



CERTIFICATION TEST REPORT

Report Number. : 4789354138-E5V1

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

Model : SM-G770U1

FCC ID : A3LSMG770U

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

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

Date Of Issue:

March 03, 2020

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ACCREDITED

Testing Laboratory

TL-637

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	03/03/20	Initial issue	Hyunsik Yun

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

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

MODEL: SM-G770U1

SERIAL NUMBER: R37MC0CE6KN (CONDUCTED)
R38MC0CE28A (RADIATED);

DATE TESTED: JAN 29, 2020 – FEB 18, 2020;

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

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
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Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



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Suwon Lab Engineer
UL Korea, Ltd.

2. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
15.247 (a)(2)	Occupied Band width (6dB)	>500KHz	Conducted	Pass
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass
15.247 (b)(3)	TX conducted output power	<30dBm		Pass
15.247 (e)	PSD	<8dBm		Pass
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m(Av)	Radiated	Pass

3. TEST METHODOLOGY

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 558074 D01 15.247 Meas Guidance v05r02.
4. 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	
<input type="checkbox"/>	Chamber 1
<input checked="" type="checkbox"/>	Chamber 2
<input type="checkbox"/>	Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <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:

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

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 GSM/CDMA/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac, ANT+ and NFC. 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	500kbps	Peak	7.119	5.15
		Average	6.981	4.99
	2Mbps	Peak	7.221	5.27
		Average	6.584	4.55

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 -3.57 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 Y 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 500kbps(37 pkt) and 2Mbps(255 pkt) power is the worst case for symbol rate. All tests were performed in these two modes.

Symbol Rate [Ms/s]	Mode	Frequency [MHz]	Conducted Burst Avg [dBm]	Symbol Rate [Ms/s]	Mode	Frequency [MHz]	Conducted Burst Avg [dBm]
1	1Mbps (37 pkt)	2402	6.401	2	2Mbps (37 pkt)	2402	6.228
		2440	6.656			2440	6.516
		2480	6.120			2480	6.218
	1Mbps (255 pkt)	2402	6.384		2Mbps (255 pkt)	2402	6.282
		2440	6.634			2440	6.584
		2480	6.066			2480	6.134
	Coded S=8 125 kbps (37 pkt)	2402	6.468				
		2440	6.749				
		2480	6.310				
	Coded S=8 125 kbps (128 pkt)	2402	6.488				
		2440	6.774				
		2480	6.299				
	Coded S=2 500 kbps (37 pkt)	2402	6.693				
		2440	6.981				
		2480	6.578				
	Coded S=2 500 kbps (128 pkt)	2402	6.566				
		2440	6.915				
		2480	6.434				

6.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37MAYF19B7DK3	N/A
Data Cable	SAMSUNG	EP-DA705BBE	N/A	N/A

