



CERTIFICATION TEST REPORT

Report Number. : 4789354110-E2V2

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

Model : SM-P610

FCC ID : A3LSMP610
IC : 649E-SMP610

EUT Description : DTS/UNII a/b/g/n/ac Tablet + BT/BLE and ANT+

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247 Issue 2
INDUSTRY CANADA RSS-GEN Issue 5

Date Of Issue:
March 23, 2020

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	03/19/20	Initial issue	SunGeun Lee
V2	03/23/20	Updated to address TCB's question	SunGeun Lee

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: DTS/UNII a/b/g/n/ac Tablet + BT/BLE and ANT+

MODEL: SM-P610

SERIAL NUMBER: R52N10VDTBB (CONDUCTED)
R52N10VEG2H (RADIATED);

DATE TESTED: MAR 09, 2020 – MAR 23, 2020;

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies
INDUSTRY CANADA RSS-247 Issue 2	Complies
INDUSTRY CANADA RSS-GEN Issue 5	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	IC Section	Test Description	Test Limit	Test Condition	Test Result
15.247 (a)(2)	RSS-247 5.2(a)	Occupied Band width (6dB)	>500KHz	Conducted	Pass
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass
15.247 (b)(3)	RSS-247 5.4(d)	TX conducted output power	<30dBm		Pass
15.247 (e)	RSS-247 5.2(b)	PSD	<8dBm		Pass
15.207 (a)	RSS-GEN Clause 7 & 8.9	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass
15.205, 15.209	RSS-GEN Clause 8.8	Radiated Spurious Emission	< 54dBuV/m(Av)	Radiated	Pass

3. TEST METHODOLOGY

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. IC RSS-GEN Issue 5
4. IC RSS-247 Issue 2
5. KDB 558074 D01 DTS Meas Guidance v05r02.
6. ANSI C63.10-2013.

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	
☐	Chamber 1
☐	Chamber 2
☒	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/wp-content/uploads/2017/05/TL-637.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:

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

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	2.35 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.49 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.82 dB
Radiated Disturbance, 18 GHz to 40 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 DTS/UNII a/b/g/n/ac Tablet + BT/BLE and ANT+. This test report addresses the DTS (BLE) operational mode.

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum total conducted output power as follows:

Frequency Range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2 402 ~ 2 480	1Mbps	Peak	2.985	1.99
		Average	2.777	1.90
	2Mbps	Peak	2.951	1.97
		Average	2.546	1.80

6.3. 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 antenna, with a maximum gain of -6.00 dBi

6.4. 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.

Radiated emission above 1GHz was performed with the EUT set to transmit low/mid/high channels.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

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

Power verification

The Output Power of all data rate are all investigated, the 1 Mbps (37pkt) and 2 Mbps (37pkt) power is the worst case for symbol rate. All tests were performed in these two modes.

Symbol Rate [Ms/s]	Mode	Frequency [MHz]	Conducted Peak Power [dBm]	Symbol Rate [Ms/s]	Mode	Frequency [MHz]	Conducted Peak Power [dBm]
1	1Mbps (37 pkt)	2402	2.321	2	2Mbps (37 pkt)	2402	2.284
		2440	2.985			2440	2.951
		2480	1.351			2480	1.322
	1Mbps (255 pkt)	2402	2.269		2Mbps (255 pkt)	2402	2.266
		2440	2.938			2440	2.934
		2480	1.322			2480	1.310

6.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA50EWE	R37N19P1472HM3	N/A
Data Cable	SAMSUNG	EP-DR140AWE	N/A	N/A
Earphone	SAMSUNG	EHS64AVFWE	N/A	N/A

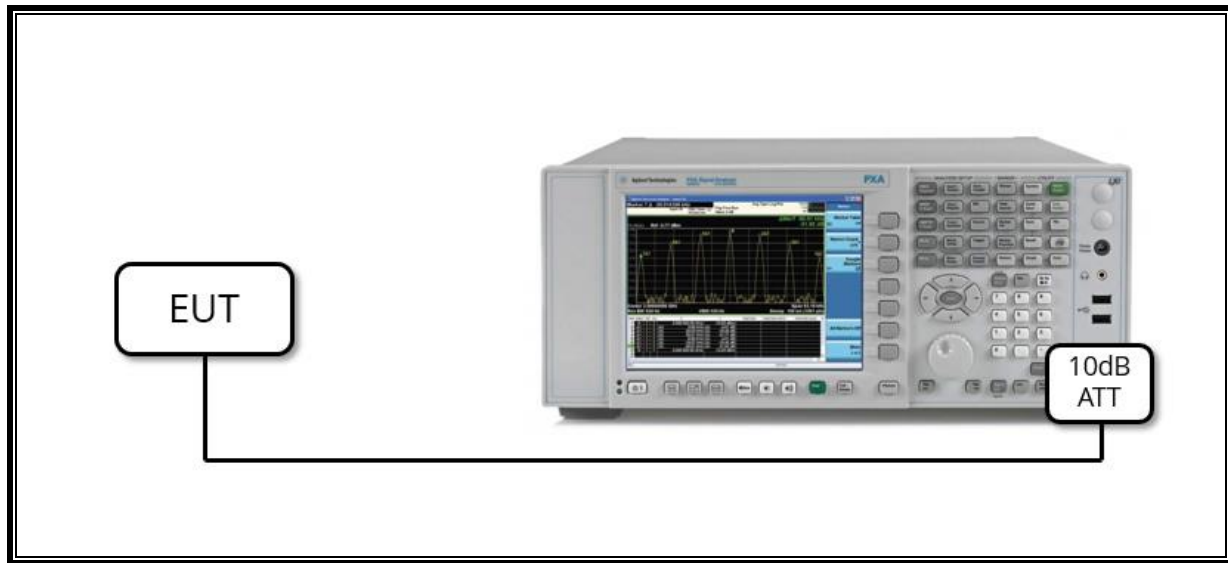
I/O CABLE

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	1.0m	N/A
2	Audio	2	Mini-Jack	Unshielded	1.2m	N/A

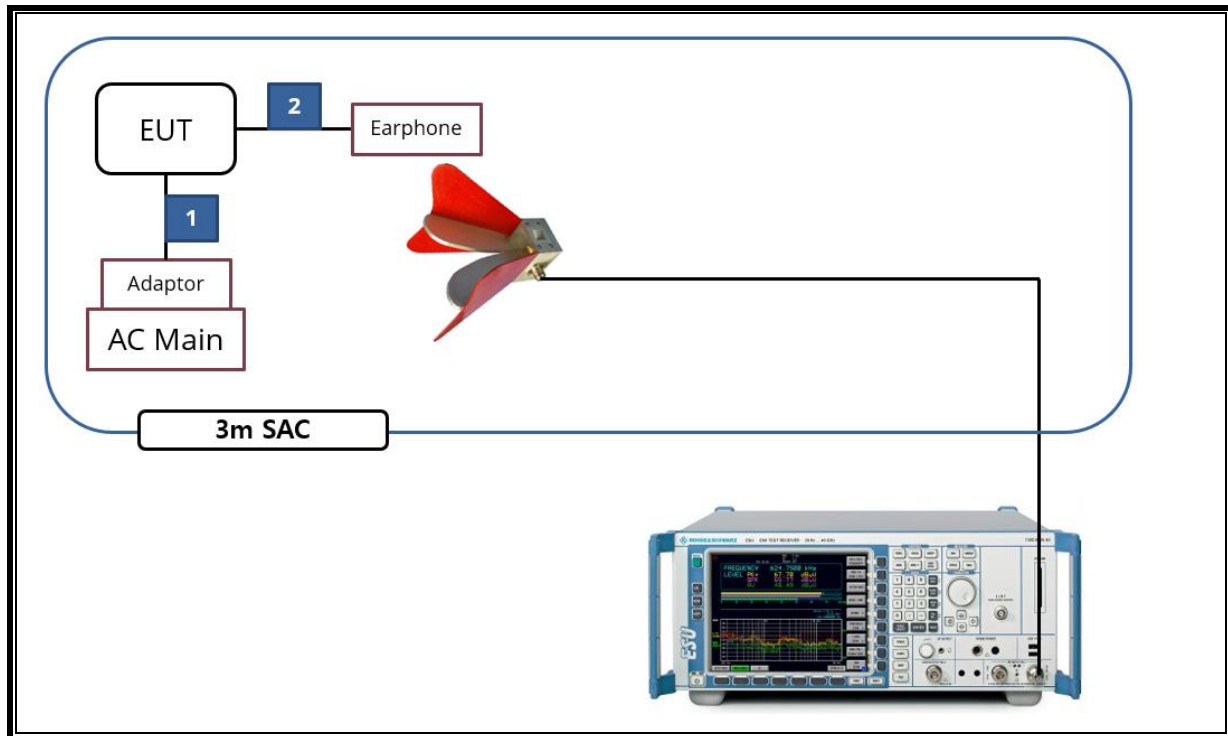
TEST SETUP

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

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



7. MEASUREMENT METHOD

6 dB BW : KDB 558074 D01 v05r02, Section 8.2.

OUTPUT POWER : KDB 558074 D01 v05r02, Section 8.3.1.1

POWER SPECTRAL DENSITY : KDB 558074 D01 v05r02, Section 8.4.

Out-of-band Emissions (Conducted) : KDB 558074 D01 v05r02, Section 8.5.

Out-of-band Emissions in Non-restricted Bands: KDB 558074 D01 v05r02, Section 8.5.

Out-of-band Emissions in Restricted Bands : KDB 558074 D01 v05r02, Section 8.6.

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	08-04-20
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	10-02-21
Preamplifier	ETS	3116C-PA	00168841	08-08-20
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-05-20
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-05-20
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-05-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-06-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-06-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-06-20
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-06-20
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-20
Spectrum Analyzer, 43.5 GHz	R&S	FSW43	104089	08-06-20
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-09-20
Attenuator	PASTERNAK	PE7087-10	A001	08-08-20
Attenuator	PASTERNAK	PE7087-10	A008	08-08-20
Attenuator	PASTERNAK	PE7004-10	2	08-06-20
Attenuator	PASTERNAK	PE7087-10	A009	08-08-20
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-20
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-20
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-05-20
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-05-20
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-06-20
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-06-20
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	08-06-20
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-06-20
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-06-20
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	08-06-20
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-06-20
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-06-20
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	08-06-20
LISN	R&S	ENV-216	101837	08-09-20
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-02-21
Antenna, Loop, 9kHz-30MHz				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

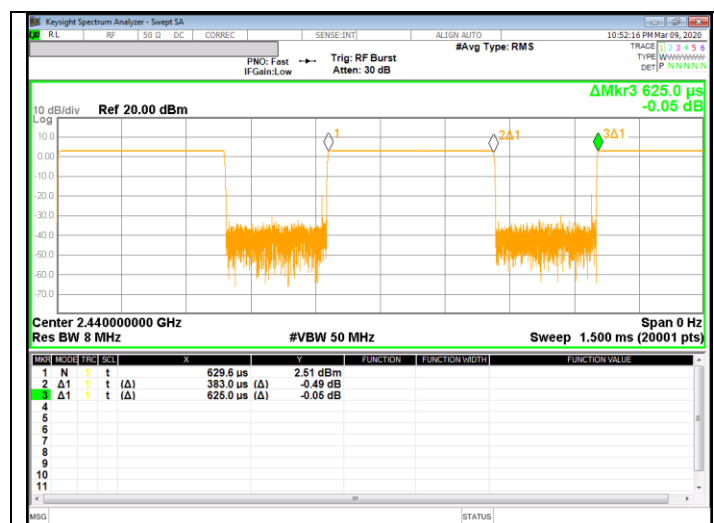
9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

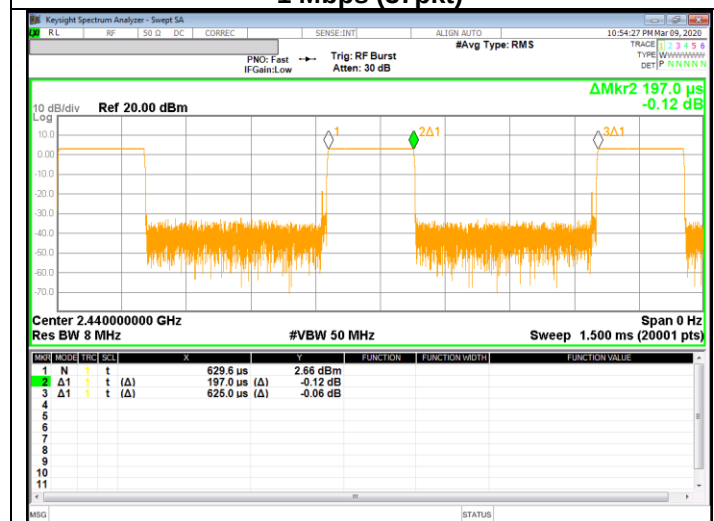
LIMITS

None; for reporting purposes only.

Mode	ON Time B [msec]	Period [msec]	Duty Cycle x [linear]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]	1/T Minimum VBW [kHz]
2400MHz Bands						
BLE 1 Mbps	0.383	0.625	0.613	61.3%	2.13	2.611
BLE 2 Mbps	0.197	0.625	0.315	31.5%	5.01	5.076



1 Mbps (37pkt)



2 Mbps (37pkt)

9.2. 6 dB BANDWIDTH & 99% BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

RSS-247 5.2 (a)

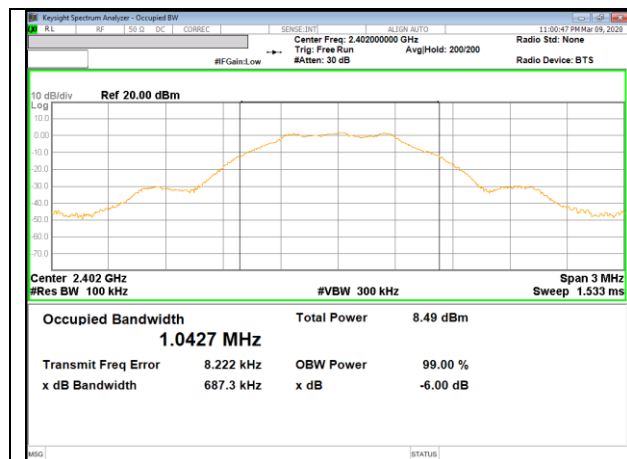
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

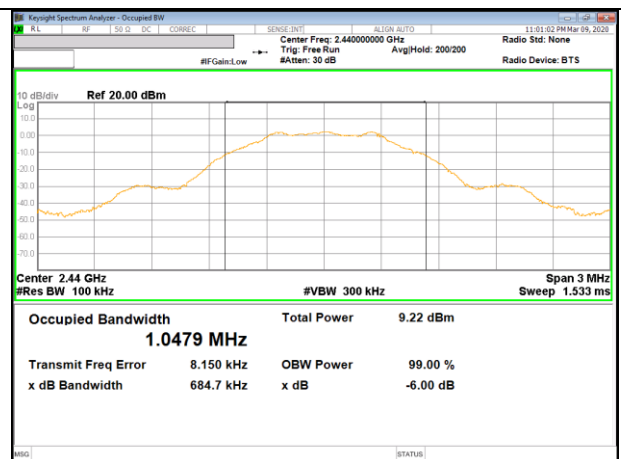
9.2.1. BLE (1 Mbps)

- 6 dB Bandwidth

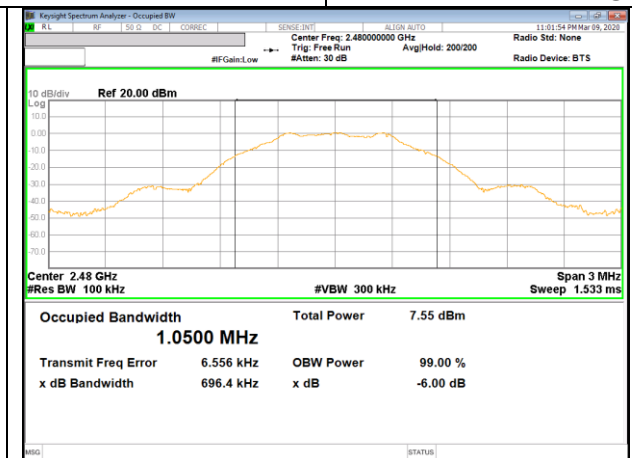
Channel	Frequency [MHz]	6 dB Bandwidth [kHz]	Minimum Limit [kHz]
Low	2 402	687.30	500.00
Mid	2 440	684.70	500.00
High	2 480	696.40	500.00
Worst		684.70	500.00



