.2.2. SPURIOUS EMISSION 9 GHz – 18 GHz

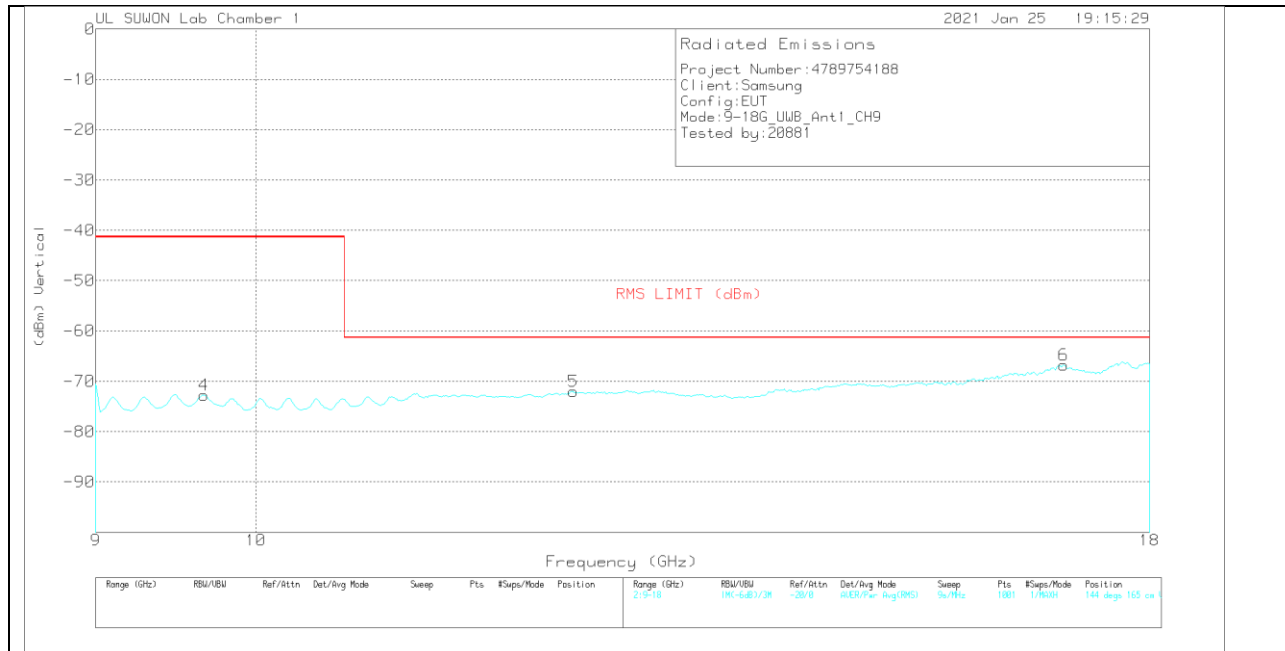
TX Antenna 1_Patch

CHANNEL, CH 9

HORIZONTAL RESULT



VERTICAL RESULT



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

Trace Markers

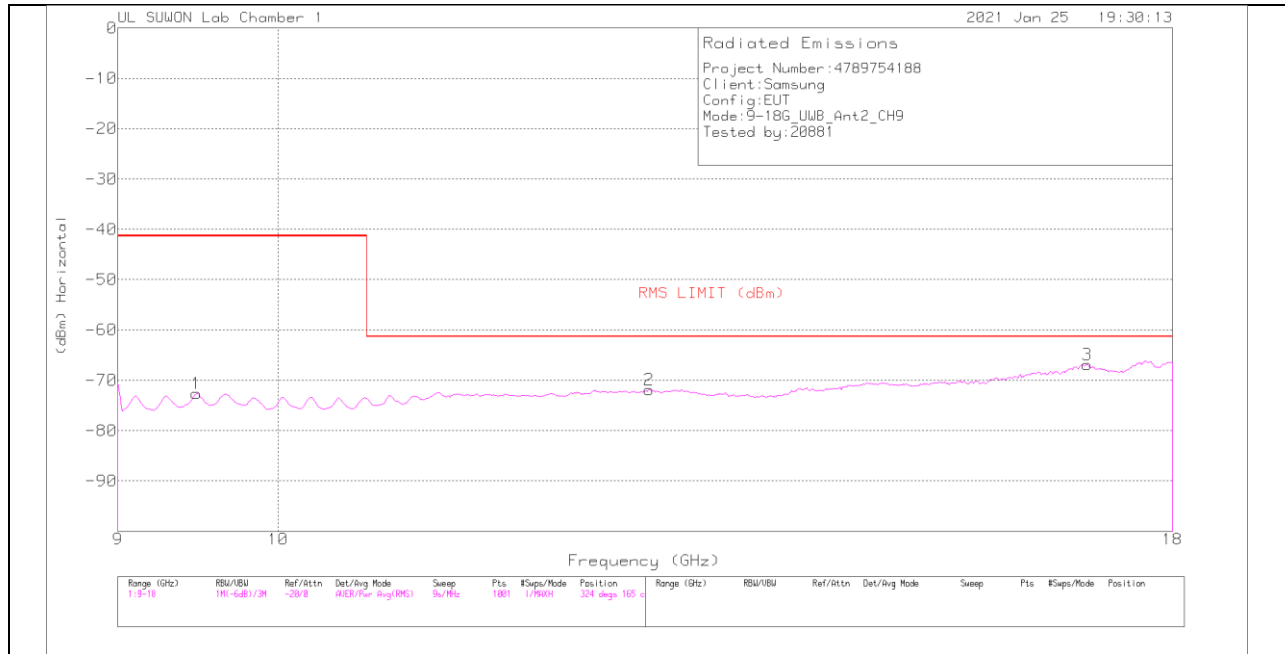
Marker	Frequency (GHz)	Meter Reading (dBm)	Det	3117_00168717	0.9618GHz(dB)	Dist. Cor. (dB)	Conv. Fact. (dB)	UWB_Ch9_HPF(dB)	Corrected Reading (dBm)	RMS LIMIT (dBm)	Margin (dB)	Azimuth (Degs)	Height (m)	Polarity
1	9.857	-84.32	RMS	37.2	-23.6	-15.6	11.8	1.8	-72.72	-41.3	-31.42	108	165	H
2	12.321	-85.36	RMS	38.9	-21.9	-15.6	11.8	2	-71.96	-61.3	-10.66	360	165	H
3	16.974	-87.05	RMS	41.7	-17.9	-15.6	11.8	2	-66.85	-61.3	-5.55	144	165	H
4	9.666	-84.45	RMS	37.3	-23.6	-15.6	11.8	1.8	-72.75	-41.3	-31.45	216	165	V
5	12.321	-85.39	RMS	38.9	-21.9	-15.6	11.8	2	-71.99	-61.3	-10.69	180	165	V
6	17.01	-86.92	RMS	41.6	-17.9	-15.6	11.8	2	-66.82	-61.3	-5.52	288	165	V