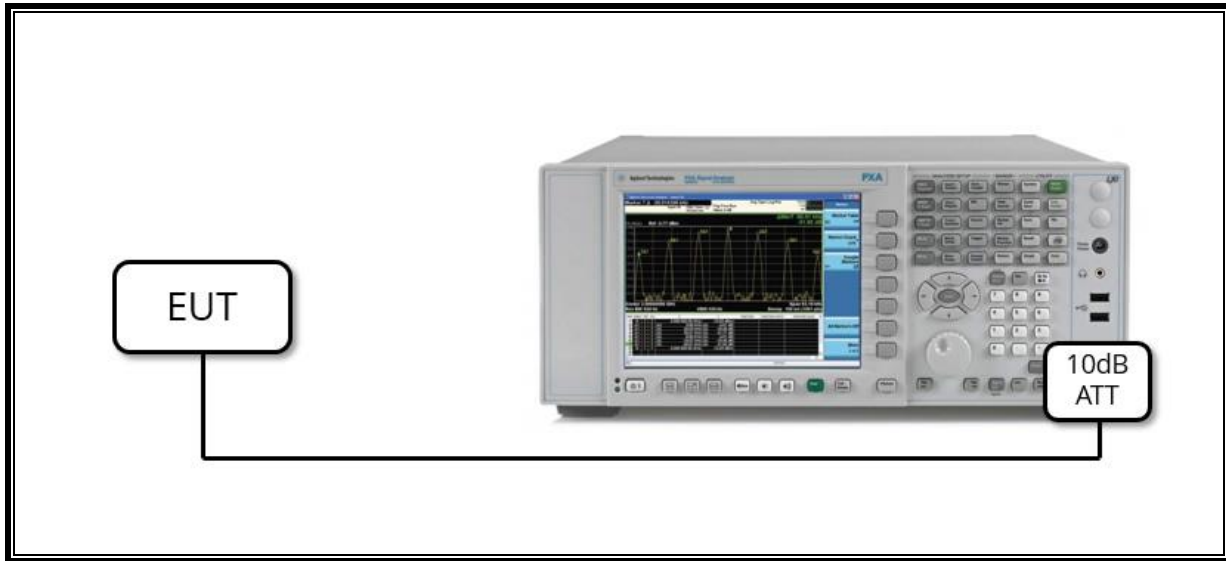
I/O CABLE

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

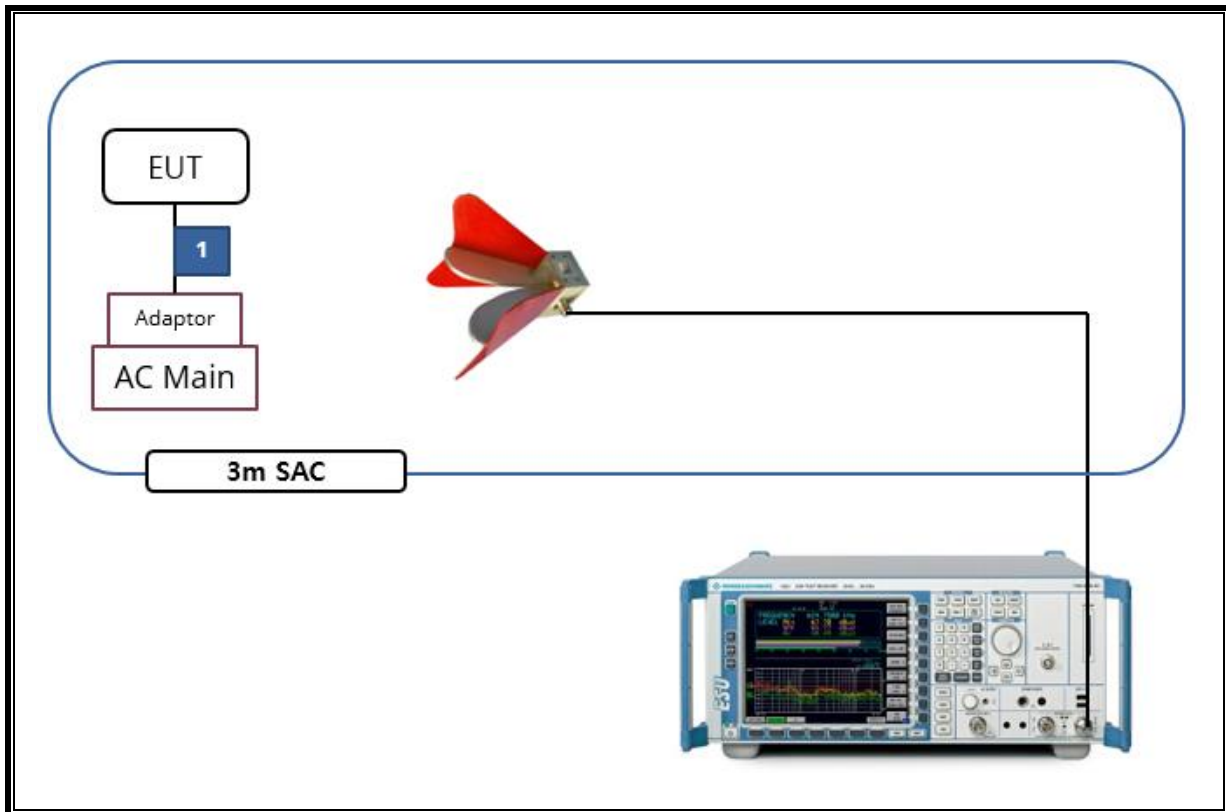
TEST SETUP

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	

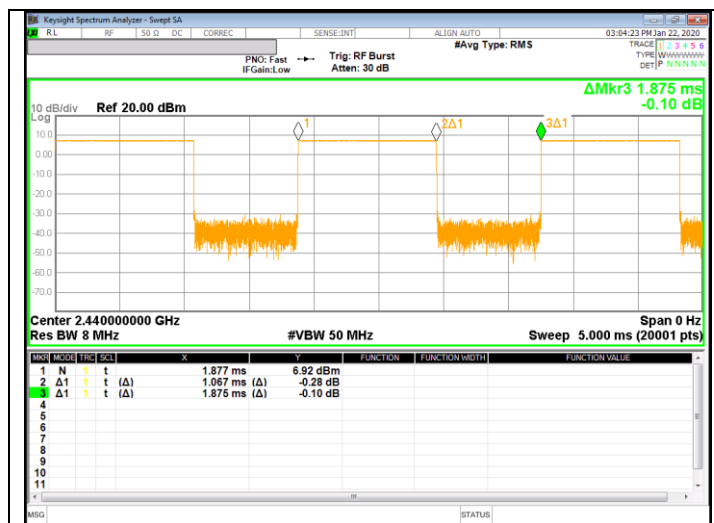
9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