LOW CHANNEL



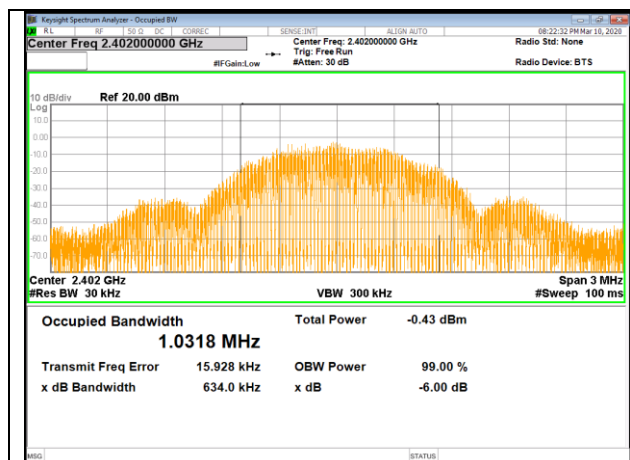
MID CHANNEL



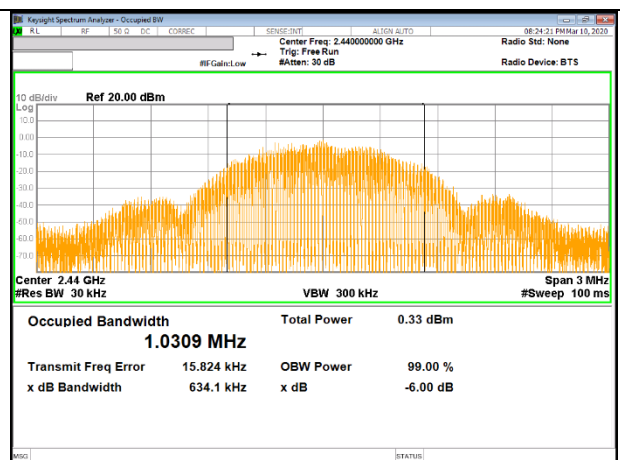
HIGH CHANNEL

- 99% Bandwidth

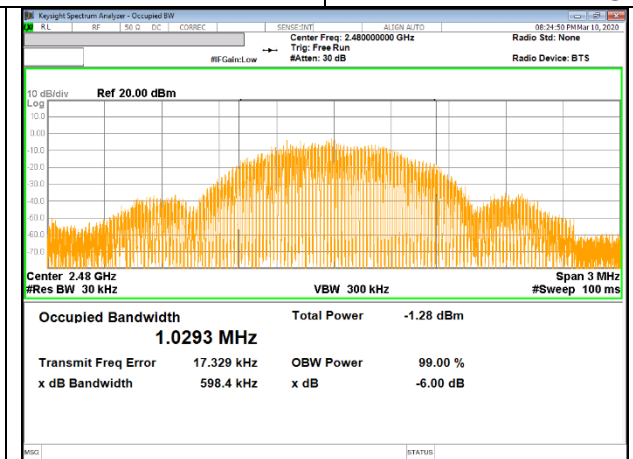
Channel	Frequency [MHz]	99% Bandwidth [kHz]
Low	2 402	1031.8
Mid	2 440	1030.9
High	2 480	1029.3



LOW CHANNEL



MID CHANNEL

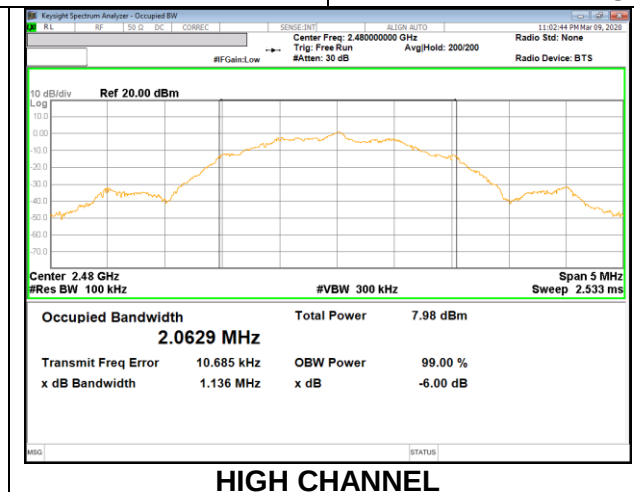
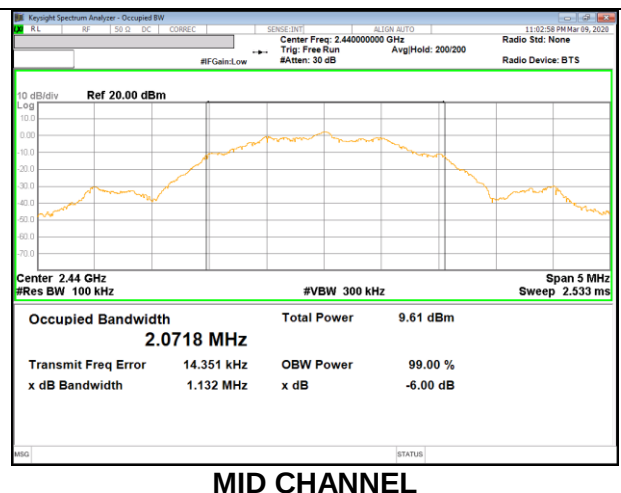
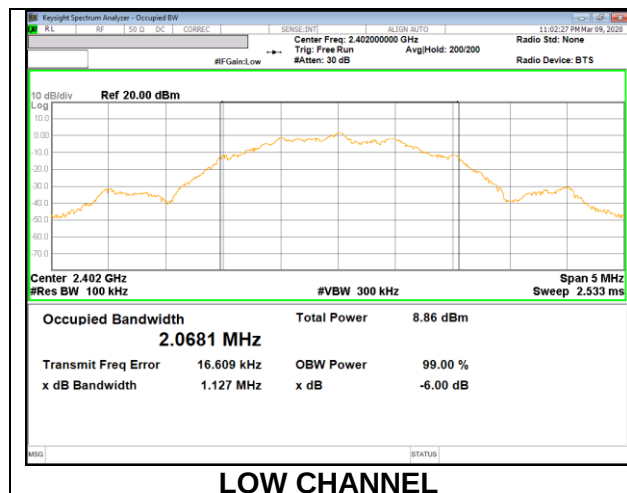


HIGH CHANNEL

9.2.2. BLE (2 Mbps)

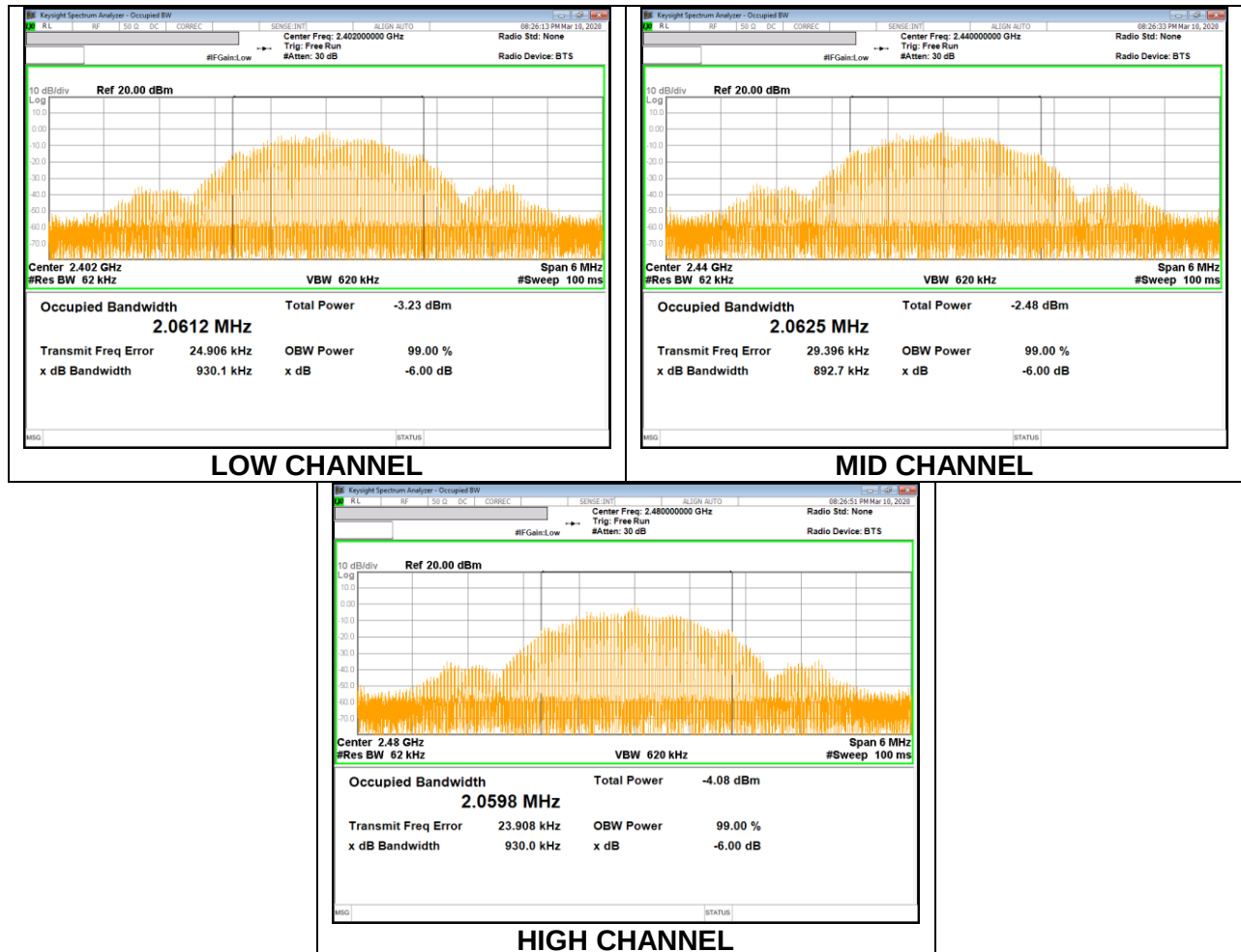
- 6dB Bandwidth

Channel	Frequency [MHz]	6 dB Bandwidth [kHz]	Minumun Limit [kHz]
Low	2 402	1127.00	500.00
Mid	2 440	1132.00	500.00
High	2 480	1136.00	500.00
Worst		1127.00	500.00



- **99% Bandwidth**

Channel	Frequency [MHz]	99% Bandwidth [kHz]
Low	2 402	2061.2
Mid	2 440	2062.5
High	2 480	2059.8



9.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

Peak power is measured using ANSI C63.10(2013) under section 11.9.1.1 utilizing spectrum analyzer.

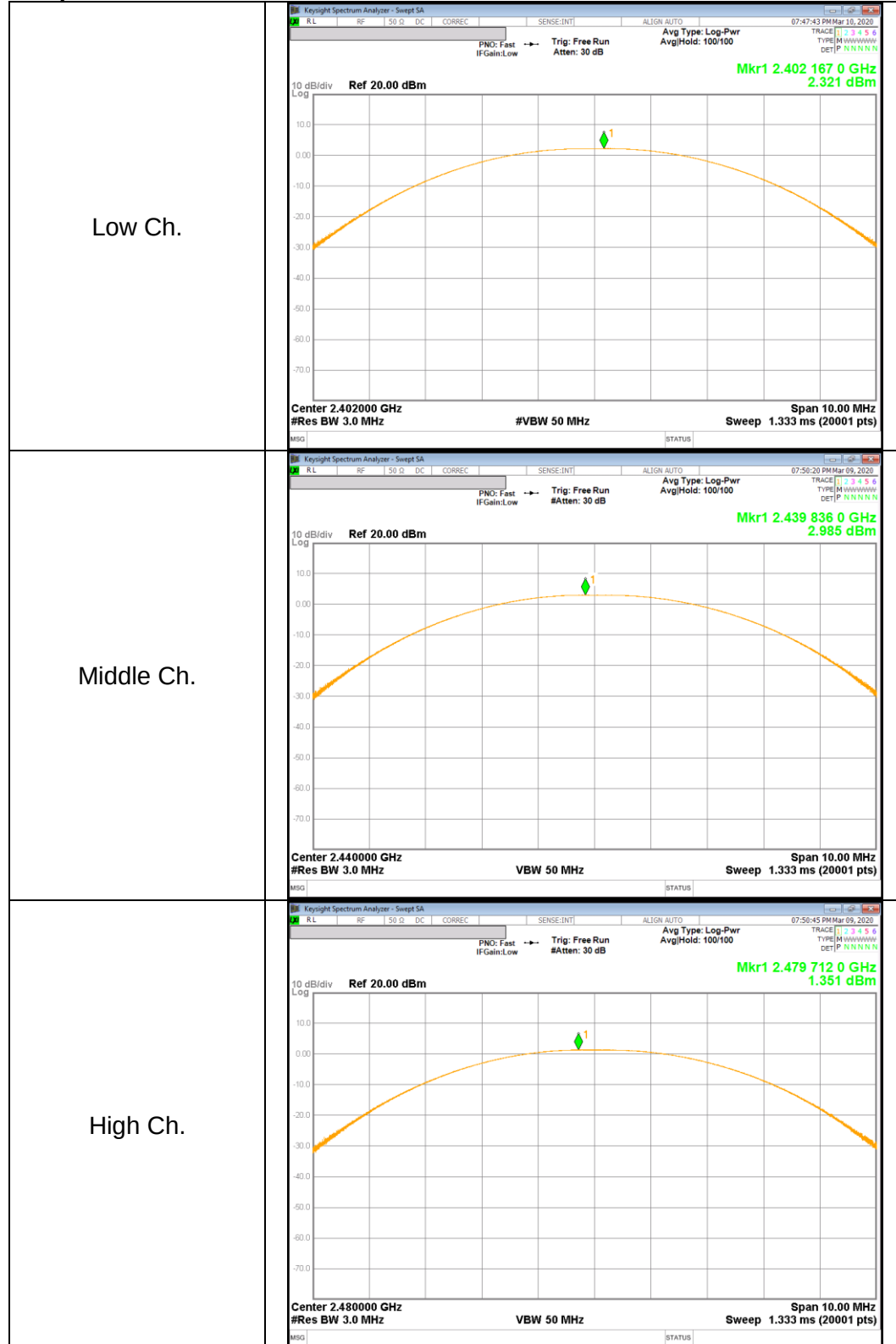
RESULTS

Symbol Rate [Ms/s]	Mode	Frequency [MHz]	Conducted Peak Power [dBm]	Symbol Rate [Ms/s]	Mode	Frequency [MHz]	Conducted Peak Power [dBm]	Limit [dBm]
1	1Mbps (37 pkt)	2402	2.321	2	2Mbps (37 pkt)	2402	2.284	30.000
		2440	2.985			2440	2.951	30.000
		2480	1.351			2480	1.322	30.000
	1Mbps (255 pkt)	2402	2.269		2Mbps (255 pkt)	2402	2.266	30.000
		2440	2.938			2440	2.934	30.000
		2480	1.322			2480	1.310	30.000

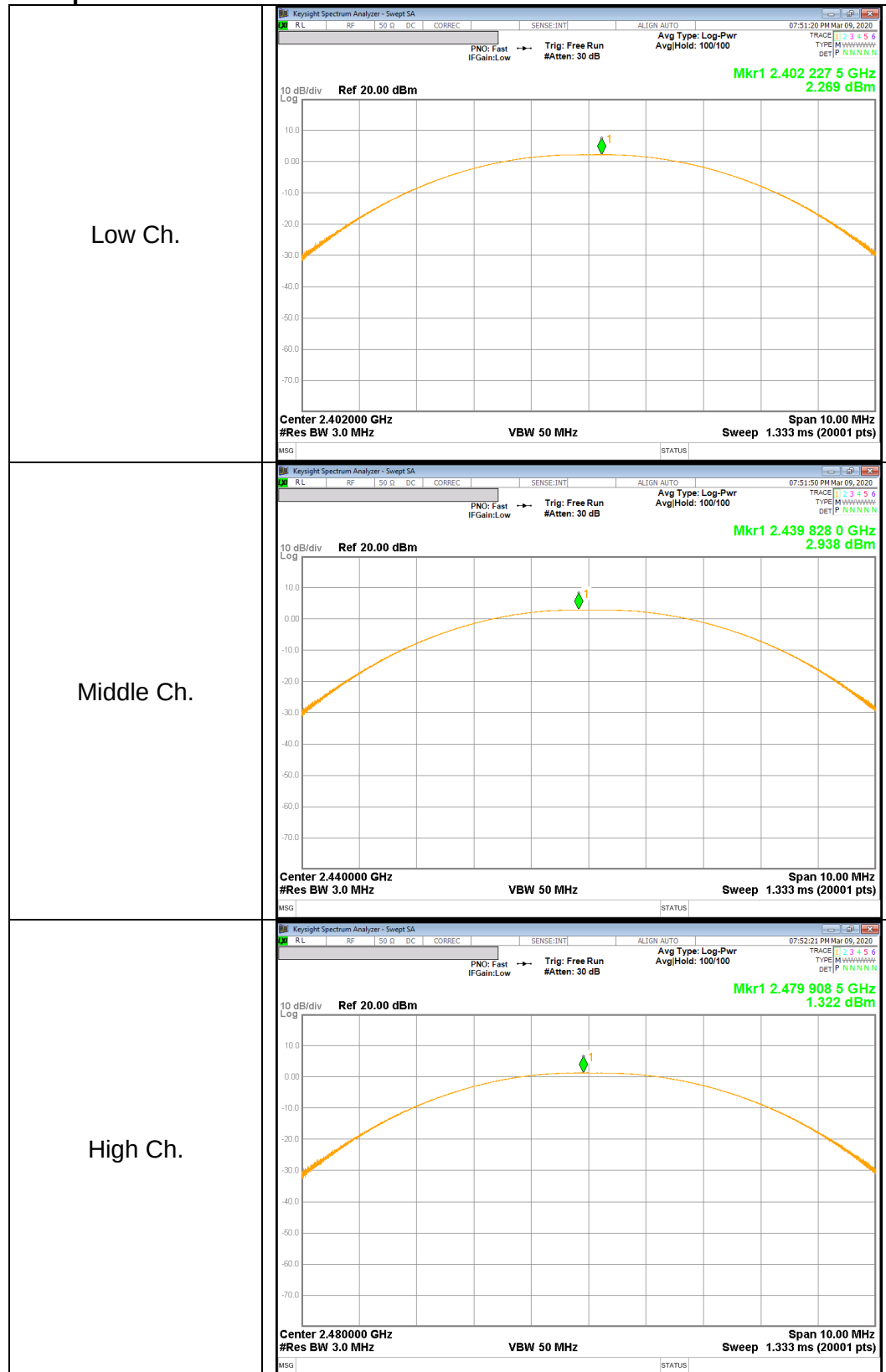
9.3.1. BLE (1 Mbps)