RMS - RMS detection

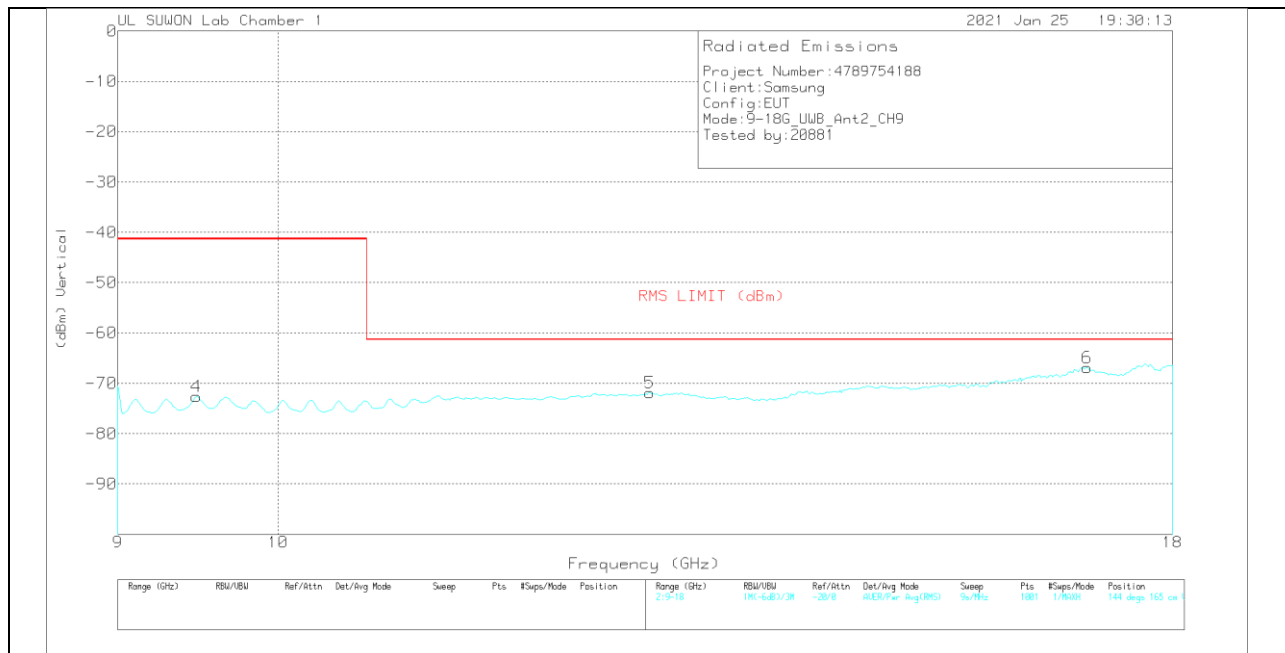
TX Antenna 2 LDS

CHANNEL, CH 9

HORIZONTAL RESULT



VERTICAL RESULT



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

Trace Markers

Marker	Frequency (GHz)	Meas. Reading (dBm)	Det	3117_00168717	0.96-18GHz[dB]	Dist. Corr. (dB)	Conv. Fact. (dB)	UWB_CH9_HPF[dB]	Corrected Reading (dBm)	RMS LIMIT (dBm)	Margin (dB)	Azimuth (Degs)	Height (m)	Polarity
1	9.477	-83.81	RMS	36.9	-23.7	-15.6	11.8	1.8	-72.61	-41.3	-31.31	286	165	H
2	12.762	-85.07	RMS	39	-22.2	-15.6	11.8	.2	-71.87	-61.3	-10.57	180	165	H
3	17.019	-86.95	RMS	41.6	-17.9	-15.6	11.8	.2	-66.85	-61.3	-5.55	180	165	H
4	9.477	-83.84	RMS	36.9	-23.7	-15.6	11.8	1.8	-72.64	-41.3	-31.34	180	165	V
5	12.7665	-85.03	RMS	39	-22.3	-15.6	11.8	.2	-71.93	-61.3	-10.63	144	165	V
6	17.019	-86.99	RMS	41.6	-17.9	-15.6	11.8	.2	-66.89	-61.3	-5.59	144	165	V