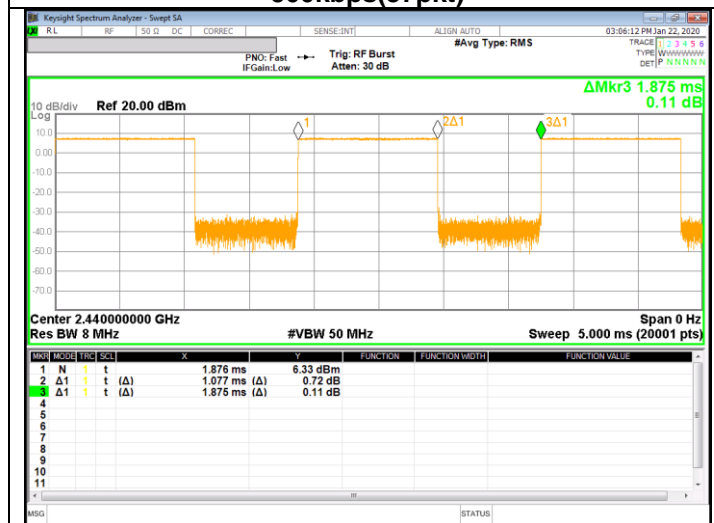
LIMITS

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 500 kbps	1.067	1.875	0.569	56.9%	2.45	0.937
BLE 2 Mbps	1.077	1.875	0.574	57.4%	2.41	0.929



500kbps(37pkt)



2Mbps(255pkt)

9.2. 99% BANDWIDTH

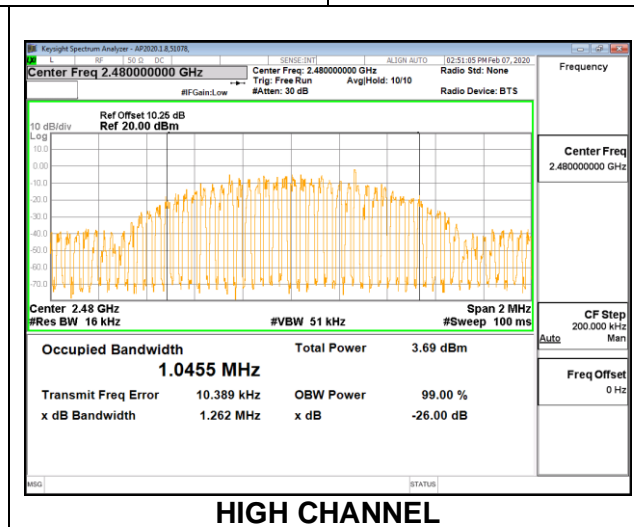
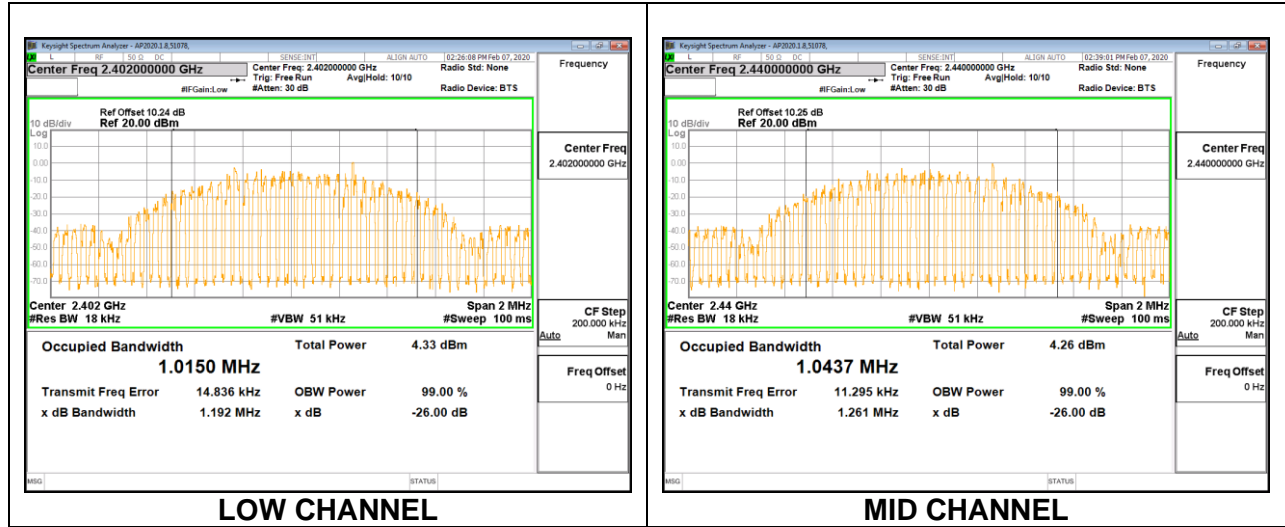
LIMITS

None; for reporting purposes only.