PEAK OUTPUT POWER PLOTS

- 37 pkt



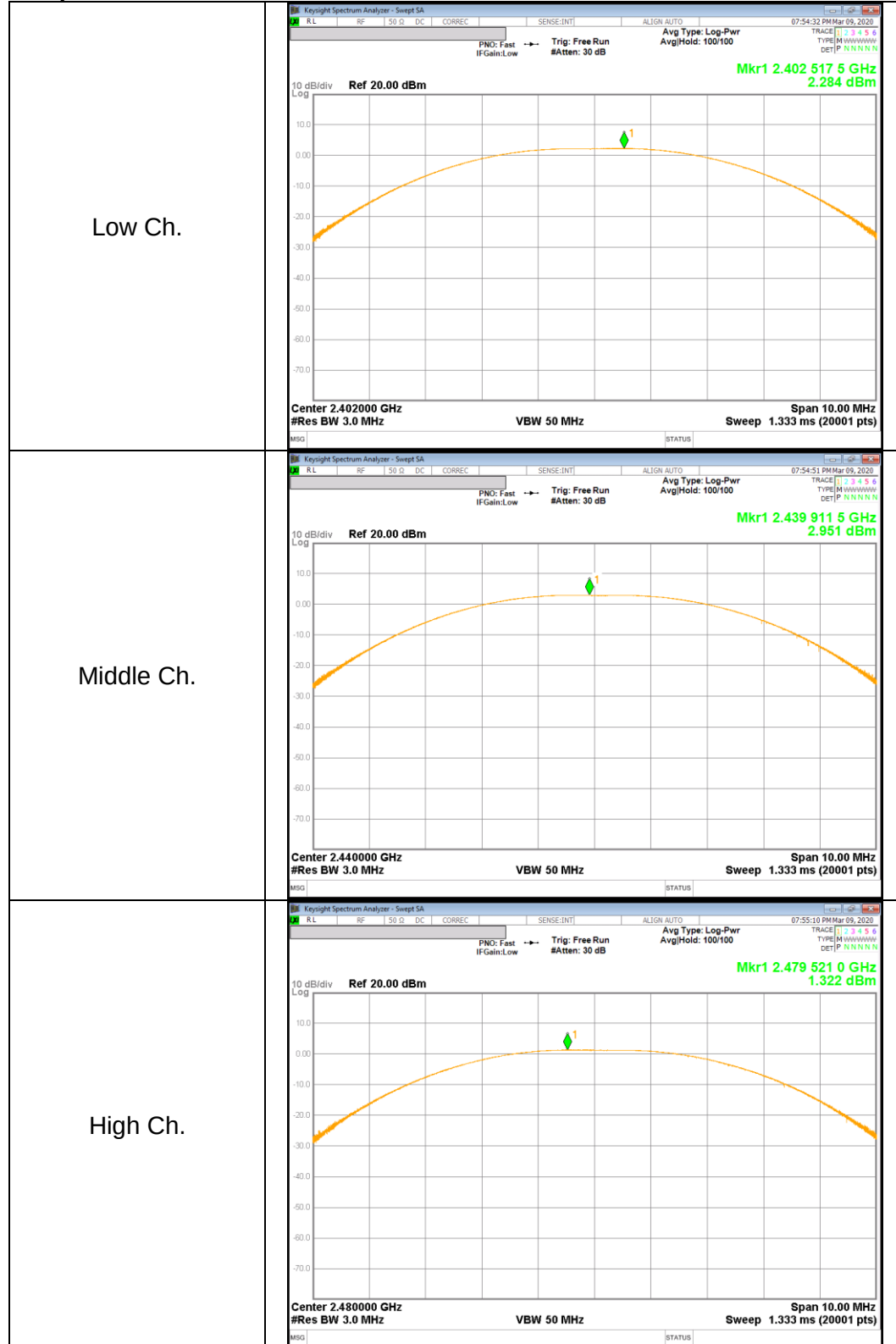
- 255 pkt



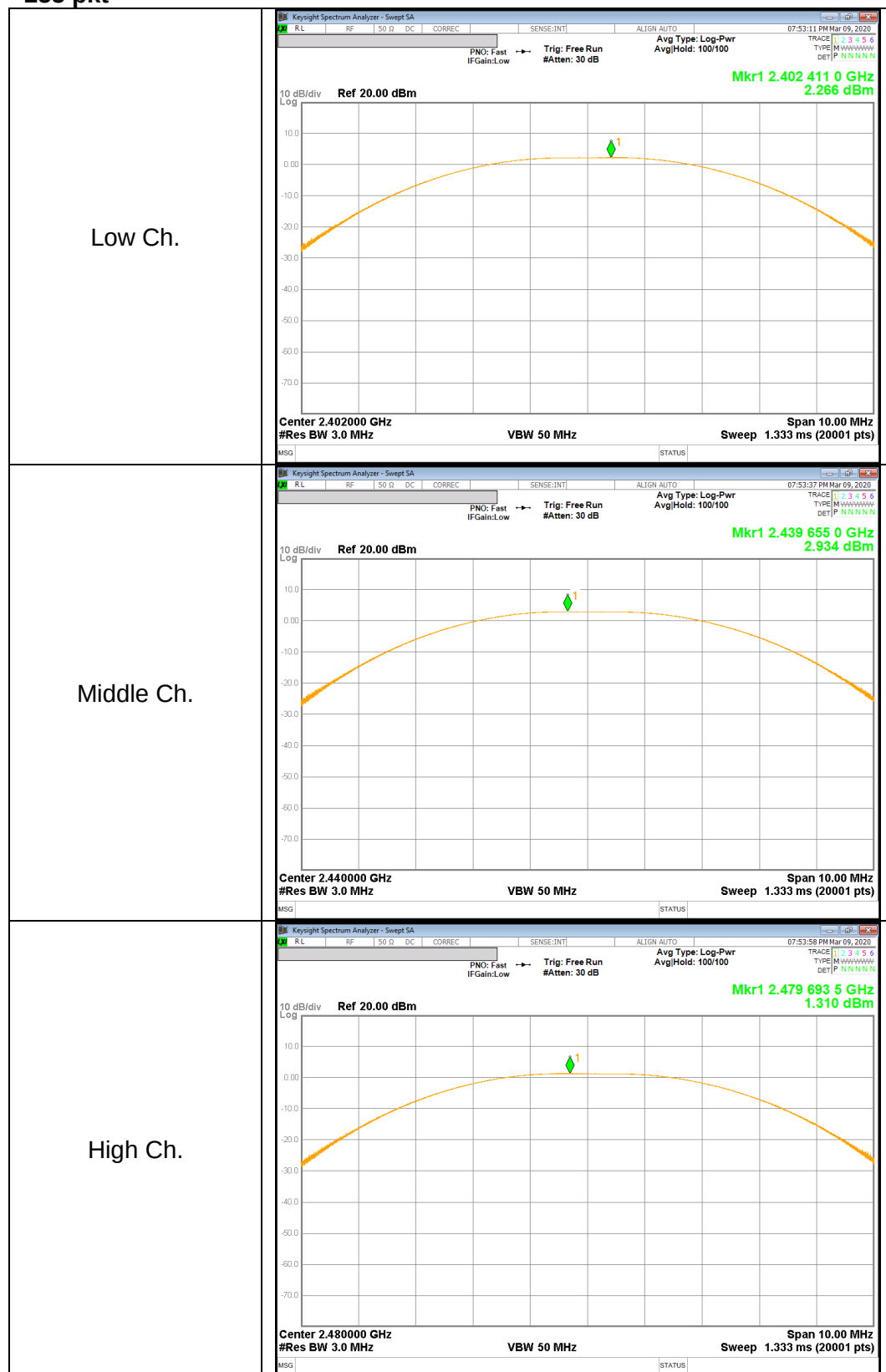
9.3.2. BLE (2 Mbps)

PEAK OUTPUT POWER PLOTS

- 37 pkt



- 255 pkt



9.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss was entered as an offset in the power meter to allow for direct reading of power. The duty factor already has been added.

Symbol Rate [Ms/s]	Symbol Rate [Ms/s]	Frequency [MHz]	Conducted Burst Avg [dBm]	Conducted Burst Avg [mmW]
1	1Mbps	2402	2.022	1.593
		2440	2.777	1.895
		2480	1.115	1.293
	2Mbps	2402	1.820	1.520
		2440	2.546	1.797
		2480	0.883	1.225

9.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

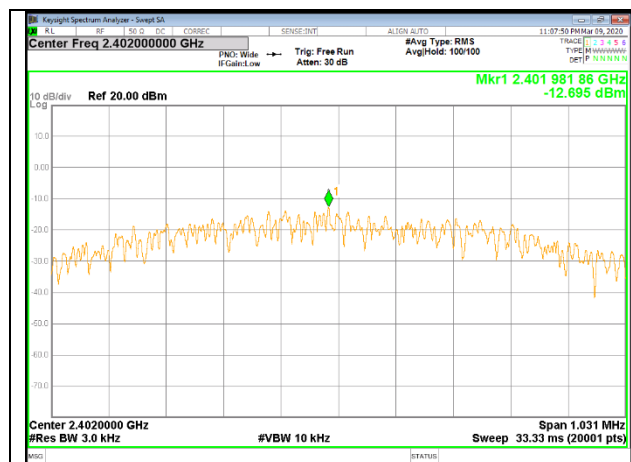
RSS-247 (5.2) (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

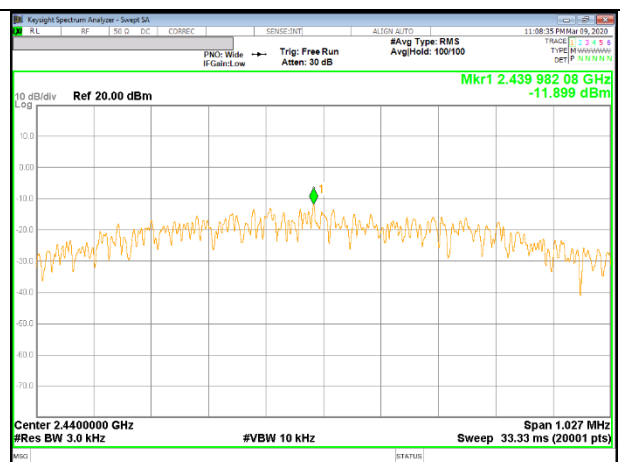
RESULTS

9.5.1. BLE (1 Mbps)

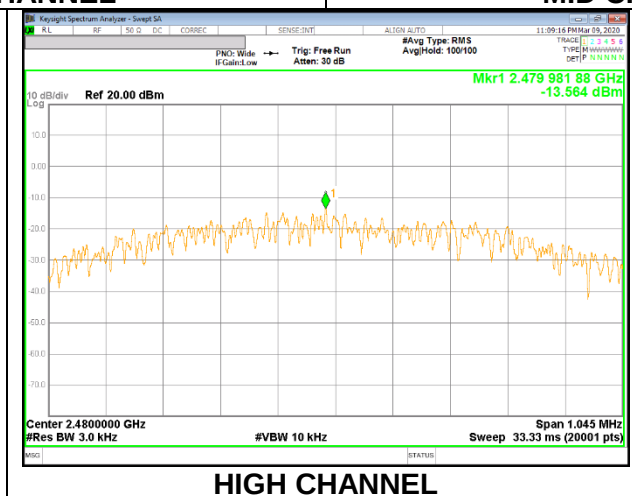
Channel	Frequency [MHz]	PSD [dBm/3kHz]	Limit [dBm/3kHz]	Margin [dB]
Low	2 402	-12.70	8.00	-20.70
Mid	2 440	-11.90	8.00	-19.90
High	2 480	-13.56	8.00	-21.56



LOW CHANNEL



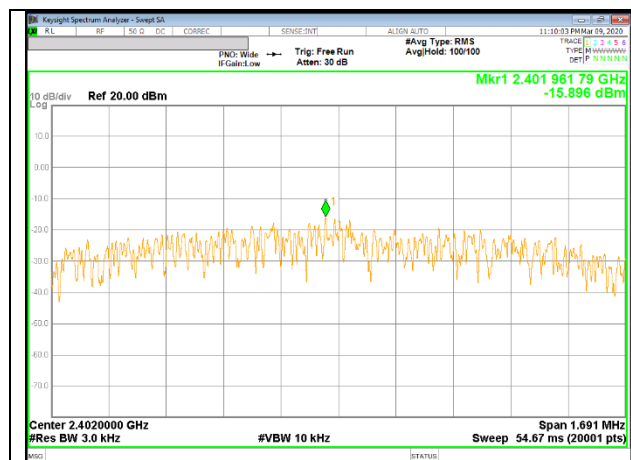
MID CHANNEL



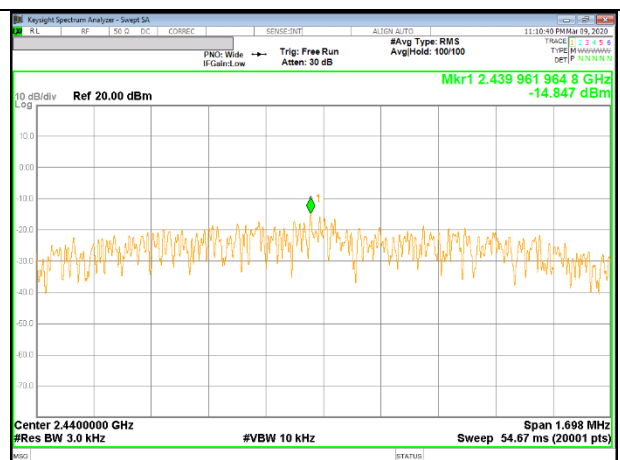
HIGH CHANNEL

9.5.2. BLE (2 Mbps)

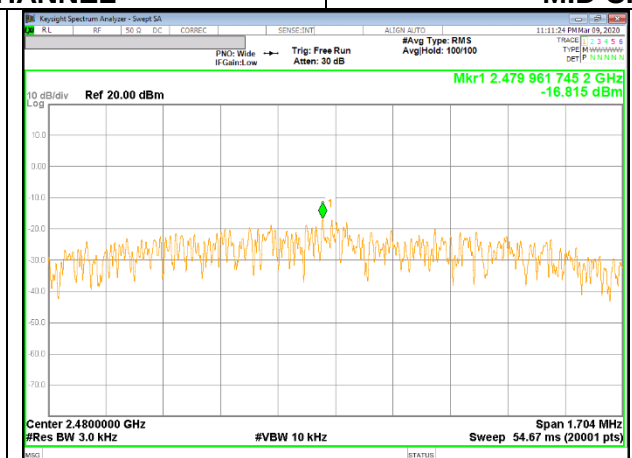
Channel	Frequency [MHz]	PSD [dBm/3kHz]	Limit [dBm/3kHz]	Margin [dB]
Low	2 402	-15.90	8.00	-23.90
Mid	2 440	-14.85	8.00	-22.85
High	2 480	-16.82	8.00	-24.82



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

9.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

RSS-247 5.5

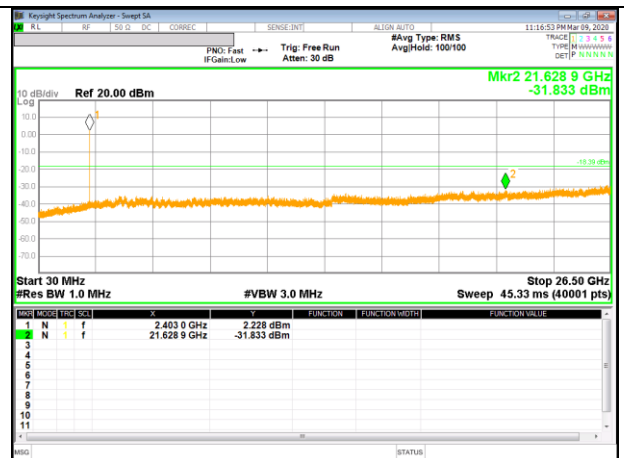
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