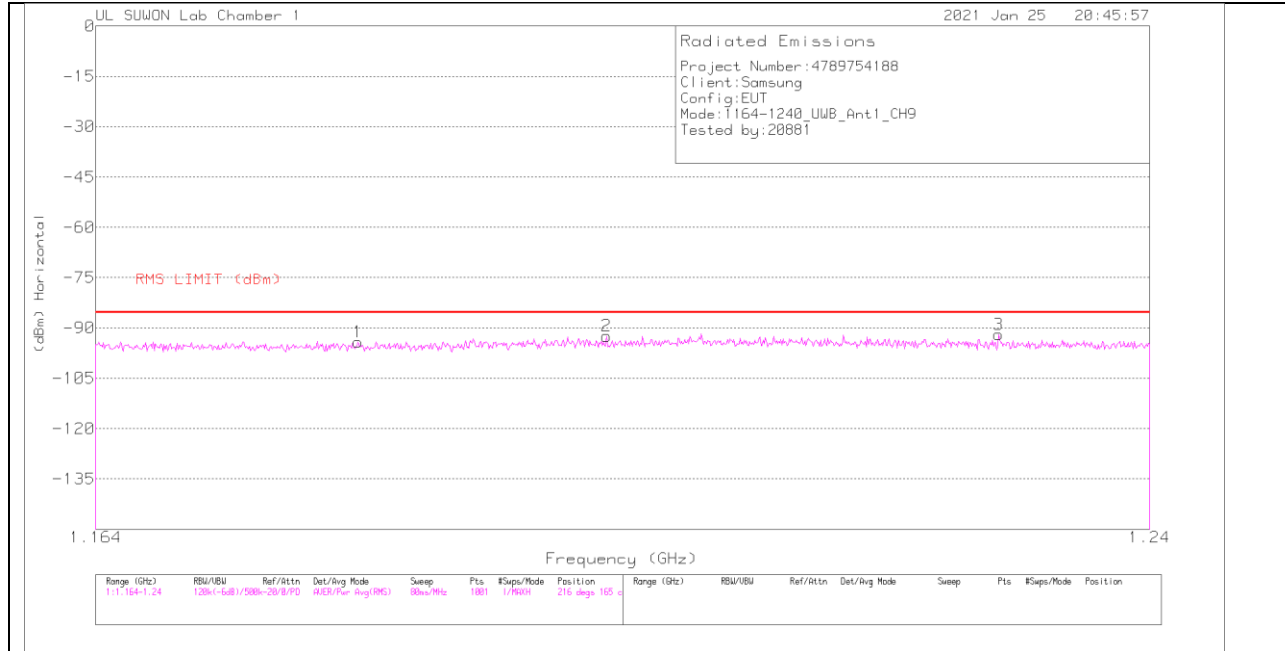
RMS - RMS detection

10.2.3. SPURIOUS EMISSION 1164 MHz – 1240 MHz

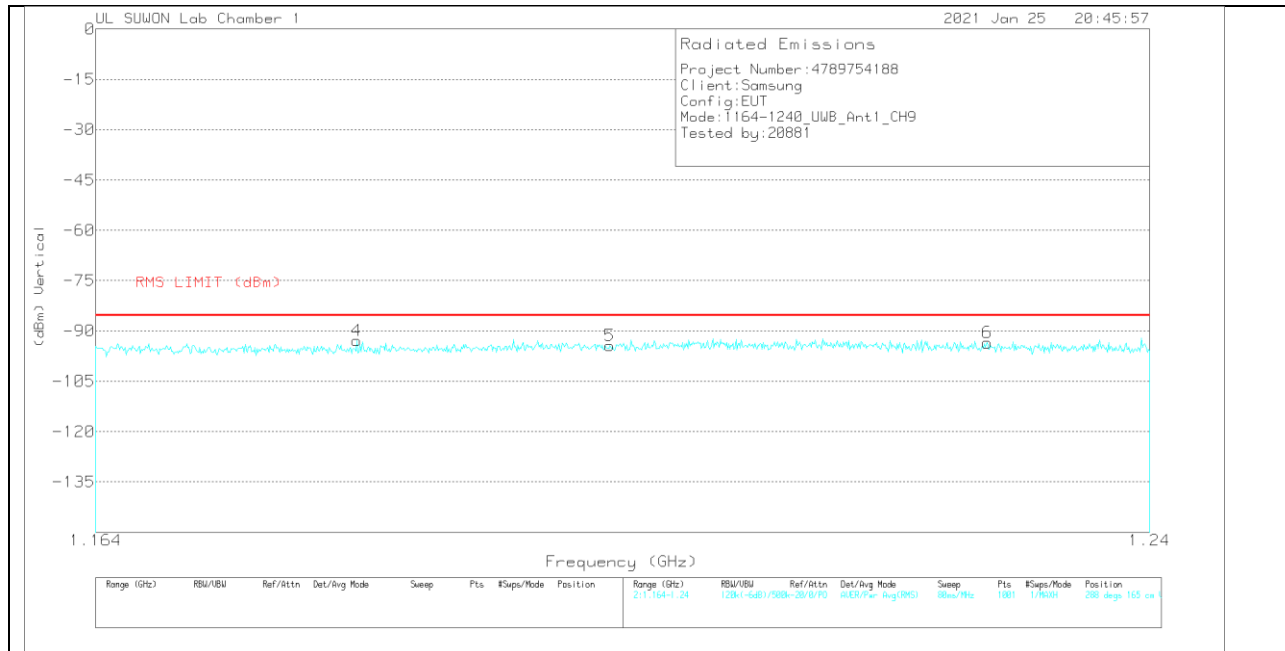
TX Antenna 1_Patch

CHANNEL, CH 9

HORIZONTAL RESULT



VERTICAL RESULT



Trace Markers

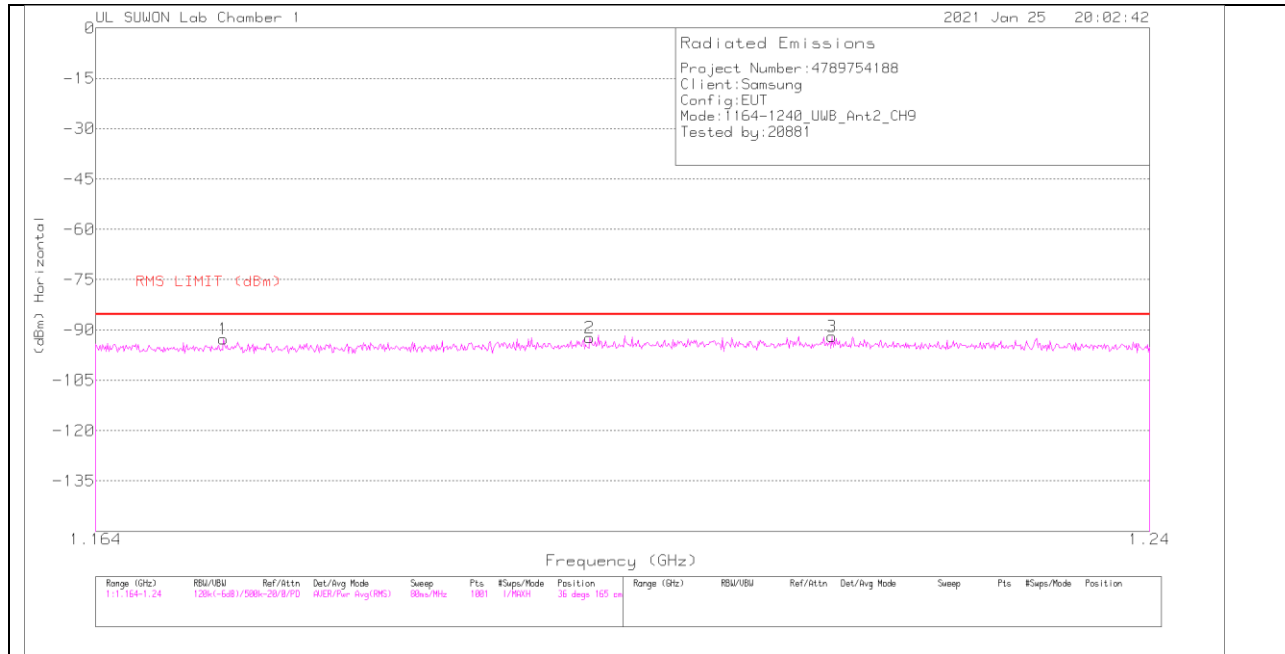
Marker	Frequency (GHz)	Meas Reading (dBm)	Det	3117_00168717	0.9618GHz[μdB]	Dist. Corr. (dB)	Conv. Fact. (dB)	UWB_CH9_LPF[dB]	Corrected Reading (dBm)	RMS LIMIT (dBm)	Margin (dB)	Azimuth (Degs)	Height (m)	Polarity
1	1.18247	-82.1	RMS	28.3	-36.8	-15.6	11.8	2	-94.2	-85.3	-8.9	288	165	H
2	1.20025	-80.49	RMS	28.5	-36.8	-15.6	11.8	2	-92.39	-85.3	-7.09	252	165	H
3	1.22883	-80.38	RMS	28.8	-36.7	-15.6	11.8	2	-91.88	-85.3	-6.58	72	165	H
4	1.18239	-80.74	RMS	28.3	-36.8	-15.6	11.8	2	-92.84	-85.3	-7.54	180	165	V
5	1.20048	-82.43	RMS	28.5	-36.8	-15.6	11.8	2	-94.33	-85.3	-9.03	72	165	V
6	1.22799	-82.01	RMS	28.8	-36.7	-15.6	11.8	2	-93.51	-85.3	-8.21	288	165	V