RESULTS

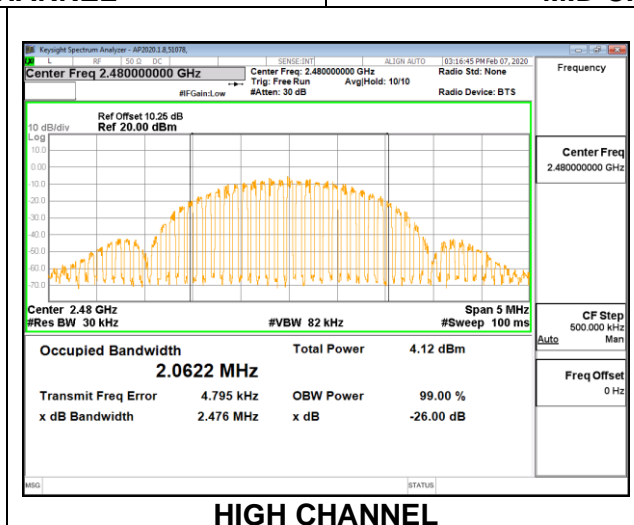
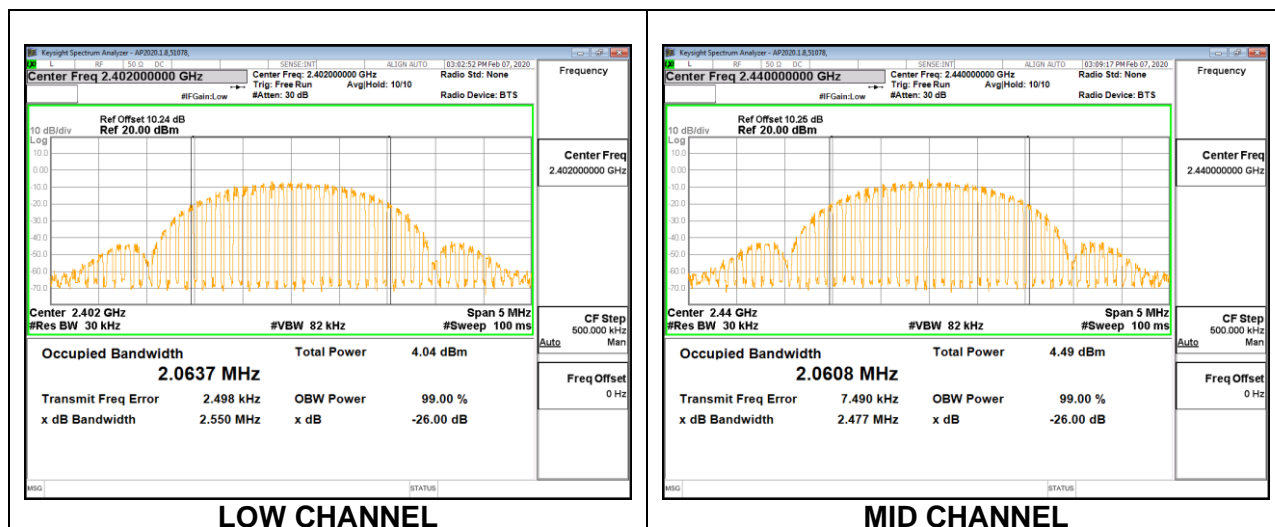
9.2.1. BLE (500Kbps)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0150
Middle	2440	1.0440
High	2480	1.0460