RESULTS

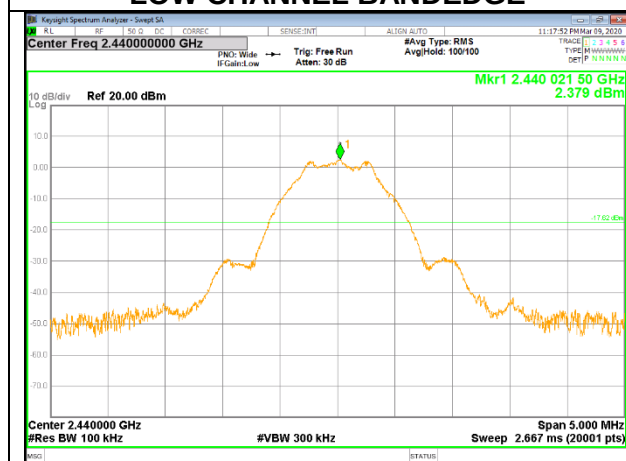
9.6.1. BLE (1 Mbps)



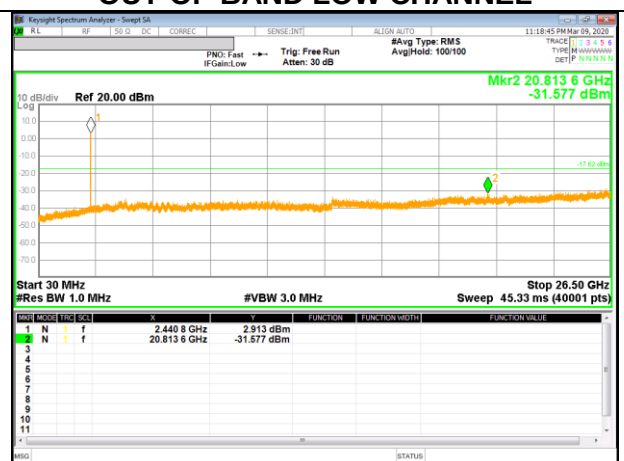
LOW CHANNEL BANDEDGE



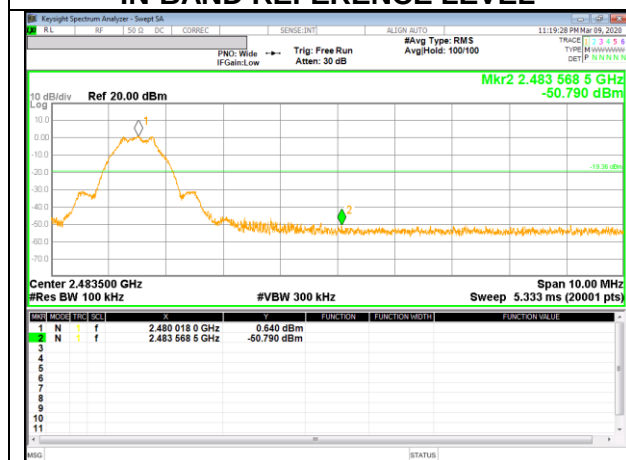
OUT-OF-BAND LOW CHANNEL



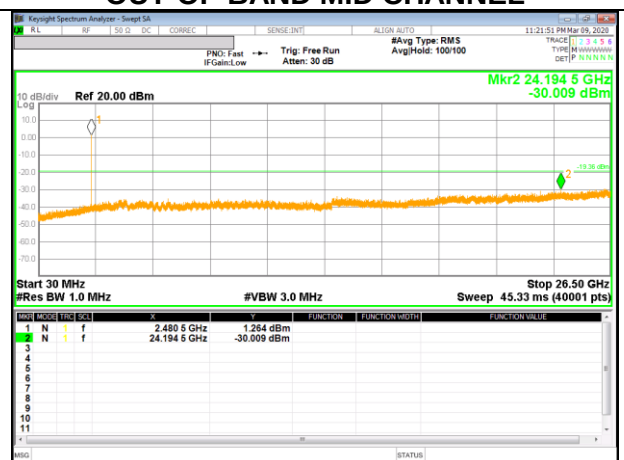
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

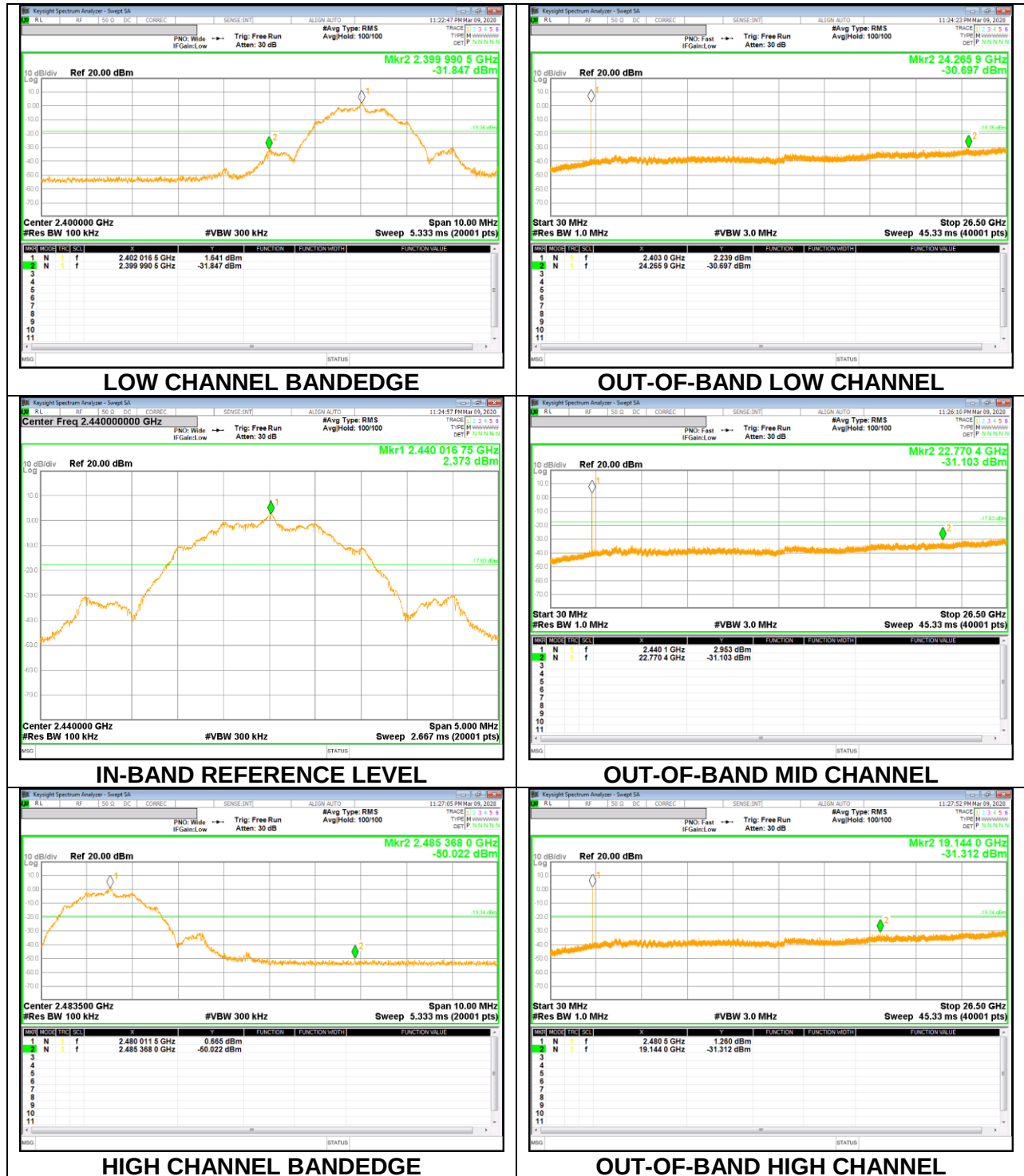


HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

9.6.2. BLE (2 Mbps)



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.

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 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, then the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor for average measurements. (Restricted band-edge, Final detection of spurious harmonic emissions) Duty cycle factor = $10 \log(1/x)$. For this sample: For 1Mbps, DCF = $10 \log(1/0.613) = 2.13 \text{ dB}$ (Spectrum Analyzer round it up to 2.13 dB) and for 2Mbps, DCF = $10 \log(1/0.315) = 5.01 \text{ dB}$ (Spectrum Analyzer round it up to 5.01 dB)

Pre-scans to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 kHz for peak measurements.

The spectrum from 1 GHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.
(From 30MHz to 1GHz, test was performed with the EUT set to transmit at the channel with highest output power)

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 9 kHz to 30 MHz; 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.

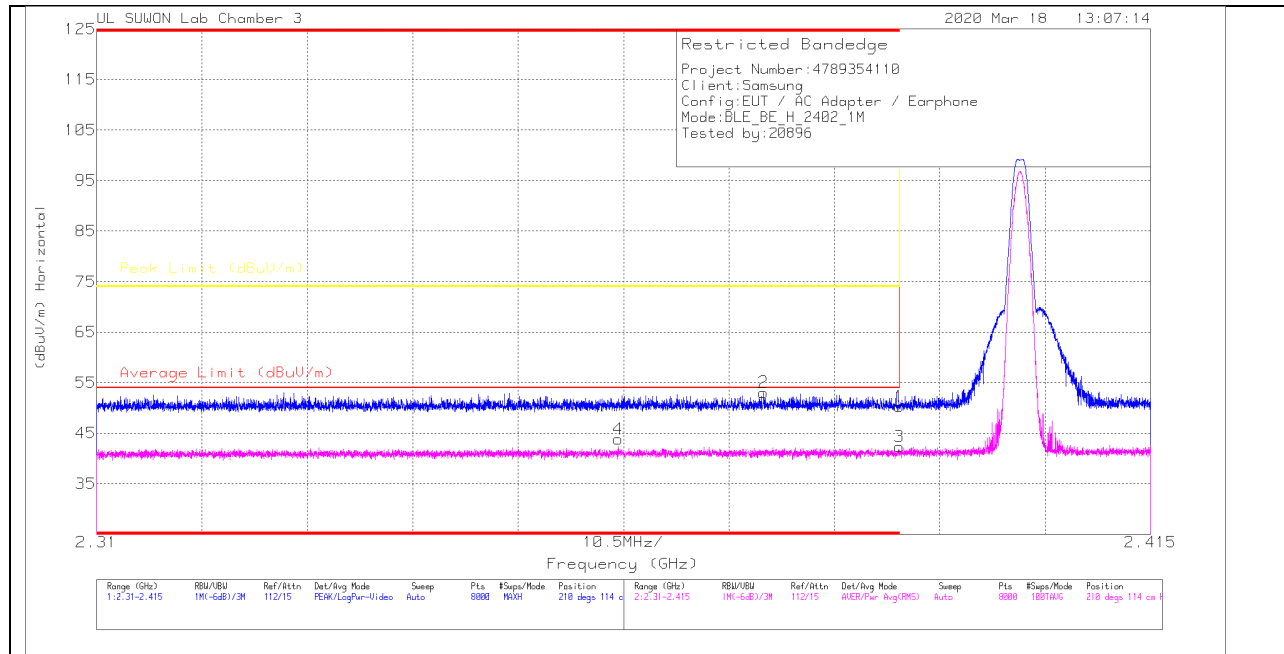
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open area test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field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

10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (1 Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

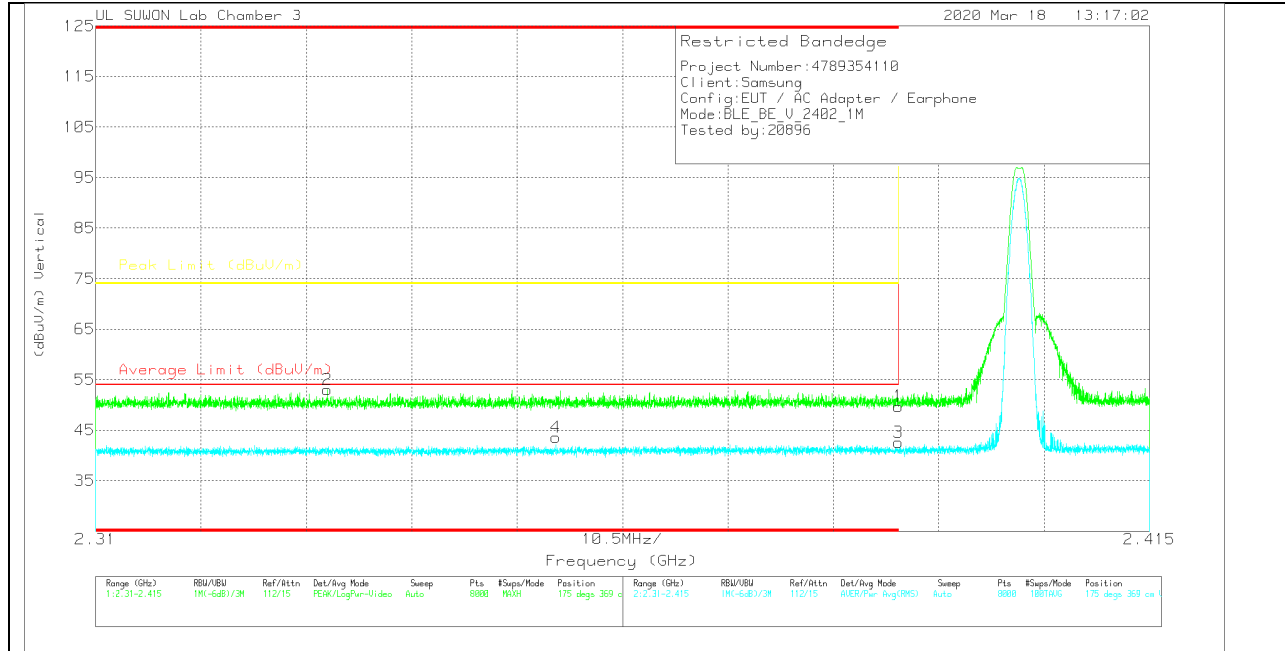
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00209959	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.49	PK		31.7	-22.9	50.29	-	-	74	-23.71	210	114	H
2	* 2.37646	44.38	PK		31.6	-22.9	53.08	-	-	74	-20.92	210	114	H
3	* 2.39	31.42	RMS		31.7	-22.9	42.35	54	-11.65	-	-	210	114	H
4	* 2.36194	32.99	RMS		31.6	-22.9	43.82	54	-10.18	-	-	210	114	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.93	Pk		-22.9	0	49.73	-	-	74	-24.27	175	369	V
2	* 2.33306	44.46	Pk		-22.9	0	53.06	-	-	74	-20.94	175	369	V
3	* 2.39	31.65	RMS		-22.9	2.13	42.58	54	-11.42	-	-	175	369	V
4	* 2.35585	32.72	RMS		-22.9	2.13	43.55	54	-10.45	-	-	175	369	V

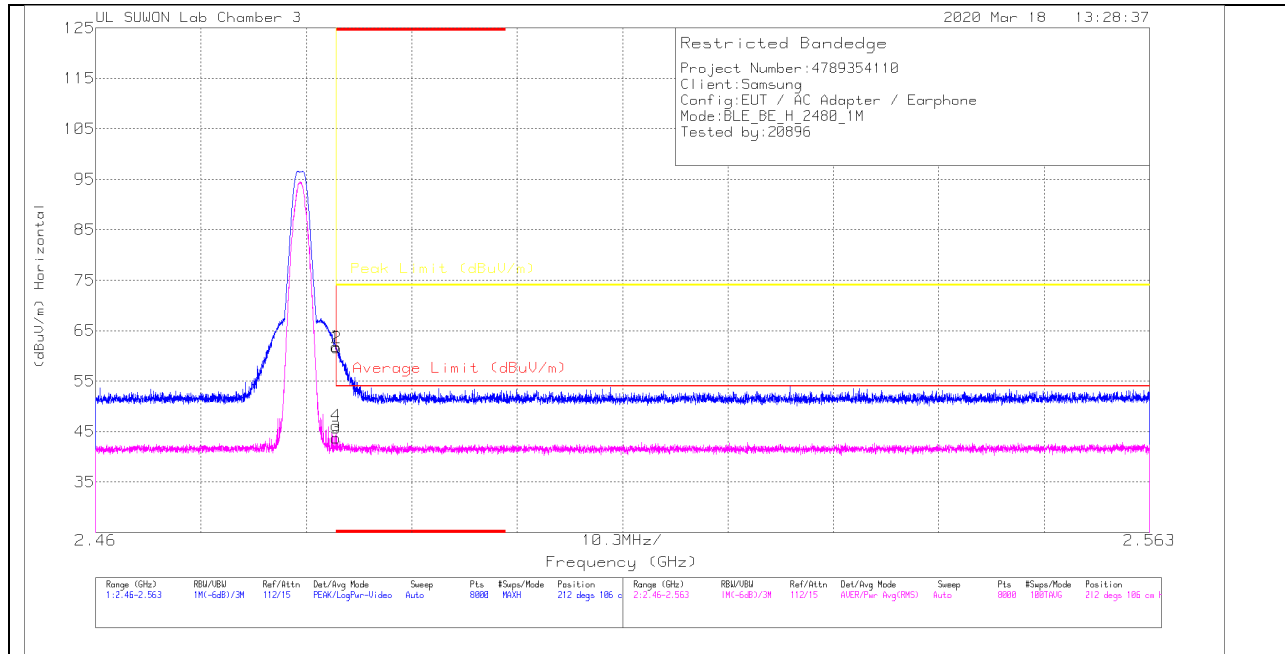
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Trace Markers