RMS - RMS detection

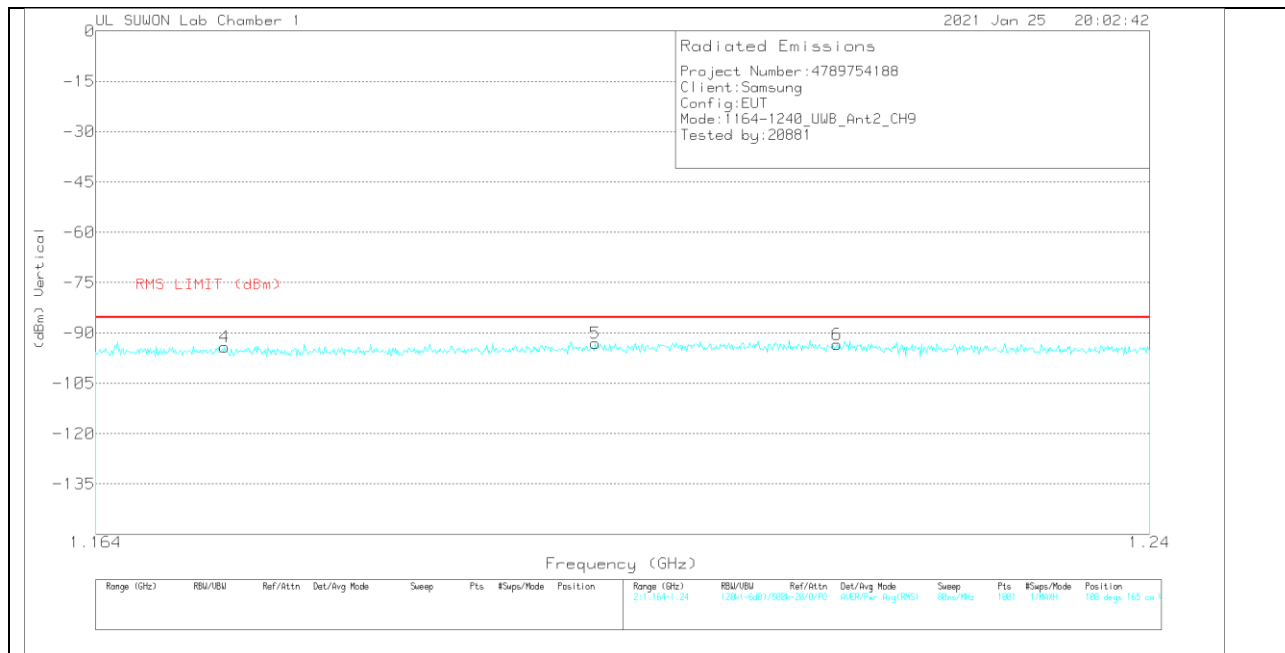
TX Antenna 2 LDS

CHANNEL, CH 9

HORIZONTAL RESULT



VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meas. Reading (dBm)	Det	3117_00168717	0.96-18GHz[μdB]	Dist. Corr. (dB)	Conv. Fact. (dB)	UWB_CH9_LPF[dB]	Corrected Reading (dBm)	RMS LIMIT (dBm)	Margin (dB)	Azimuth (Degs)	Height (m)	Polarity
1	1.17297	-80.52	RMS	28.2	-36.8	-15.6	11.8	2	-92.72	-85.3	-7.42	144	165	H
2	1.19904	-80.44	RMS	28.5	-36.8	-15.6	11.8	2	-92.34	-85.3	-7.04	216	165	H
3	1.21659	-80.29	RMS	28.7	-36.8	-15.6	11.8	2	-91.99	-85.3	-6.69	180	165	H
4	1.17304	-81.9	RMS	28.2	-36.8	-15.6	11.8	2	-94.1	-85.3	-8.8	108	165	V
5	1.19942	-81.16	RMS	28.5	-36.8	-15.6	11.8	2	-93.06	-85.3	-7.76	36	165	V
6	1.21697	-81.75	RMS	28.7	-36.8	-15.6	11.8	2	-93.45	-85.3	-8.15	324	165	V