9.2.2. BLE (2Mbps)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	2.0640
Middle	2440	2.0610
High	2480	2.0620



9.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

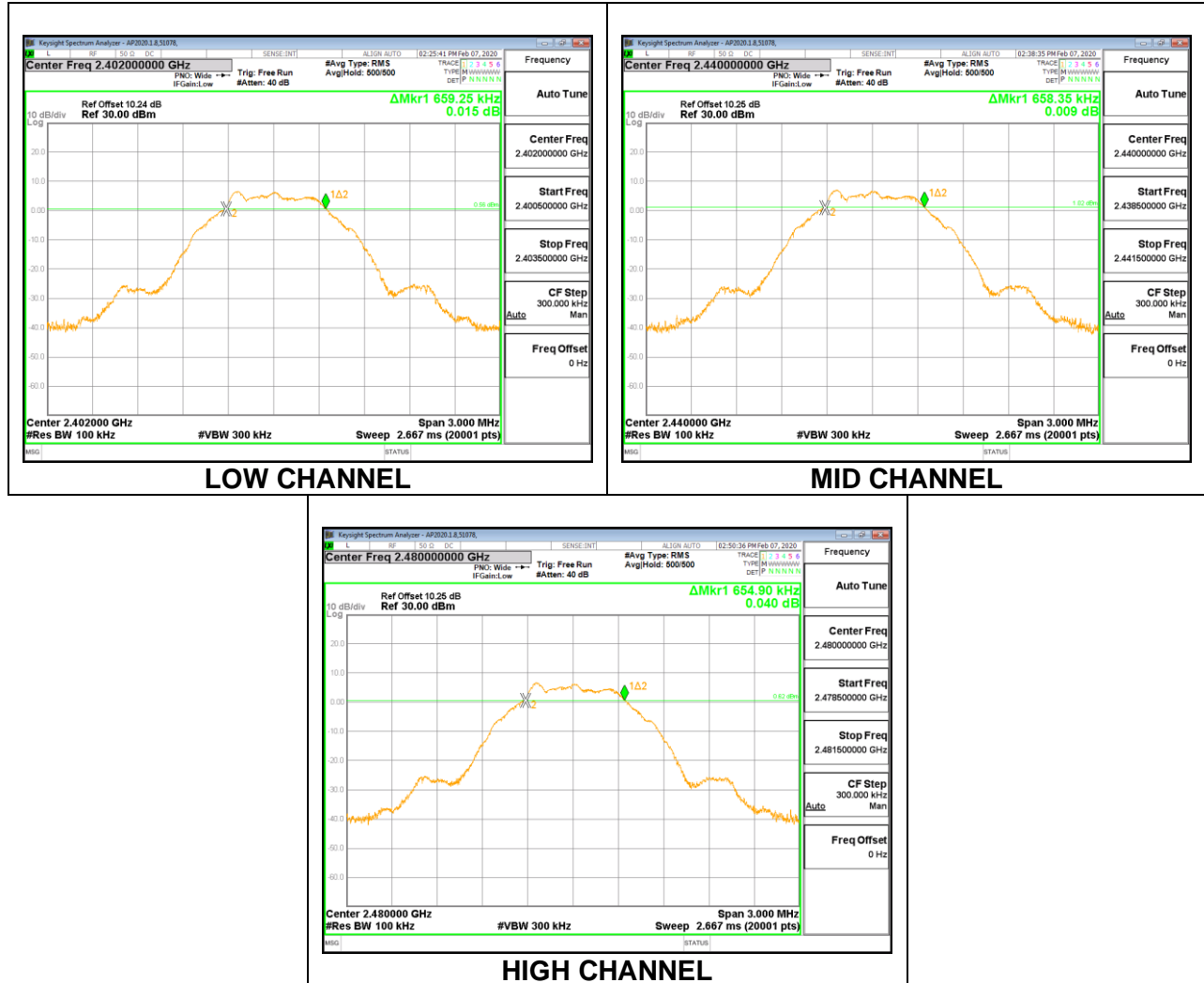
RSS-247 5.2 (a)

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

RESULTS

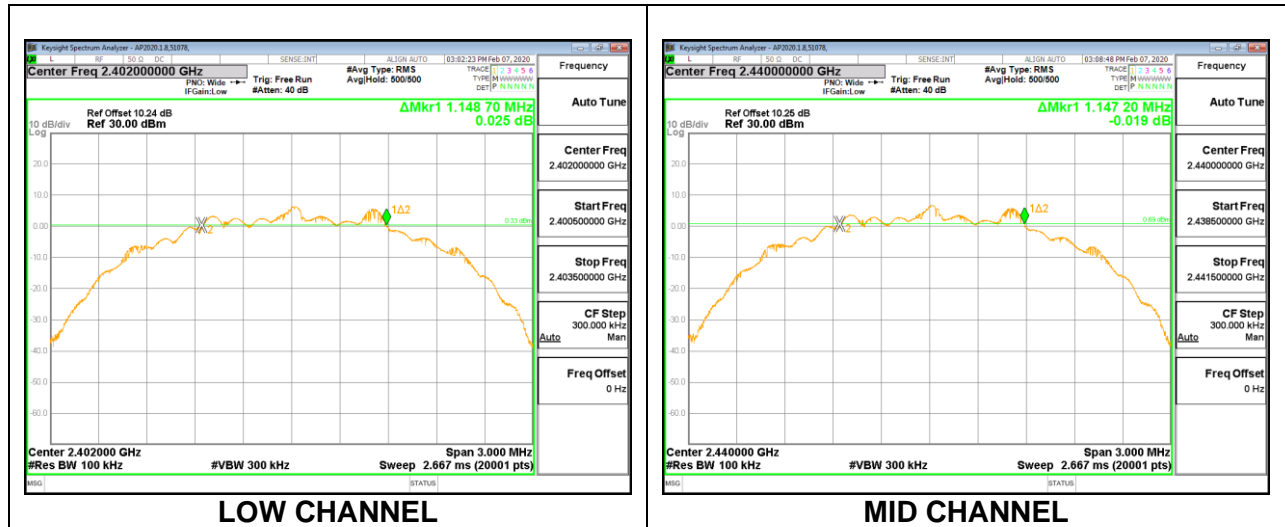
9.3.1. BLE (500Kbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6590	0.5
Middle	2440	0.6580	0.5
High	2480	0.6550	0.5