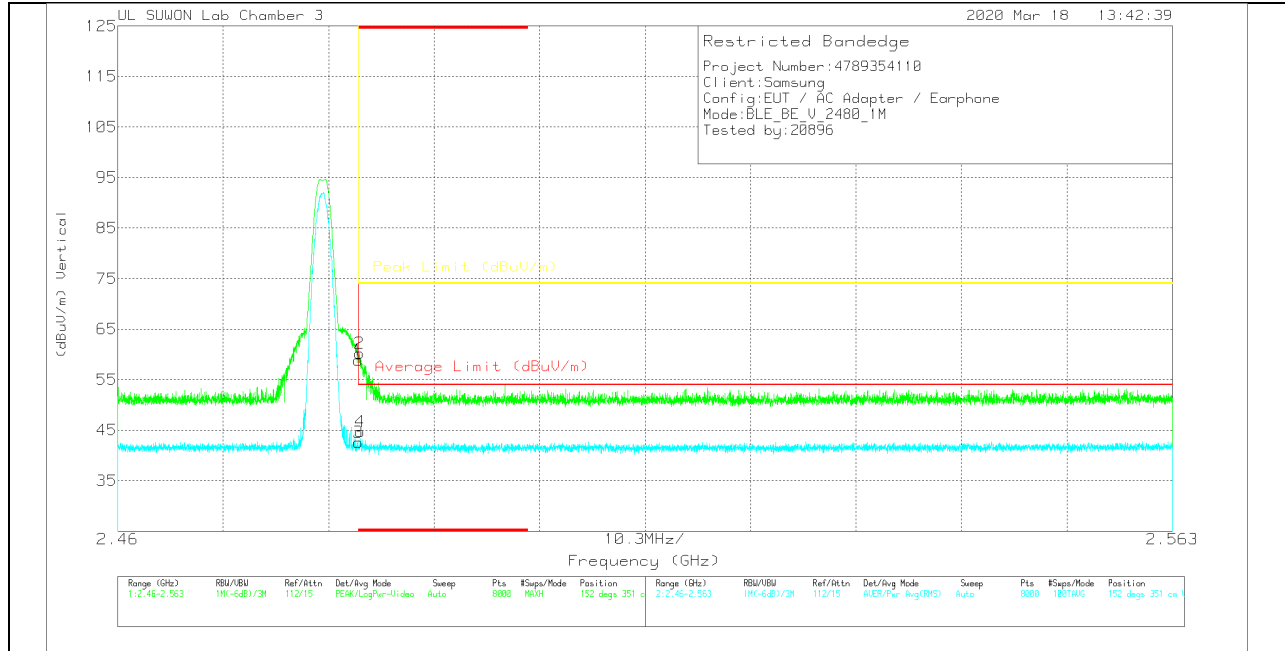
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Pk Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	52.74	Pk	31.9	-22.8	0	61.84	-	-	74	-12.16	212	106	H
2	* 2.48358	52.49	Pk	31.9	-22.8	0	61.59	-	-	74	-12.41	212	106	H
3	* 2.4835	32.54	RMS	31.9	-22.8	2.13	43.77	54	-10.23	-	-	212	106	H
4	* 2.48351	34.93	RMS	31.9	-22.8	2.13	46.16	54	-7.84	-	-	212	106	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00209559	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	49.71	Pk	31.9	-22.8	0	58.81	-	-	74	-15.19	152	351	V
2	* 2.4836	51.13	Pk	31.9	-22.8	0	60.23	-	-	74	-13.77	152	351	V
3	* 2.4835	31.42	RMS	31.9	-22.8	2.13	42.65	54	-11.35	-	-	152	351	V
4	* 2.4836	33.5	RMS	31.9	-22.8	2.13	44.73	54	-9.27	-	-	152	351	V

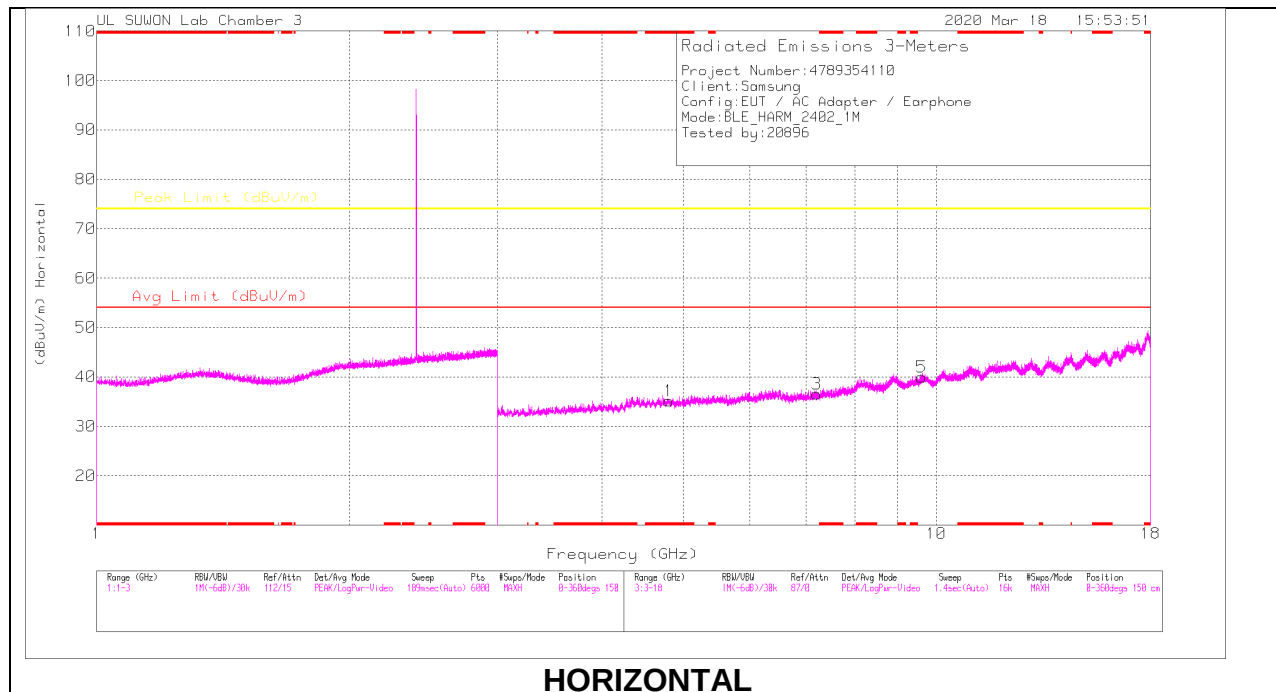
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

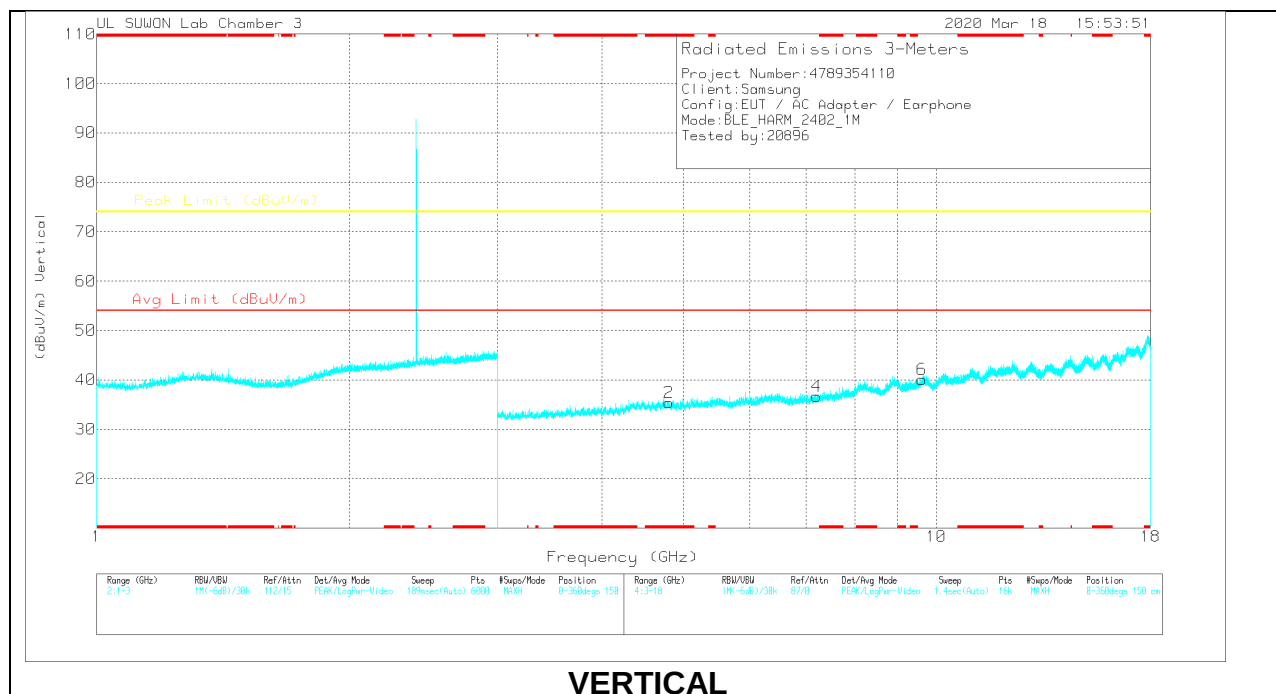
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

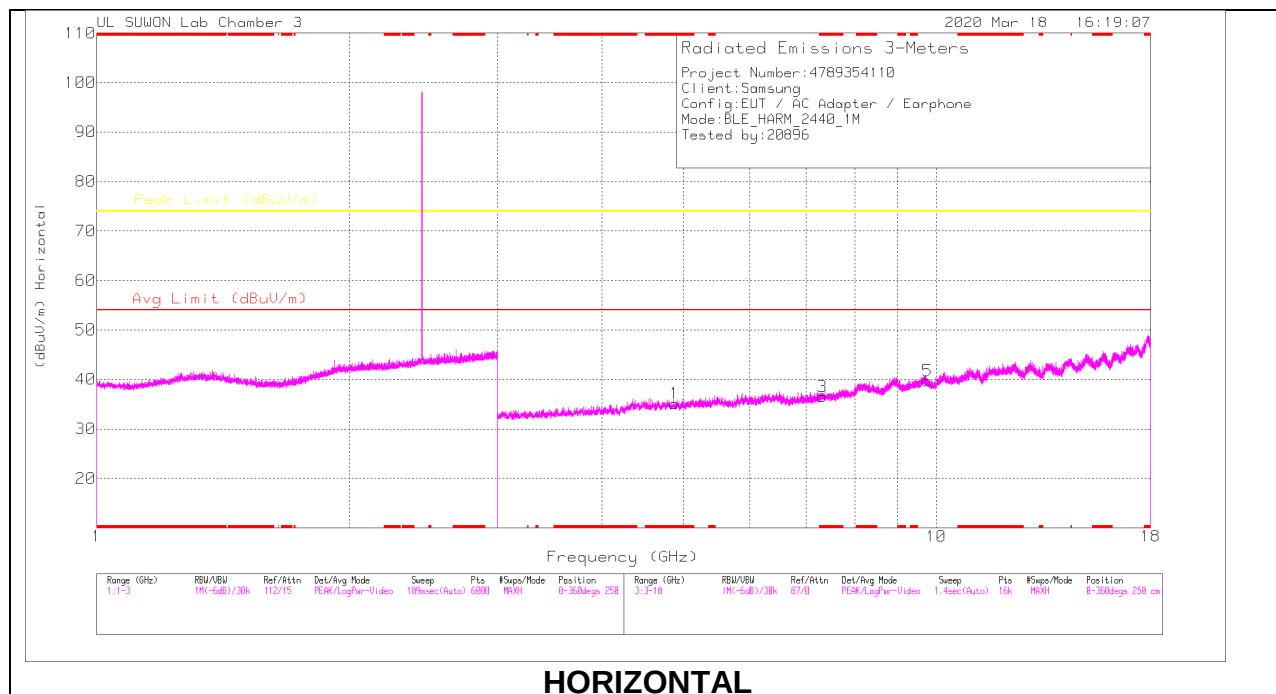
Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

RADIATED EMISSIONS

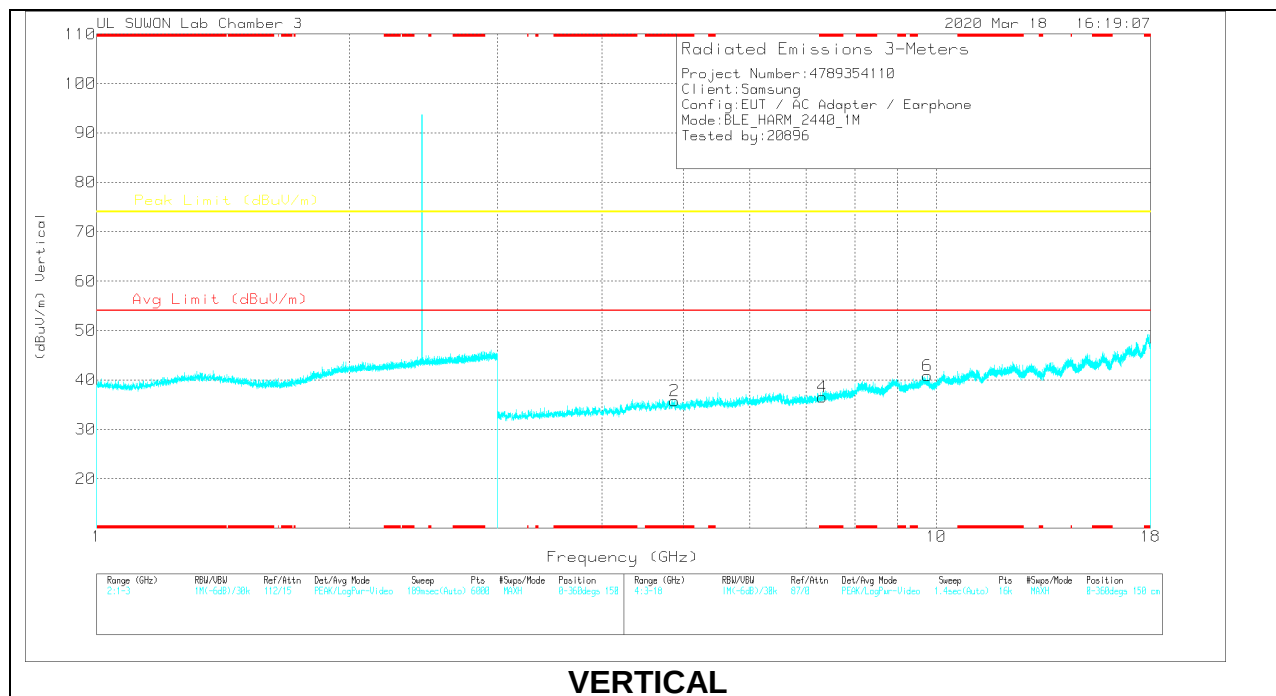
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.80402	39.24	PK2	34.2	-27.9	0	45.54	-	-	74	-28.46	0	100	H
* 4.80393	39.03	PK2	34.2	-27.9	0	45.33	-	-	74	-28.67	0	100	V
7.20636	35.63	PK2	35.8	-23.7	0	47.73	-	-	74	-26.27	0	100	H
7.20498	35.38	PK2	35.8	-23.7	0	47.48	-	-	74	-26.52	0	100	V
9.60699	32.41	PK2	37	-19.7	0	49.71	-	-	74	-24.29	0	100	H
9.60637	32.32	PK2	37	-19.7	0	49.62	-	-	74	-24.38	0	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

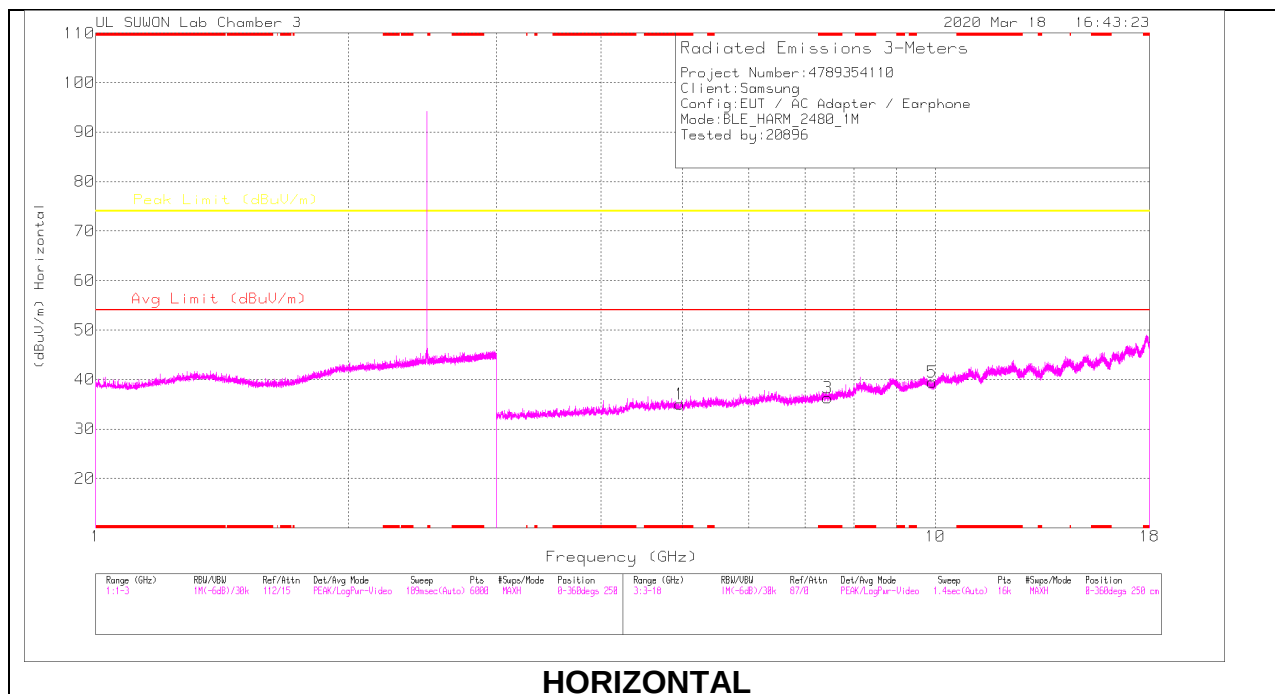
RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88275	39.2	PK2	34.2	-28.8	0	44.6	-	-	74	-29.4	0	100	H
* 4.88243	39.75	PK2	34.2	-28.8	0	45.15	-	-	74	-28.85	0	100	V
* 7.32012	35.05	PK2	35.8	-23.2	0	47.65	-	-	74	-26.35	0	100	H
* 7.32084	35	PK2	35.8	-23.2	0	47.6	-	-	74	-26.4	0	100	V
9.75949	31.97	PK2	37.2	-19.3	0	49.87	-	-	74	-24.13	0	100	H
9.76056	31.66	PK2	37.2	-19.3	0	49.56	-	-	74	-24.44	0	100	V