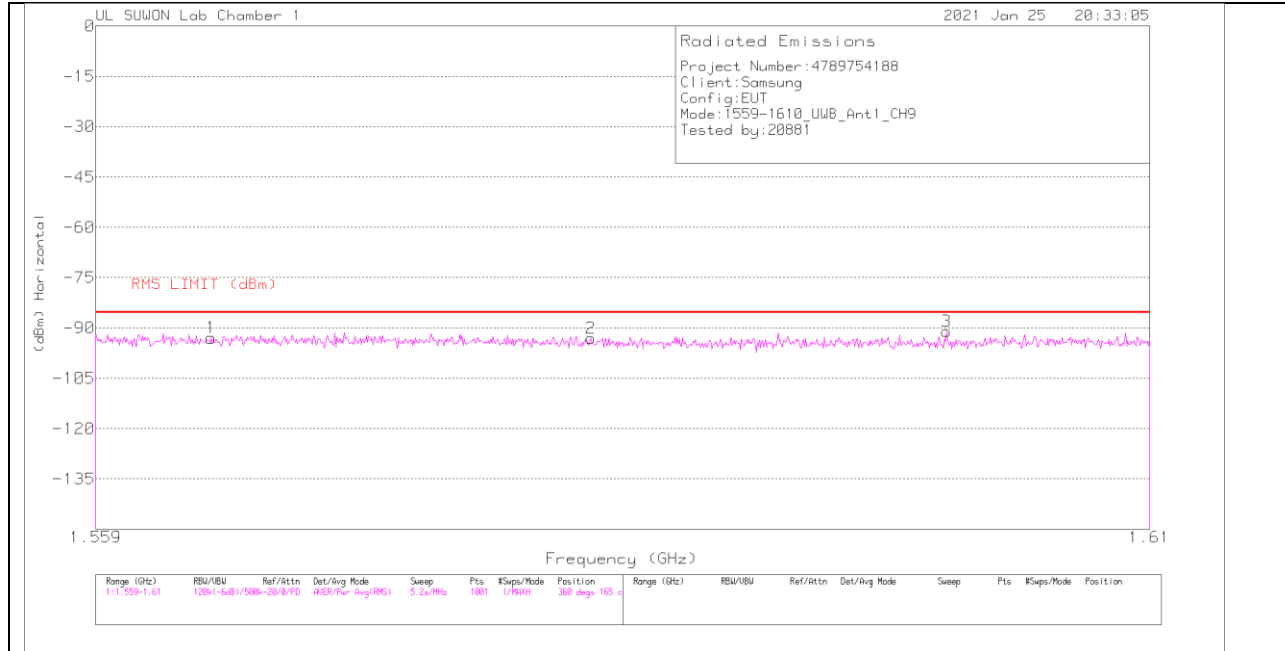
RMS - RMS detection

10.2.4. SPURIOUS EMISSION 1559 MHz – 1610 MHz

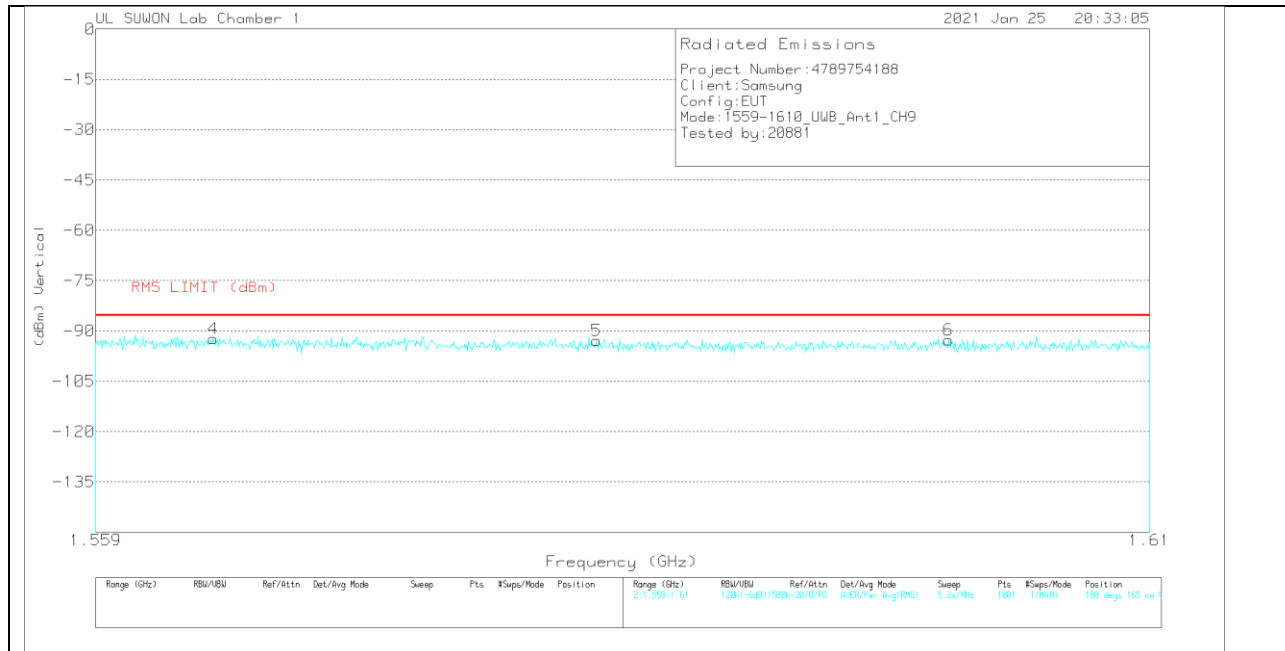
TX Antenna 1_Patch

CHANNEL, CH 9

HORIZONTAL RESULT



VERTICAL RESULT



Trace Markers

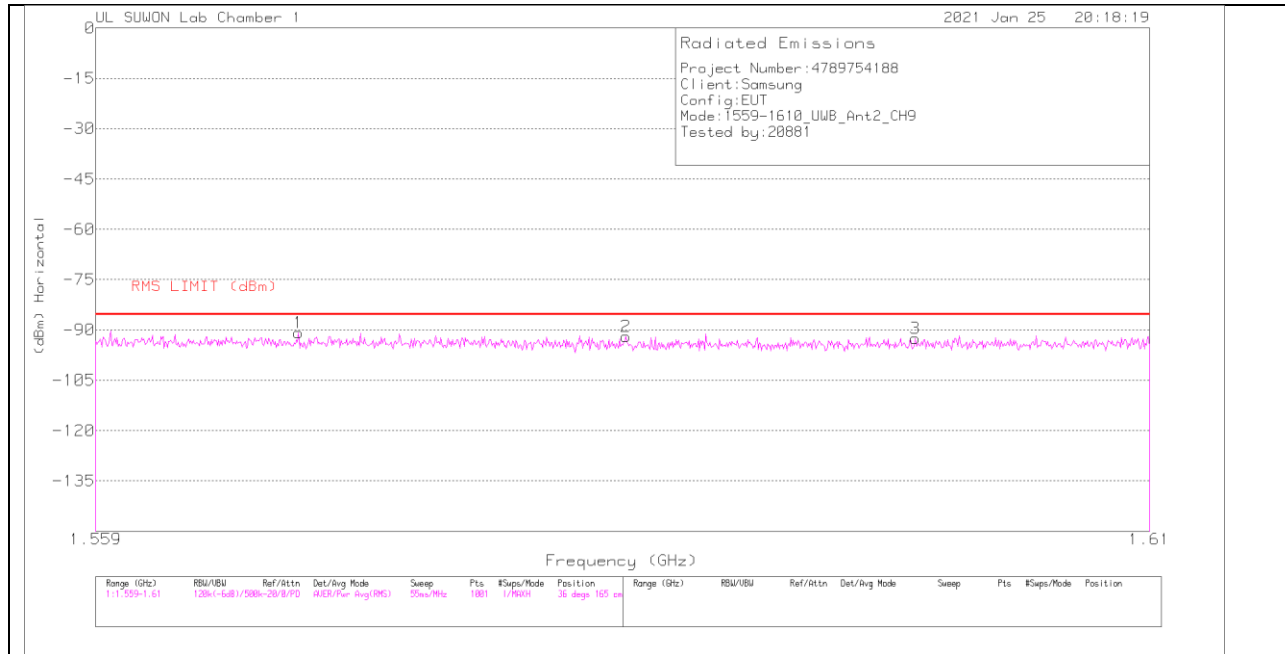
Marker	Frequency (GHz)	Meas Reading (dBm)	Det	3117_00168717	0.9618GHz[dB]	Dist. Corr. (dB)	Conv. Fact. (dB)	UWB_CH9_LPF[dB]	Corrected Reading (dBm)	RMS LIMIT (dBm)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity
1	1.56451	-82.05	RMS	28.5	-35.9	-15.6	11.8	.3	-82.95	-85.3	-7.65	72	165	H