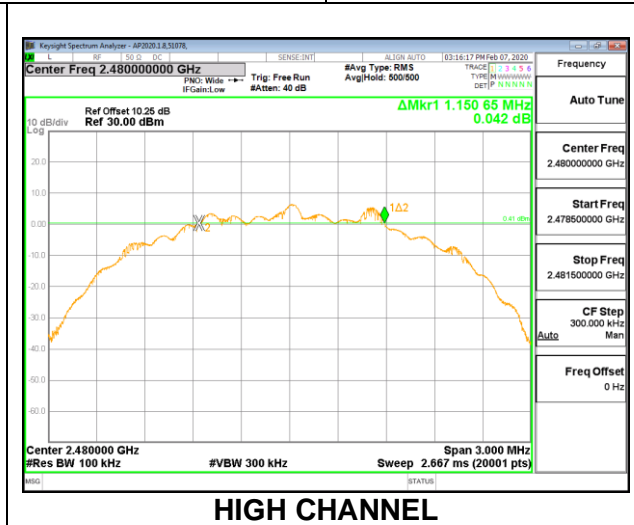
9.3.2. BLE (2Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.1490	0.5
Middle	2440	1.1470	0.5
High	2480	1.1510	0.5



LOW CHANNEL

MID CHANNEL



HIGH CHANNEL

9.4. 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

- 500kbps

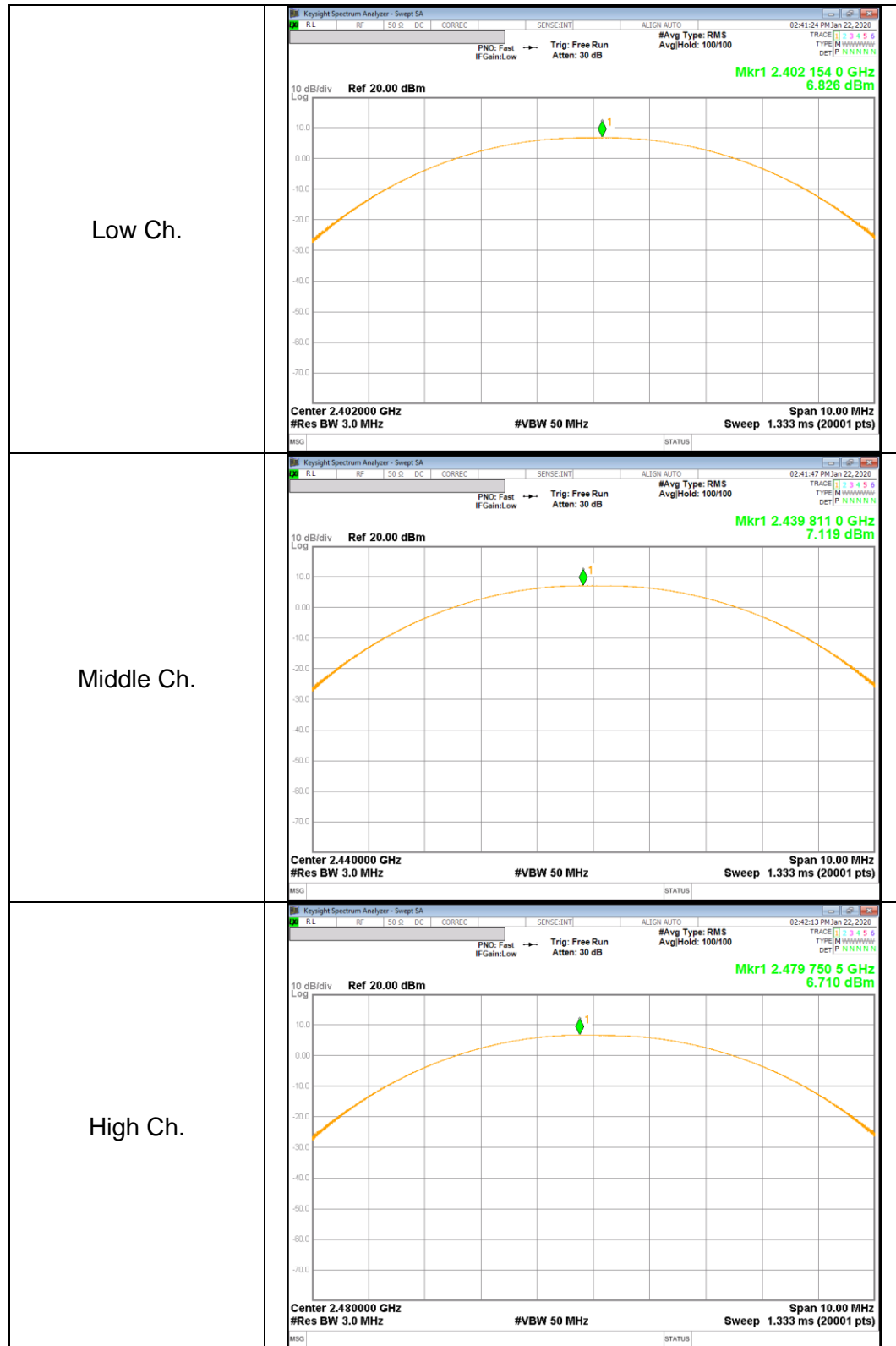
Channel	Frequency [MHz]	Peak Power [dBm]	Limit [dBm]	Margin [dB]
Low	2 402	6.826	30.000	-23.174
Mid	2 440	7.119	30.000	-22.881
High	2 480	6.710	30.000	-23.290
Worst		7.119	30.000	-22.881