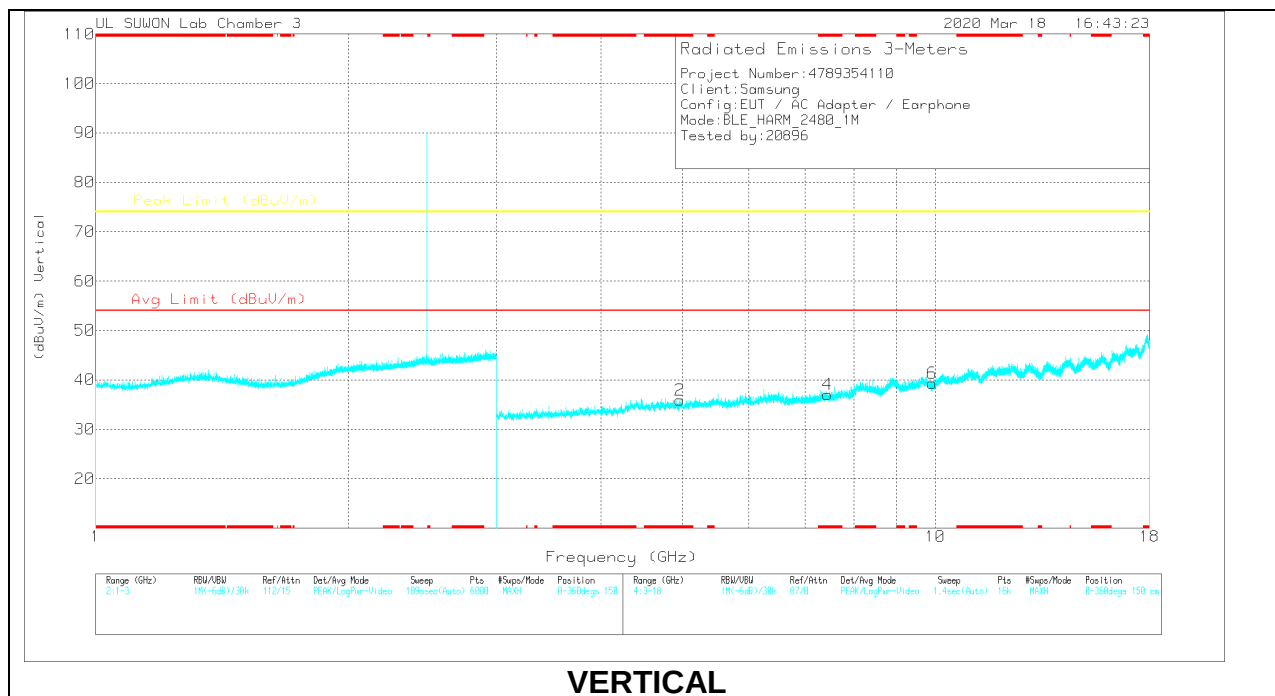
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96499	38.86	PK2	34.2	-28.4	0	44.66	-	-	74	-29.34	0	100	H
* 4.96526	39.2	PK2	34.2	-28.4	0	45	-	-	74	-29	0	100	V
* 7.43905	34.59	PK2	35.8	-23	0	47.39	-	-	74	-26.61	0	100	H
* 7.44134	34.45	PK2	35.8	-23	0	47.25	-	-	74	-26.75	0	100	V
9.91702	30.78	PK2	37.5	-19.5	0	48.78	-	-	74	-25.22	0	100	H
9.91861	30.69	PK2	37.5	-19.5	0	48.69	-	-	74	-25.31	0	100	V

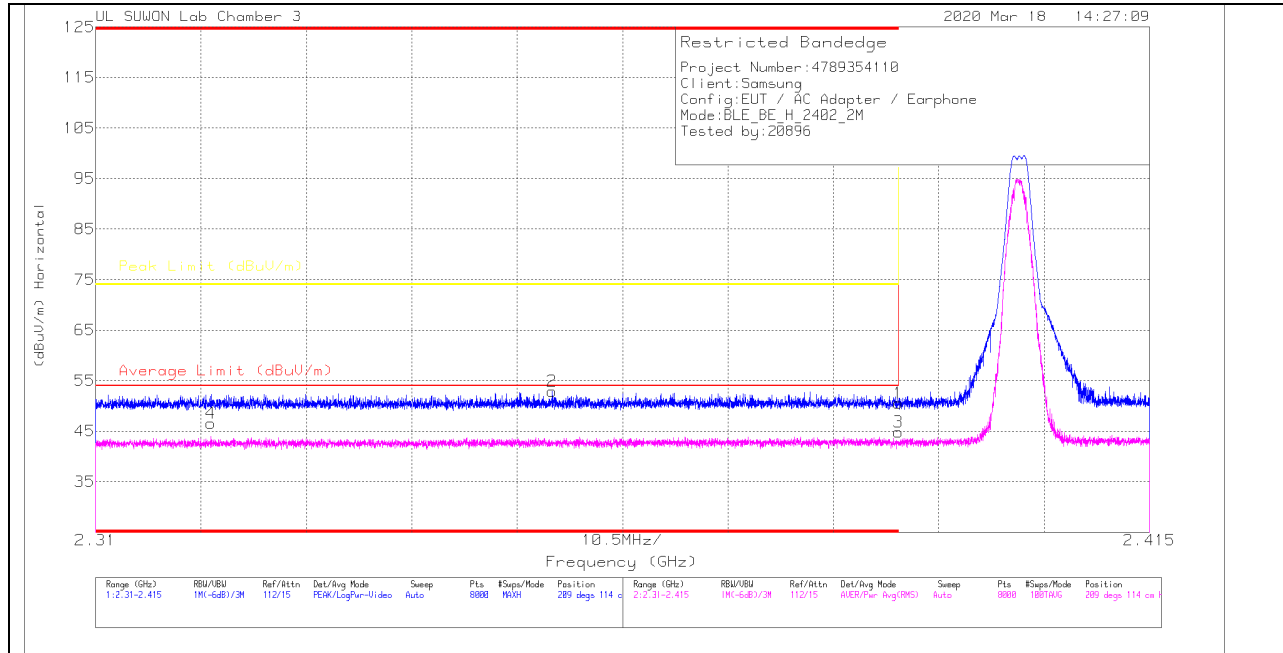
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

10.2.2. BLE (2 Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

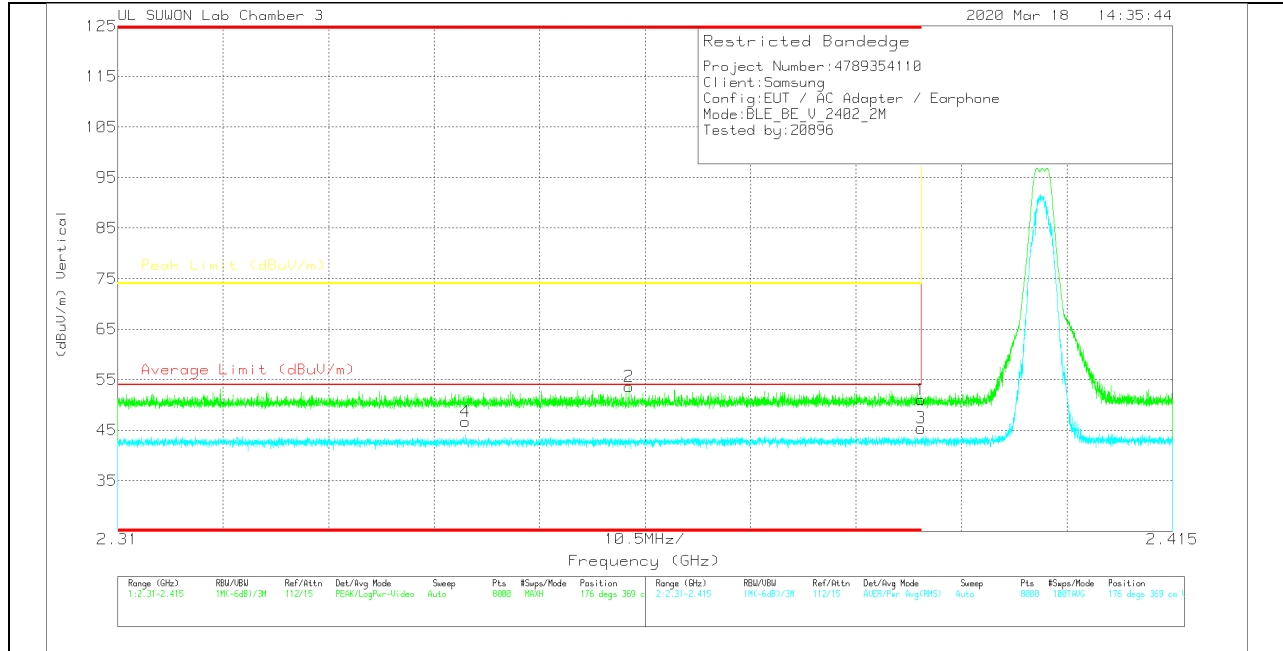
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00209599	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.39	41.78	PK		-22.9	0	50.58	-	-	74	-23.42	209	114	H
2	* 2.35949	44.15	PK		-22.9	0	52.85	-	-	74	-21.15	209	114	H
3	* 2.39	31.02	RMS		-22.9	5.01	44.83	54	-9.17	-	-	209	114	H
4	* 2.32146	32.95	RMS		-22.9	5.01	46.56	54	-7.44	-	-	209	114	H

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

PK - Peak detector

RMS - RMS detection

VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	42.26	PK	31.7	-22.9	0	51.06	-	-	74	-22.94	176	369	V
2	* 2.36088	45.09	PK	31.6	-23	0	53.69	-	-	74	-20.31	176	369	V
3	* 2.39	31.58	RMS	31.7	-22.9	5.01	45.39	54	-8.61	-	-	176	369	V
4	* 2.34464	32.99	RMS	31.6	-22.9	5.01	46.7	54	-7.3	-	-	176	369	V

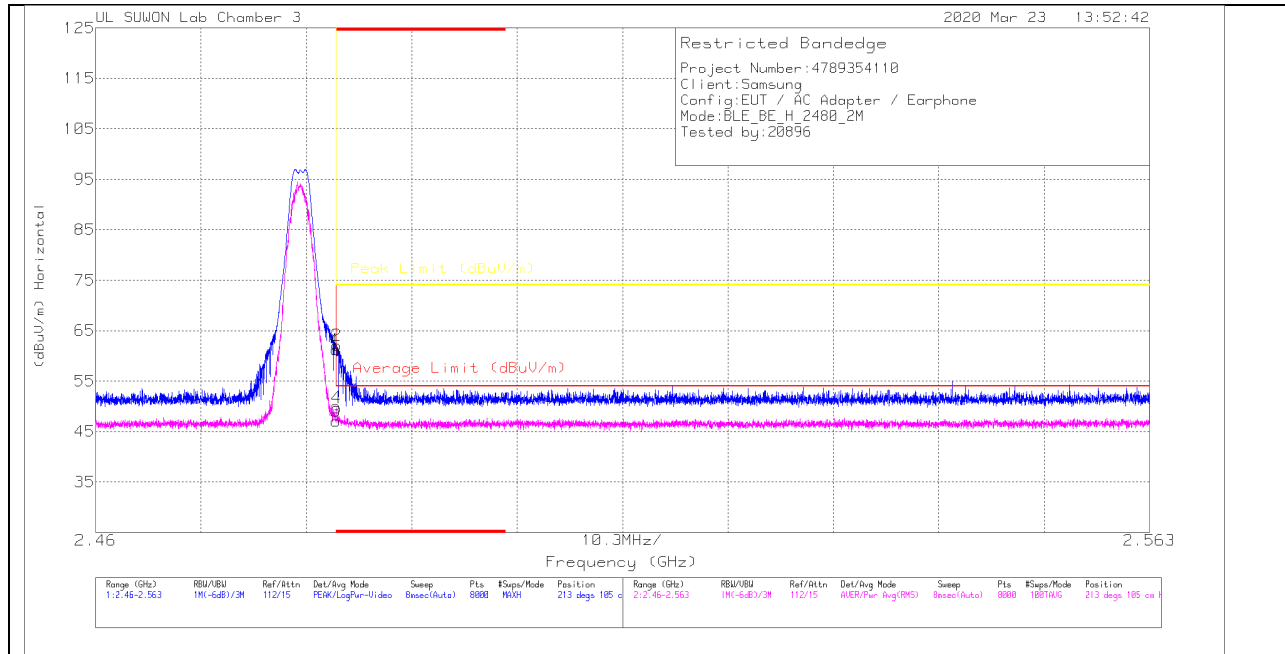
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

RMS - RMS detection

BANEDGE (HIGH CHANNEL)

HORIZONTAL RESULT

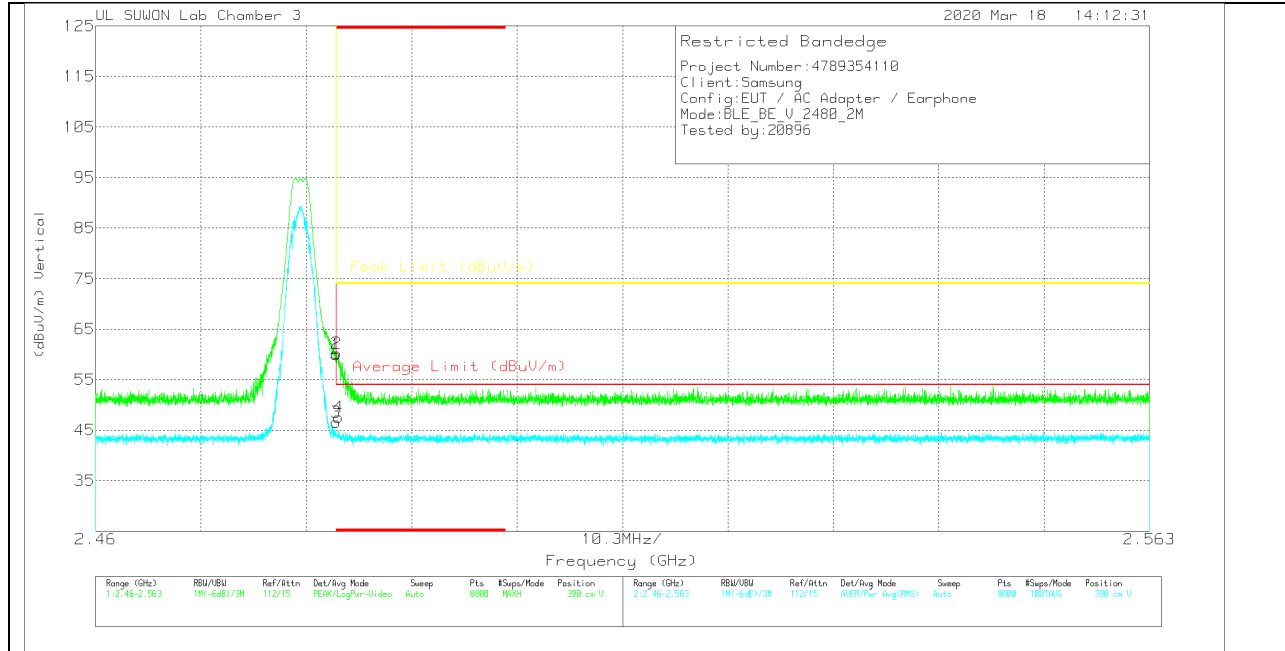


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (m)	Height (cm)	Polarity
1	* 2.4835	52.1	PK	31.9	-22.8	0	62.2	-	-	74	-12.8	213	105	H
2	* 2.48358	53.03	PK	31.9	-22.8	0	62.13	-	-	74	-11.87	213	105	H
3	* 2.4835	32.94	RMS	31.9	-22.8	5.01	47.05	54	-6.95	-	-	213	105	H
4	* 2.48355	35.62	RMS	31.9	-22.8	5.01	49.73	54	-4.27	-	-	213	105	H