2	1.58277	-82.15	RMS	28.5	-35.9	-15.6	11.8	.3	-83.05	-85.3	-7.75	36	165	H
3	1.60006	-80.07	RMS	28.4	-35.9	-15.6	11.8	.3	-81.07	-85.3	-5.77	72	165	H
4	1.56461	-81.38	RMS	28.5	-35.9	-15.6	11.8	.3	-82.28	-85.3	-6.98	72	165	V
5	1.58302	-81.99	RMS	28.5	-35.9	-15.6	11.8	.3	-82.89	-85.3	-7.59	180	165	V
6	1.60016	-81.74	RMS	28.4	-35.9	-15.6	11.8	.3	-82.74	-85.3	-7.44	180	165	V

RMS - RMS detection

TX Antenna 2 LDS

CHANNEL, CH 9

HORIZONTAL RESULT



VERTICAL RESULT



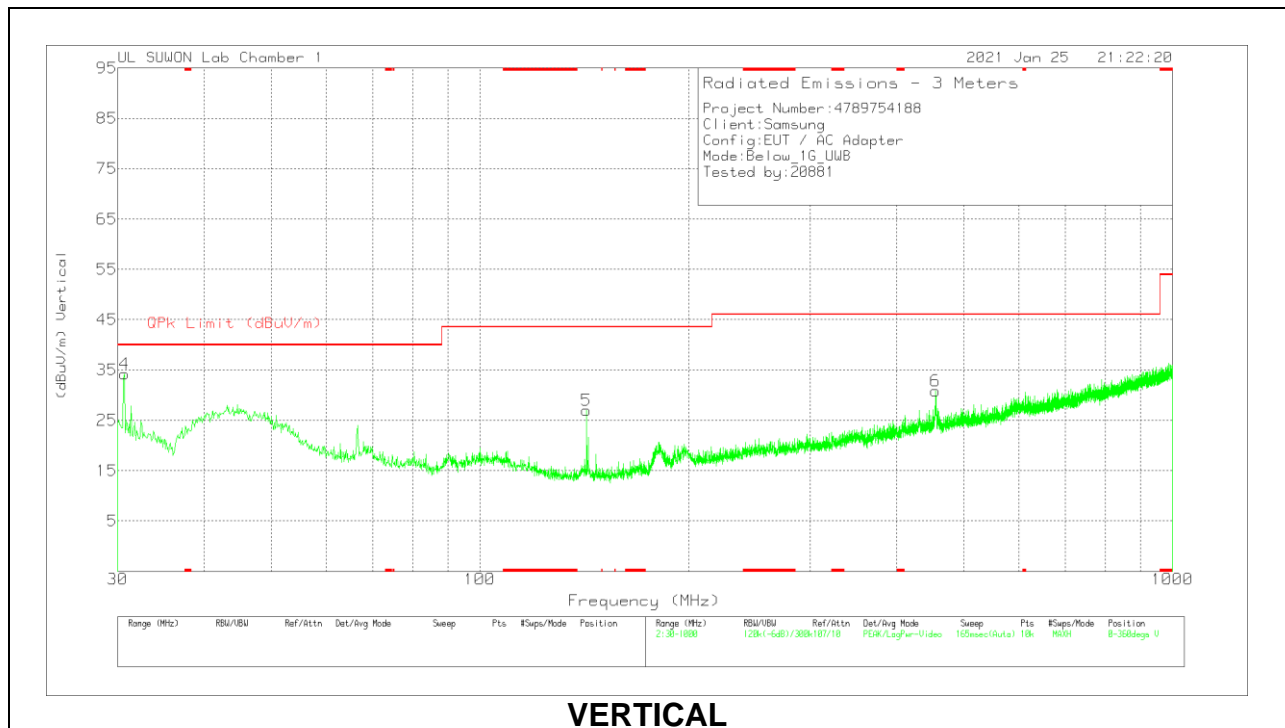
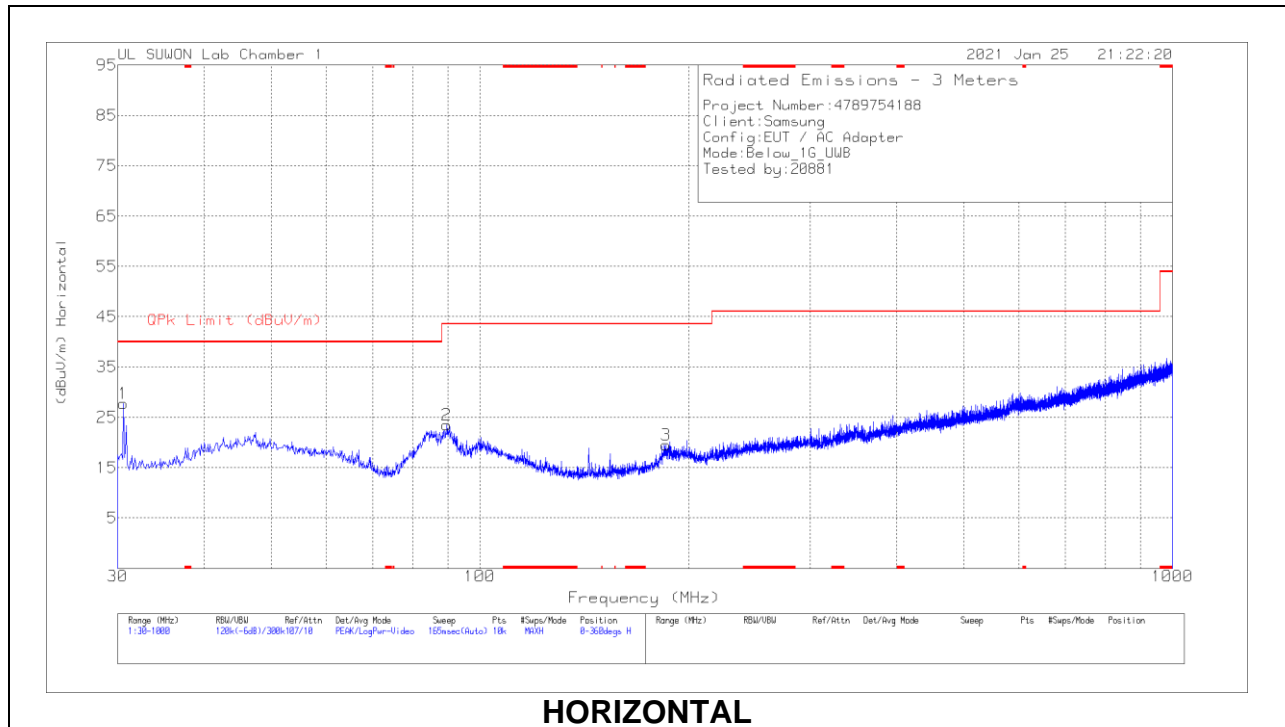
Trace Markers