- 2Mbps

Channel	Frequency [MHz]	Peak Power [dBm]	Limit [dBm]	Margin [dB]
Low	2 402	6.888	30.000	-23.112
Mid	2 440	7.221	30.000	-22.779
High	2 480	6.832	30.000	-23.168
Worst		7.221	30.000	-22.779

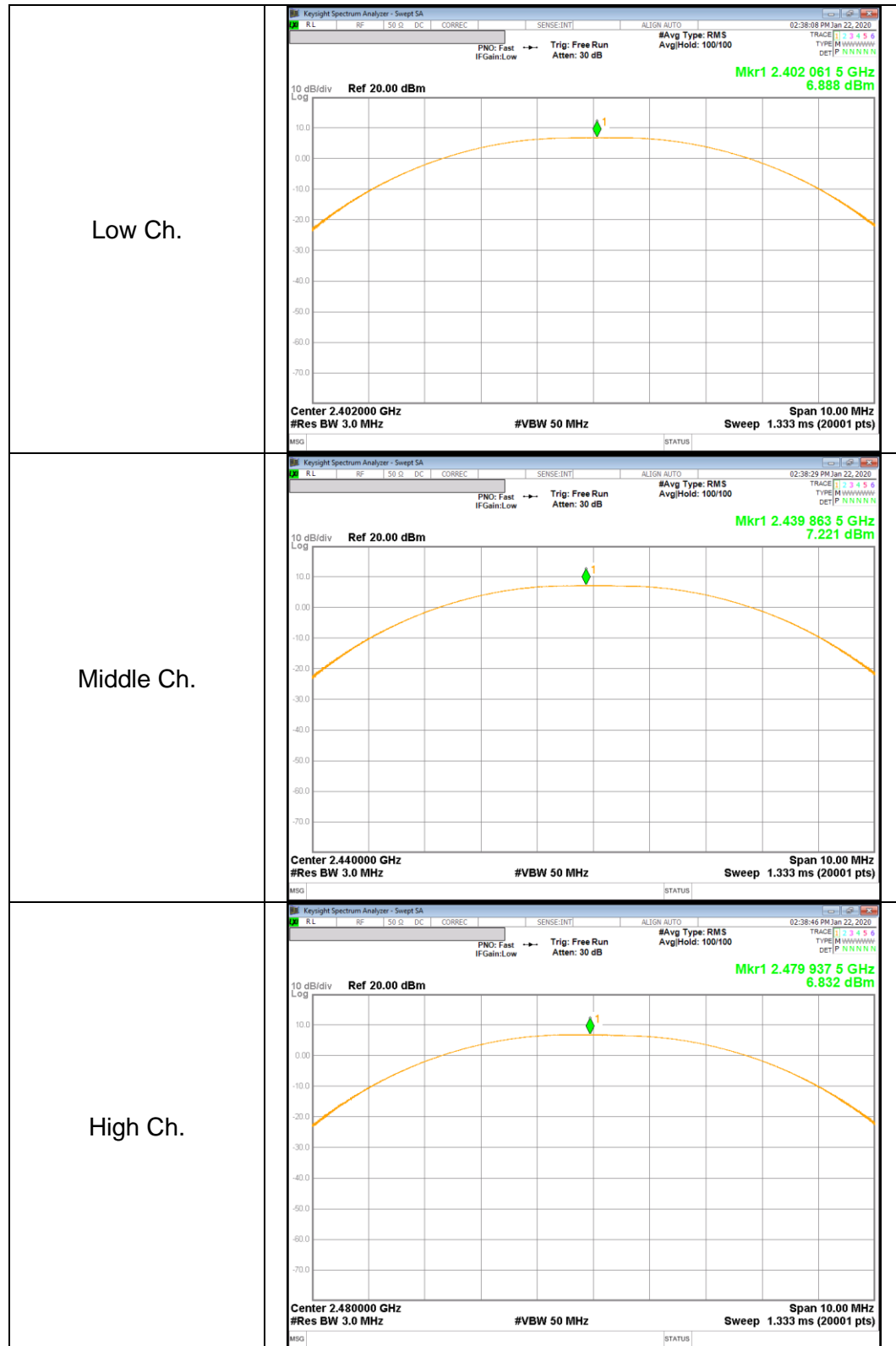
9.4.1. BLE (500Kbps)

PEAK OUTPUT POWER PLOTS



9.4.2. BLE (2Mbps)

PEAK OUTPUT POWER PLOTS



9.5. 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.