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

VERTICAL RESULT



Trace Markers

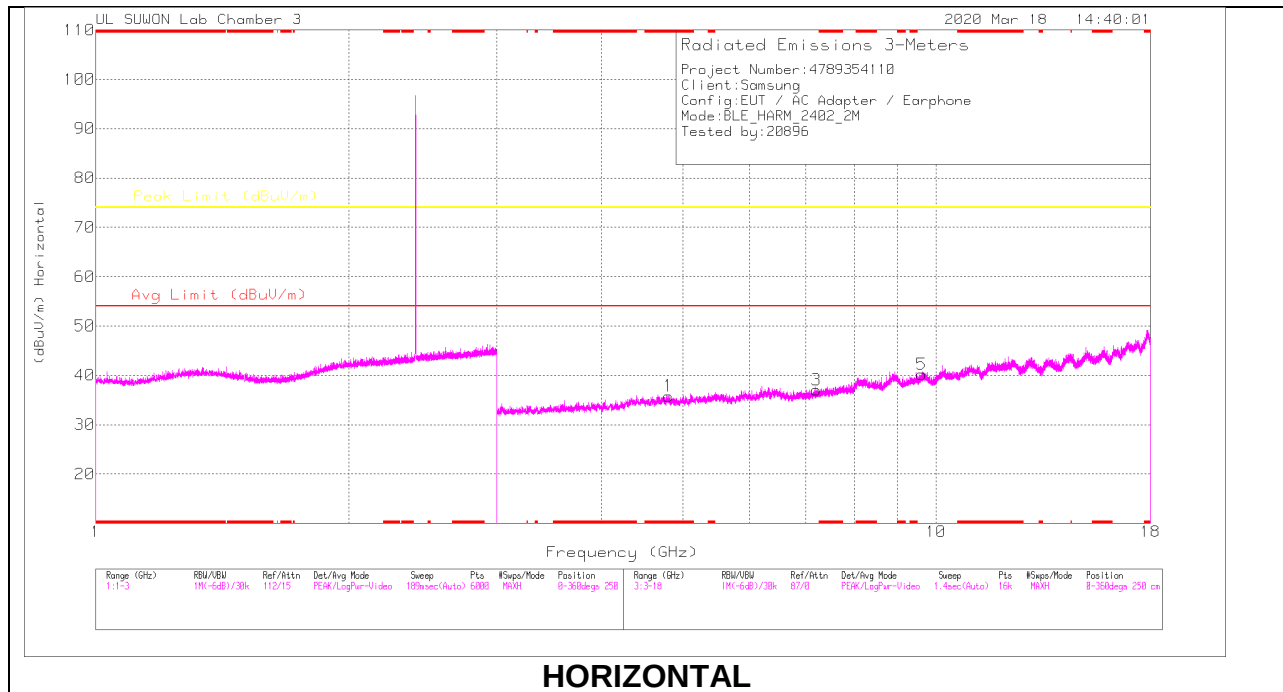
Marker	Frequency (GHz)	Meter Reading (dBUV)	Det	3117_00205959	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBUV/m)	Average Limit (dBUV/m)	Margin (dB)	Peak Limit (dBUV/m)	PK Margin (dB)	Height (cm)	Polarity
1	* 2.4835	50.92	Pk	31.9	-22.8	0	60.02	-	-	74	-13.98	390	V
2	* 2.48353	51.12	Pk	31.9	-22.8	0	60.22	-	-	74	-13.78	390	V
3	* 2.4835	32.5	RMS	31.9	-22.8	5.01	46.61	54	-7.39	-	-	390	V
4	* 2.48375	33.42	RMS	31.9	-22.8	5.01	47.53	54	-6.47	-	-	390	V

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

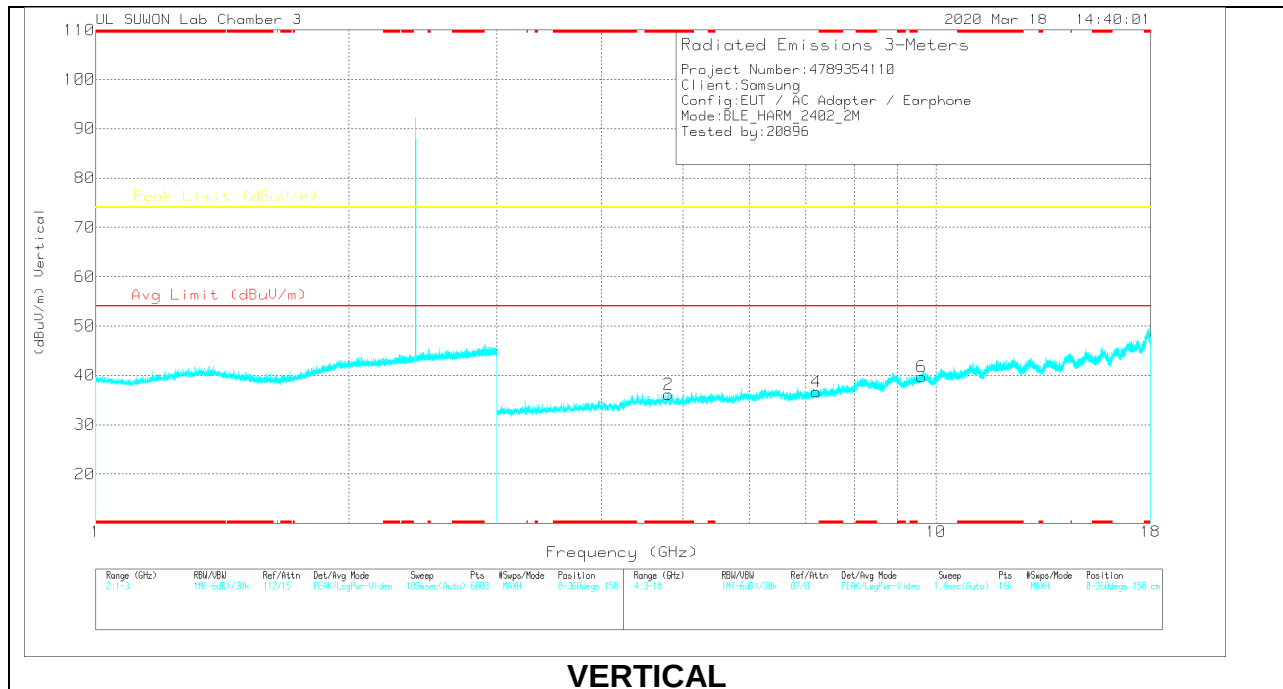
Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

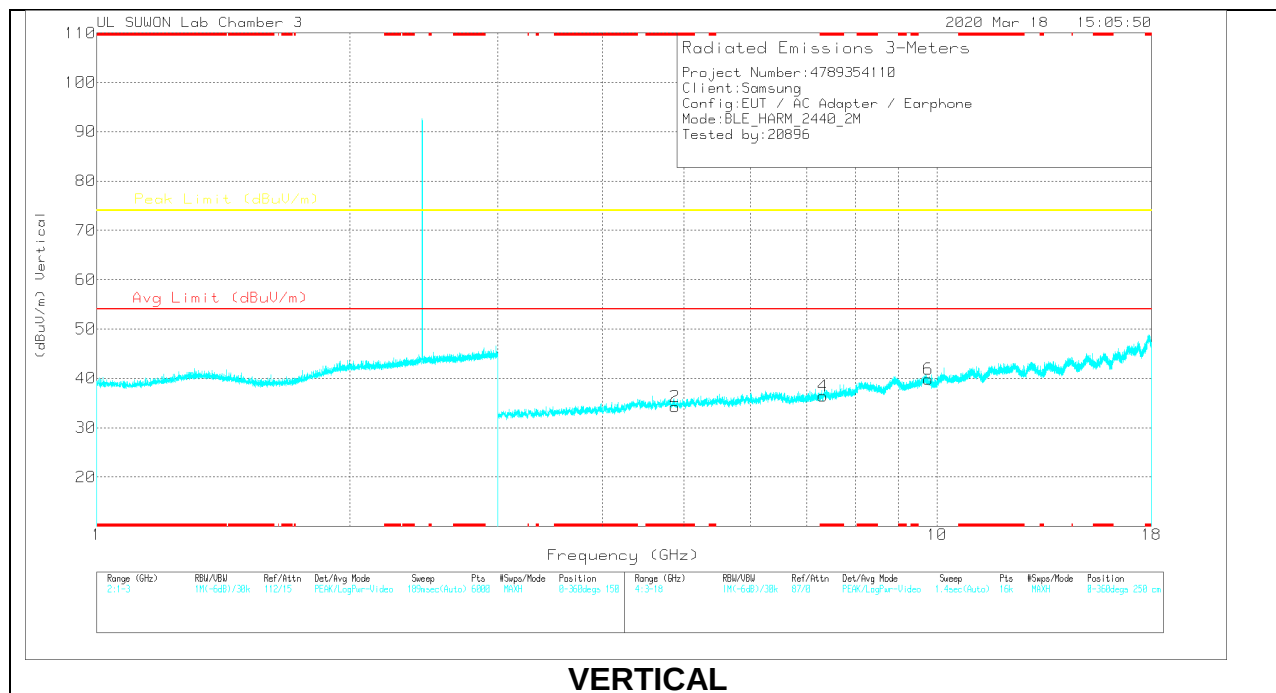
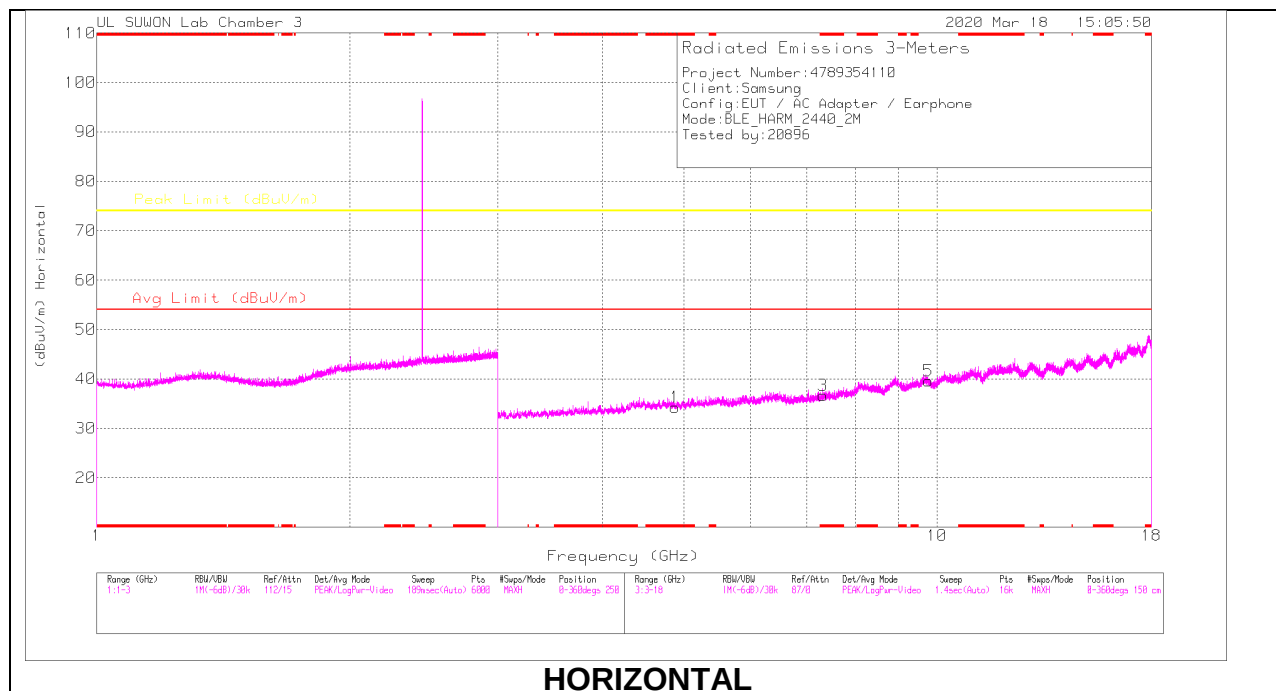
RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.80562	38.83	PK2	34.2	-28	0	45.03	-	-	74	-28.97	0	100	H
* 4.80588	38.52	PK2	34.2	-28	0	44.72	-	-	74	-29.28	0	100	V
7.20951	35.49	PK2	35.8	-23.7	0	47.59	-	-	74	-26.41	0	100	H
7.20914	35.03	PK2	35.8	-23.7	0	47.13	-	-	74	-26.87	0	100	V
9.61038	32.5	PK2	37	-19.7	0	49.8	-	-	74	-24.2	0	100	H
9.61105	32.24	PK2	37	-19.7	0	49.54	-	-	74	-24.46	0	100	V

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

PK2 - KDB558074 Method: Maximum Peak

MID CHANNEL RESULTS



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

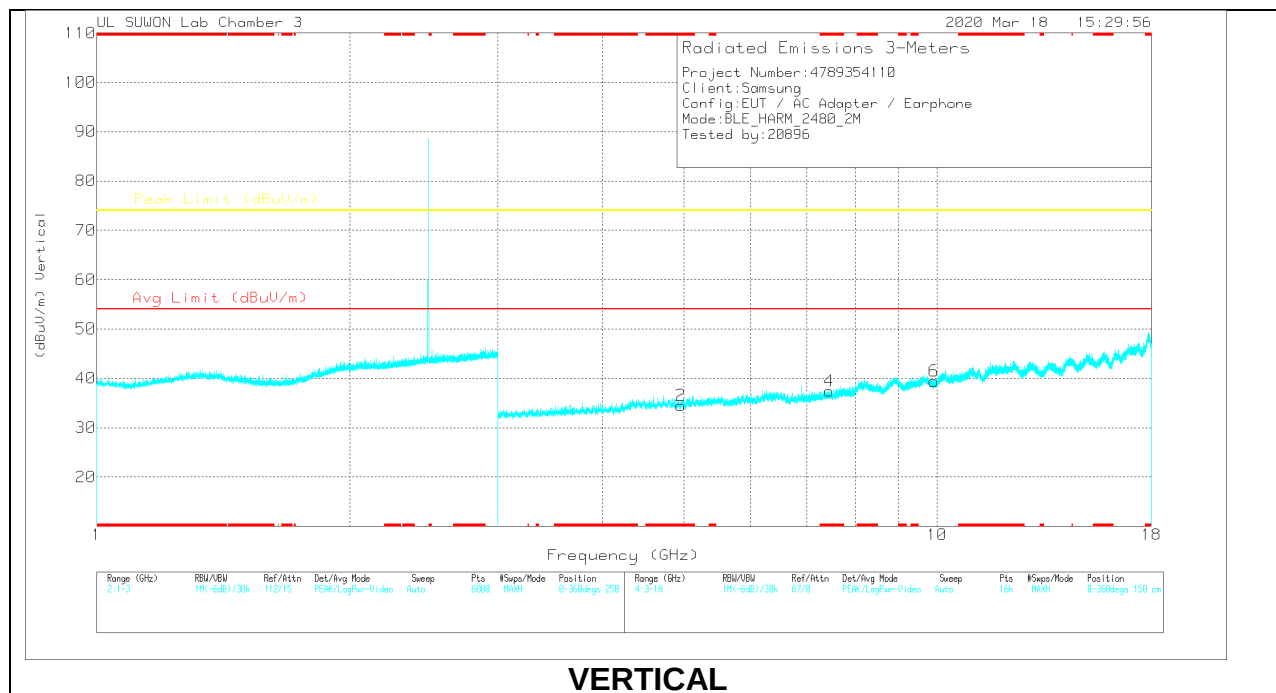
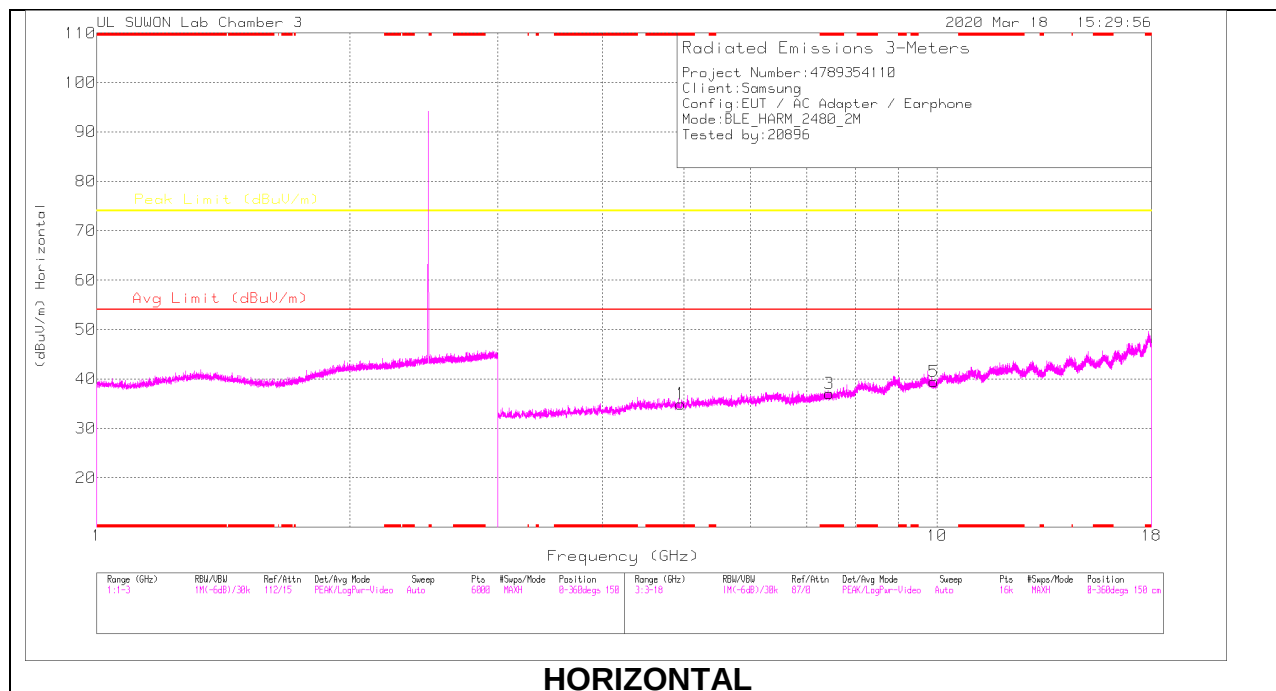
RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88271	39.61	PK2	34.2	-28.8	0	45.01	-	-	74	-28.99	0	100	H
* 4.88275	39.32	PK2	34.2	-28.8	0	44.72	-	-	74	-29.28	0	100	V
* 7.31932	34.63	PK2	35.8	-23.2	0	47.23	-	-	74	-26.77	0	100	H
* 7.323	34.84	PK2	35.8	-23.2	0	47.44	-	-	74	-26.56	0	100	V
9.76299	32.07	PK2	37.2	-19.3	0	49.97	-	-	74	-24.03	0	100	H
9.76289	31.59	PK2	37.2	-19.3	0	49.49	-	-	74	-24.51	0	100	V