Marker	Frequency (GHz)	Meas. Reading (dBm)	Det	3117_00168717	0.9618GHz[μdB]	Dist. Corr. (dB)	Conv. Fact. (dB)	UWB_CH9_LPF[dB]	Corrected Reading (dBm)	RMS LIMIT (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.56869	-79.87	RMS	28.5	-35.9	-15.6	11.8	.3	-90.77	-85.3	-5.47	36	165	H
2	1.58445	-81.04	RMS	28.5	-35.9	-15.6	11.8	.3	-91.94	-85.3	-6.64	288	165	H
3	1.59853	-81.54	RMS	28.4	-35.9	-15.6	11.8	.3	-92.54	-85.3	-7.24	36	165	H
4	1.56854	-81.77	RMS	28.5	-35.9	-15.6	11.8	.3	-92.67	-85.3	-7.37	0	165	V
5	1.58445	-81.71	RMS	28.5	-35.9	-15.6	11.8	.3	-92.61	-85.3	-7.31	180	165	V
6	1.59837	-80.72	RMS	28.4	-35.9	-15.6	11.8	.3	-91.72	-85.3	-6.42	0	165	V

RMS - RMS detection

10.3. WORST CASE BELOW 1 GHZ

SPURIOUS EMISSIONS 30 TO 1000 MHz



Below 1GHz 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	30.582	42.7	Pk	15.8	-30.8	27.7	40	-12.3	0-360	300	H
2	89.558	37.68	Pk	15.7	-29.9	23.48	43.52	-20.04	0-360	200	H
3	185.588	32.11	Pk	16	-28.6	19.51	43.52	-24.01	0-360	100	H
4	30.679	49.4	Pk	15.8	-31	34.2	40	-5.8	0-360	100	V
5	142.52	42.28	Pk	13.8	-29.1	26.98	43.52	-16.54	0-360	100	V
6	455.248	35.39	Pk	22.2	-26.7	30.89	46.02	-15.13	0-360	100	V

Pk - Peak detector

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

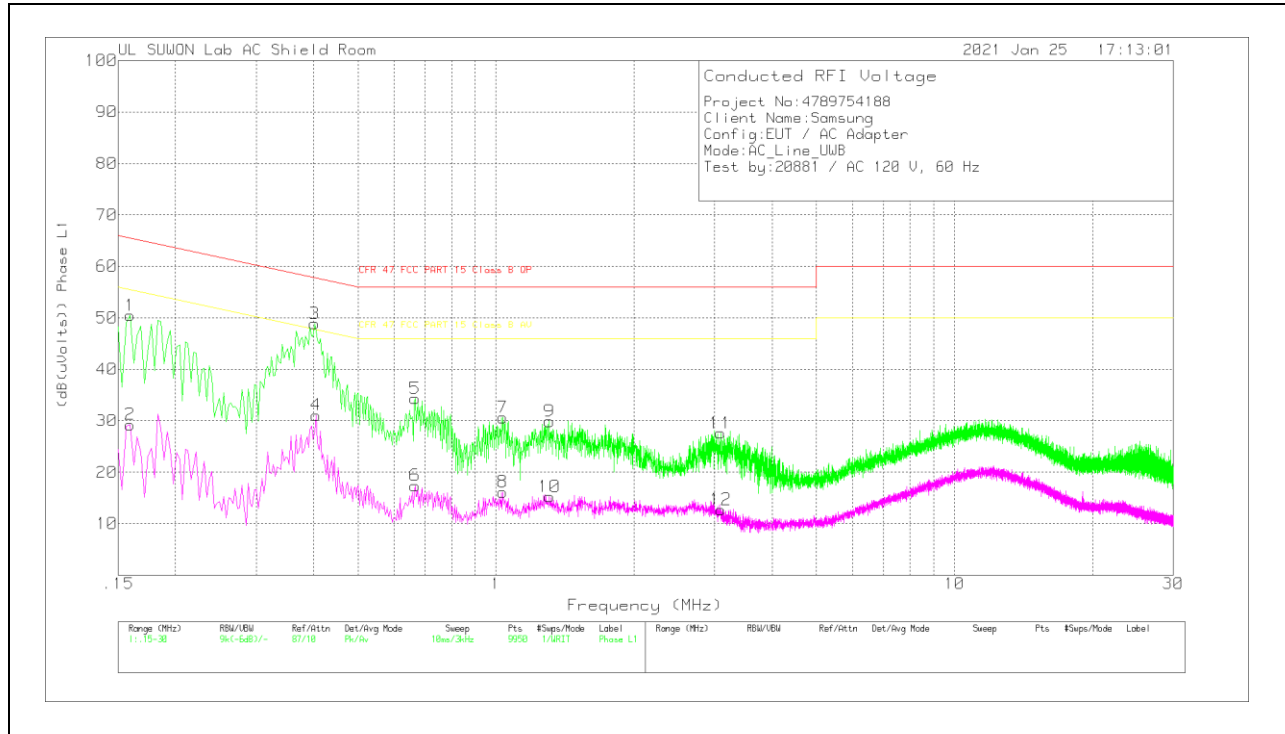
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