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

PK2 - KDB558074 Method: Maximum Peak

HIGH CHANNEL RESULTS



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

RADIATED EMISSIONS

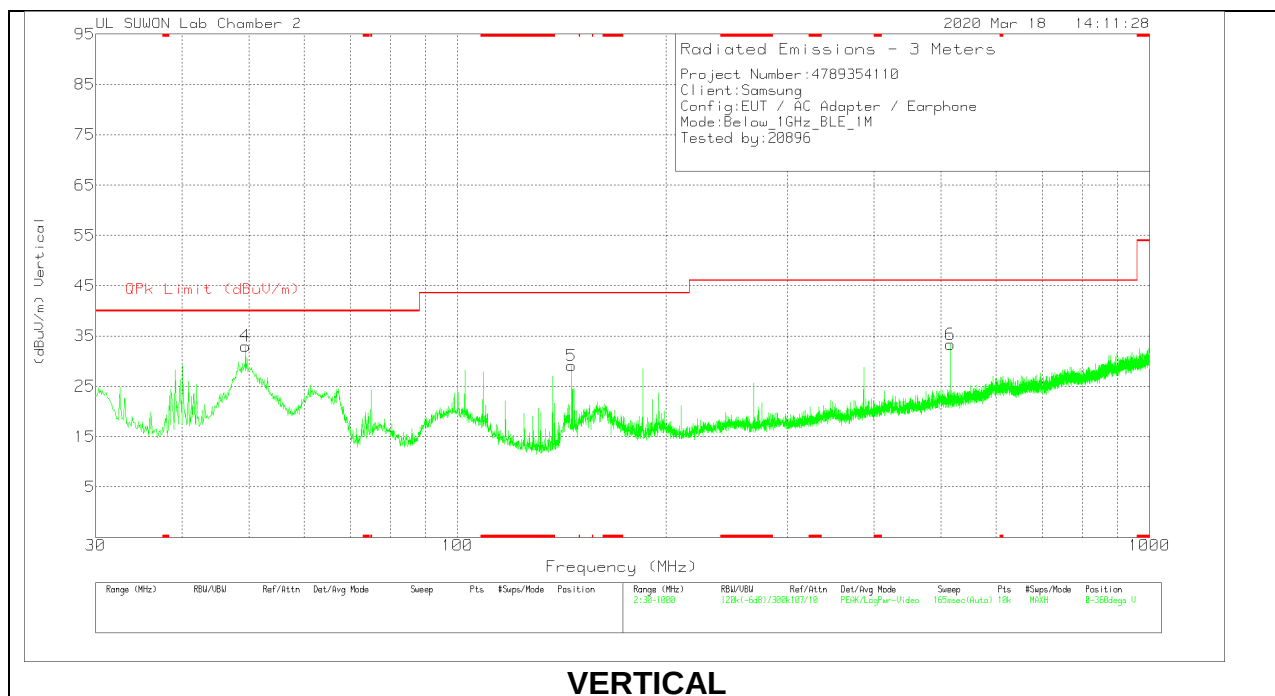
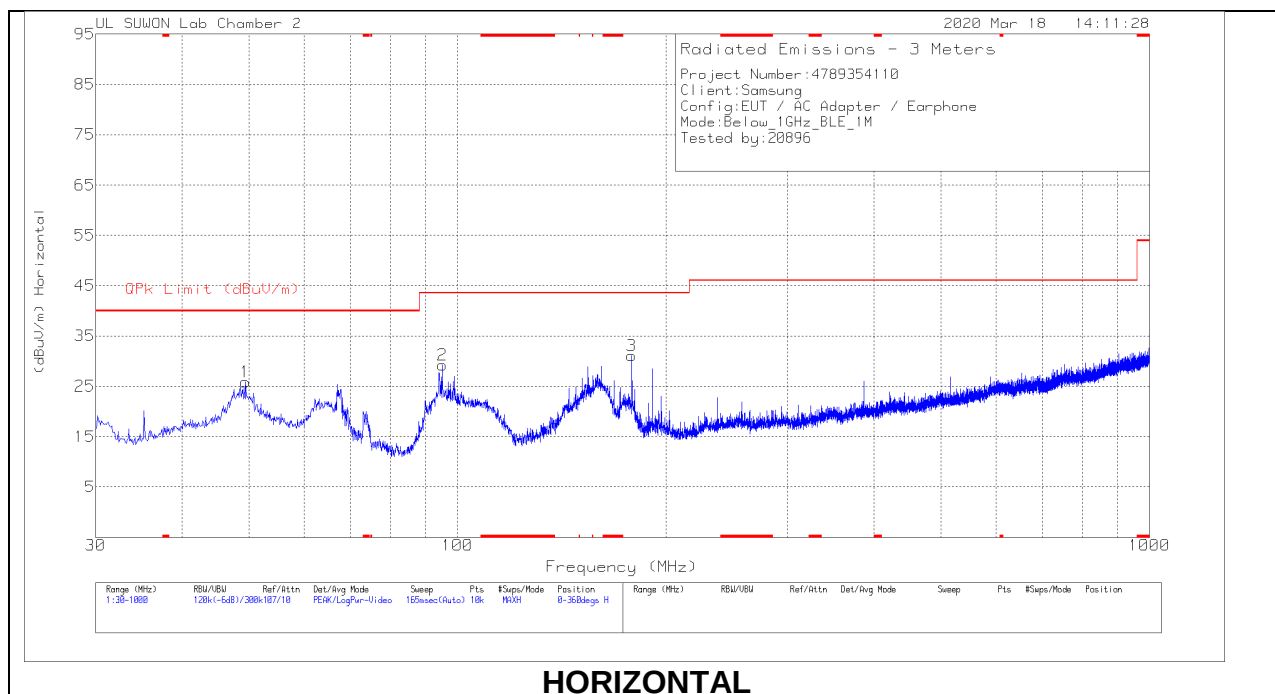
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.95967	38.83	PK2	34.2	-28.5	0	44.53	-	-	74	-29.47	0	100	H
* 4.95931	39.13	PK2	34.2	-28.5	0	44.83	-	-	74	-29.17	0	100	V
* 7.44191	34.56	PK2	35.8	-23.1	0	47.26	-	-	74	-26.74	0	100	H
* 7.44141	34.64	PK2	35.8	-23	0	47.44	-	-	74	-26.56	0	100	V
9.92188	30.98	PK2	37.5	-19.5	0	48.98	-	-	74	-25.02	0	100	H
9.92095	31.41	PK2	37.5	-19.5	0	49.41	-	-	74	-24.59	0	100	V

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

PK2 - KDB558074 Method: Maximum Peak

10.3. WORST CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



Below 1GHz Data(1 Mbps)

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Below_1G[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	49.4	37.91	Pk	19.7	-31.7	0	25.91	40	-14.09	0-360	400	H
2	95.087	43.32	Pk	17.2	-31.3	0	29.22	43.52	-14.3	0-360	300	H
3	178.604	46.61	Pk	15.5	-31	0	31.11	43.52	-12.41	0-360	200	H
4	49.4	45.03	Pk	19.7	-31.7	0	33.03	40	-6.97	0-360	100	V
5	146.206	46.12	Pk	14.1	-31.1	0	29.12	43.52	-14.4	0-360	200	V
6	515.097	39.97	Pk	23.2	-29.8	0	33.37	46.02	-12.65	0-360	100	V

Pk - Peak detector

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

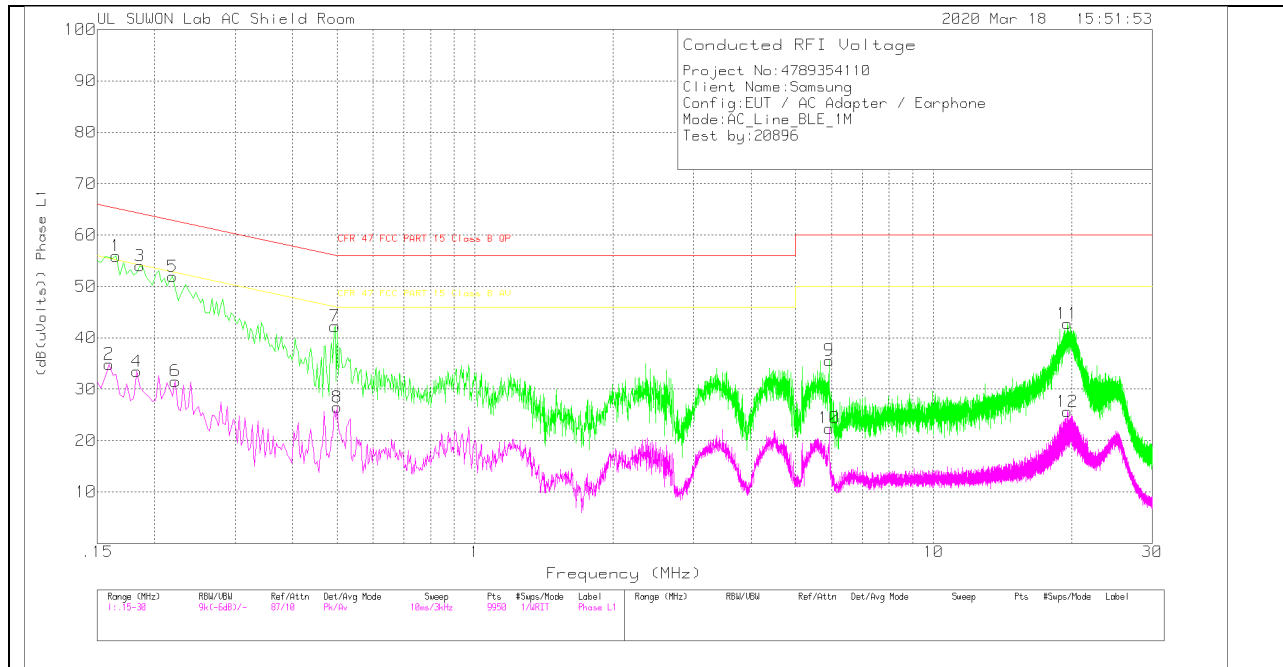
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

RESULTS

11.1.1. AC Power Line (1 Mbps)

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	.165	45.82	Pk	10	.1	55.92	65.21	-9.29	-	-
2	.159	24.87	Av	9.9	.1	34.87	-	-	55.52	-20.65
3	.186	43.79	Pk	10	.2	53.99	64.21	-10.22	-	-
4	.183	23.26	Av	10	.2	33.46	-	-	54.35	-20.89
5	.219	41.94	Pk	9.8	.2	51.94	62.86	-10.92	-	-
6	.222	21.58	Av	9.8	.2	31.58	-	-	52.74	-21.16
7	.495	32.14	Pk	9.9	.2	42.24	56.08	-13.84	-	-
8	.501	16.41	Av	9.9	.2	26.51	-	-	46	-19.49
9	5.922	25.5	Pk	9.8	.3	35.6	60	-24.4	-	-
10	5.922	12.3	Av	9.8	.3	22.4	-	-	50	-27.6
11	19.584	32.06	Pk	10.3	.4	42.76	60	-17.24	-	-
12	19.584	14.92	Av	10.3	.4	25.62	-	-	50	-24.38

Pk - Peak detector

Av - Average detection

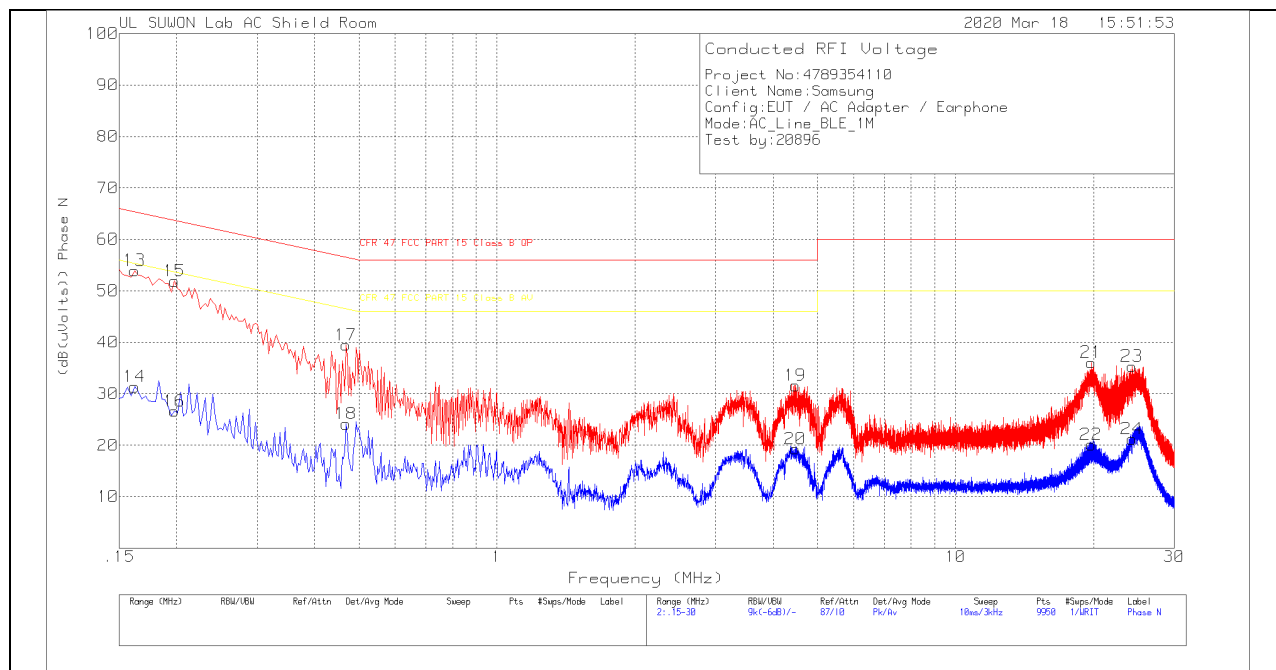
Quasi-Peak Emissions

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)
.16425	38.84	Qp	10	.1	48.94	65.25	-16.31	-	-

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]	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	.162	43.82	Pk	10	.1	53.92	65.36	-11.44	-	-
14	.162	21.25	Av	10	.1	31.35	-	-	55.36	-24.01
15	.198	41.79	Pk	9.9	.2	51.89	63.69	-11.8	-	-
16	.198	16.5	Av	9.9	.2	26.6	-	-	53.69	-27.09
17	.468	29.35	Pk	9.9	.2	39.45	56.55	-17.1	-	-
18	.468	14.05	Av	9.9	.2	24.15	-	-	46.55	-22.4
19	4.473	21.5	Pk	9.8	.3	31.6	56	-24.4	-	-
20	4.473	9.17	Av	9.8	.3	19.27	-	-	46	-26.73
21	19.77	25.37	Pk	10.3	.4	36.07	60	-23.93	-	-
22	19.758	9.41	Av	10.3	.4	20.11	-	-	50	-29.89
23	24.255	24.43	Pk	10.5	.4	35.33	60	-24.67	-	-
24	24.255	10.31	Av	10.5	.4	21.21	-	-	50	-28.79

Pk - Peak detector

Av - Average detection

END OF TEST REPORT