RESULTS

11.1.1. AC Power Line

LINE 1 RESULTS



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	.159	40.44	Pk	9.9	.1	50.44	65.52	-15.08	-	-
2	.159	19.25	Av	9.9	.1	29.25	-	-	55.52	-26.27
3	.402	38.77	Pk	9.9	.2	48.87	57.81	-8.94	-	-
4	.405	20.99	Av	9.9	.2	31.09	-	-	47.75	-16.66
5	.666	24.2	Pk	9.9	.2	34.3	56	-21.7	-	-
6	.666	7.29	Av	9.9	.2	17.39	-	-	46	-28.61
7	1.035	20.53	Pk	9.8	.3	30.63	56	-25.37	-	-
8	1.035	6.05	Av	9.8	.3	16.15	-	-	46	-29.85
9	1.308	19.79	Pk	9.8	.3	29.89	56	-26.11	-	-
10	1.308	5.13	Av	9.8	.3	15.23	-	-	46	-30.77
11	3.087	17.5	Pk	9.8	.3	27.6	56	-28.4	-	-
12	3.09	2.61	Av	9.8	.3	12.71	-	-	46	-33.29

Pk - Peak detector

Av - Average detection

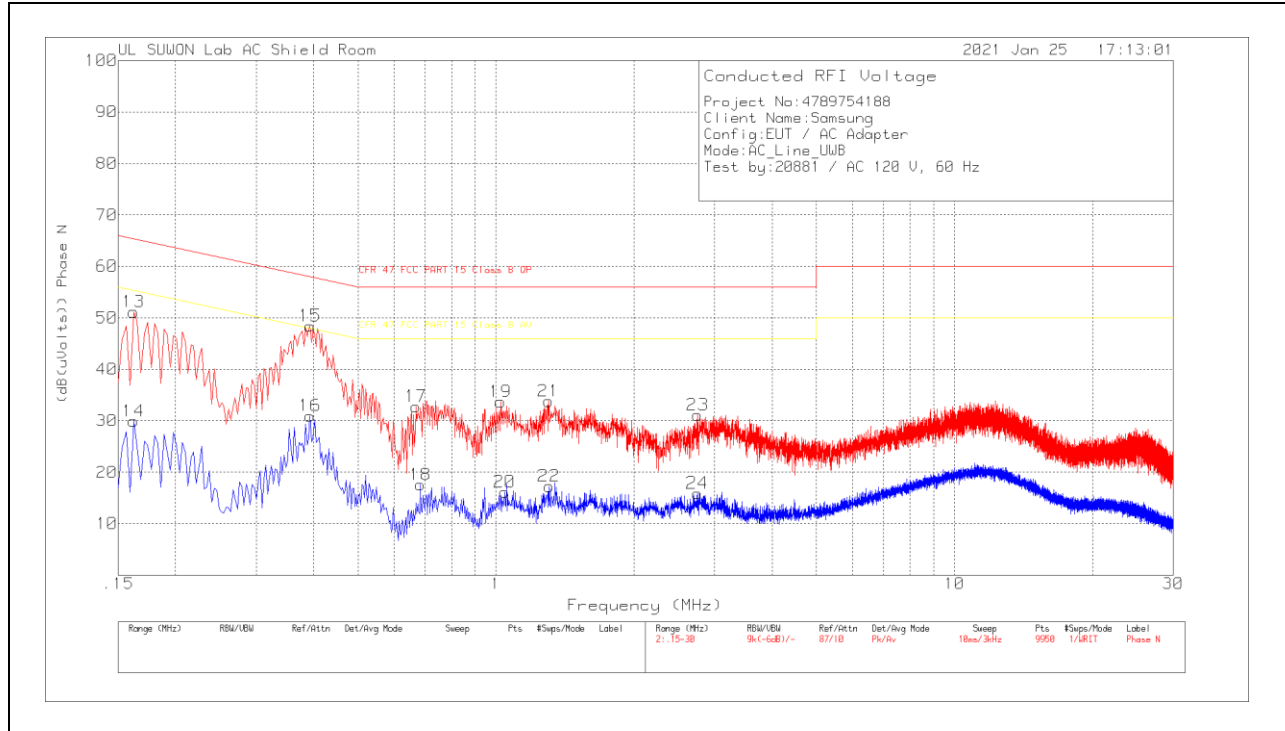
Quasi-Peak Emissions

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)
.40275	31.78	Qp	9.9	.2	41.88	57.8	-15.92	-	-

Qp - Quasi-Peak detector

LINE 2 RESULTS



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)
13	.162	41.05	Pk	10	.1	51.15	65.36	-14.21	-	-
14	.162	19.8	Av	10	.1	29.9	-	-	55.36	-25.46
15	.393	38.33	Pk	9.9	.2	48.43	58	-9.57	-	-
16	.393	20.87	Av	9.9	.2	30.97	-	-	48	-17.03
17	.669	22.69	Pk	9.9	.2	32.79	56	-23.21	-	-
18	.684	7.48	Av	9.9	.2	17.58	-	-	46	-28.42
19	1.023	23.58	Pk	9.8	.3	33.68	56	-22.32	-	-
20	1.044	6.05	Av	9.8	.3	16.15	-	-	46	-29.85
21	1.302	23.71	Pk	9.8	.3	33.81	56	-22.19	-	-
22	1.305	7.18	Av	9.8	.3	17.28	-	-	46	-28.72
23	2.754	21.02	Pk	9.8	.3	31.12	56	-24.88	-	-
24	2.748	5.79	Av	9.8	.3	15.89	-	-	46	-30.11

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)
.39225	35.24	Qp	9.9	.2	45.34	58.02	-12.68	-	-

Qp - Quasi-Peak detector

END OF TEST REPORT