- 500kbps

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2 402	6.693	4.669
Middle	2 440	6.981	4.990
High	2 480	6.578	4.547

- 2Mbps

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2 402	6.282	4.248
Middle	2 440	6.584	4.554
High	2 480	6.134	4.106

9.6. POWER SPECTRAL DENSITY

LIMITS

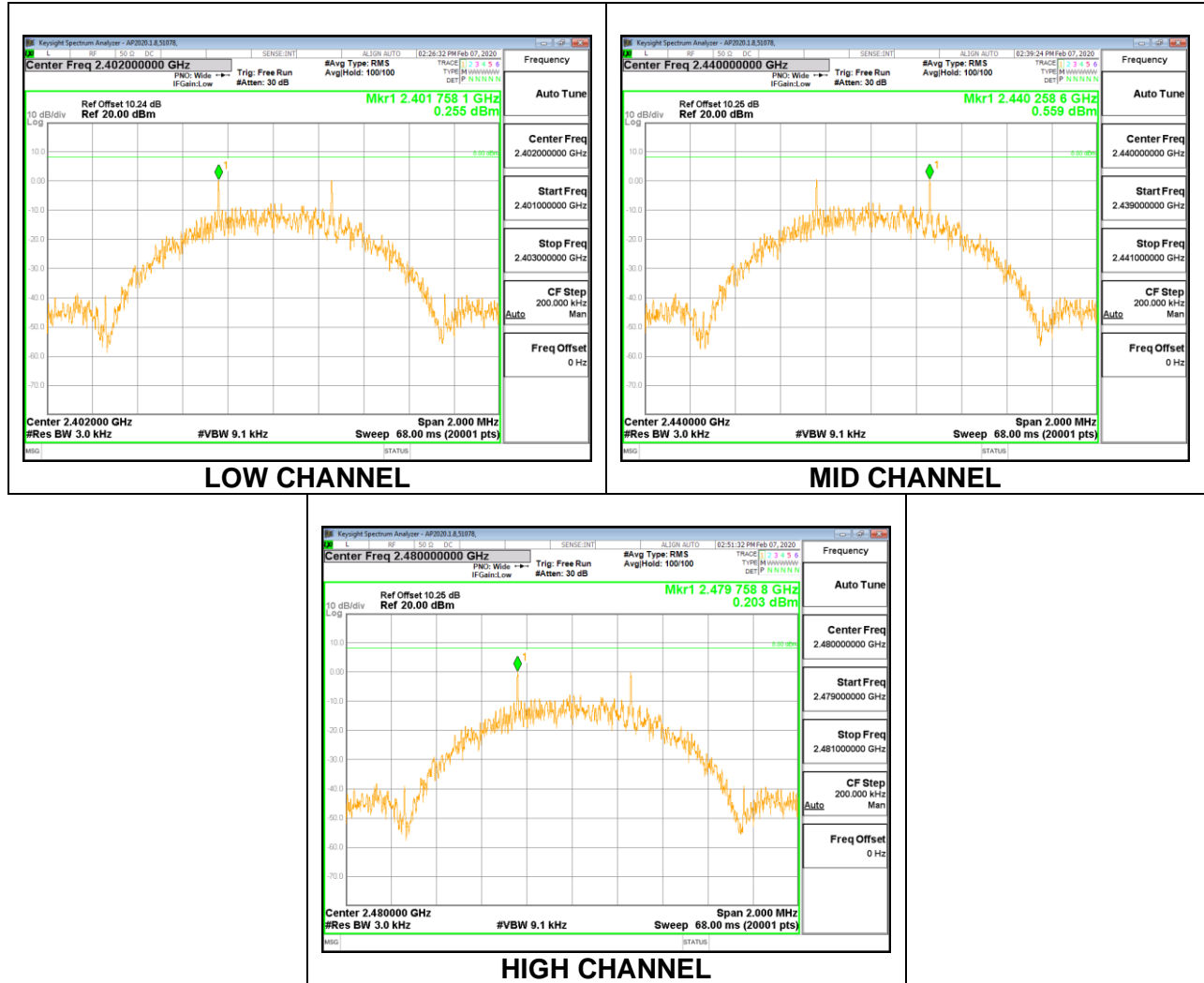
FCC §15.247 (e)

RSS-247 (5.2) (b)

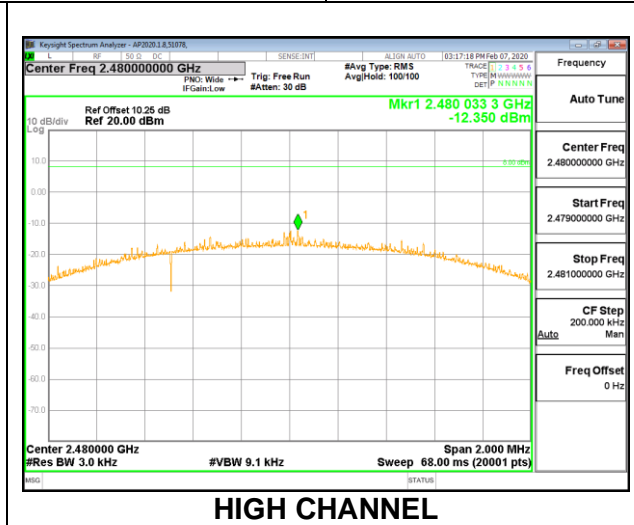
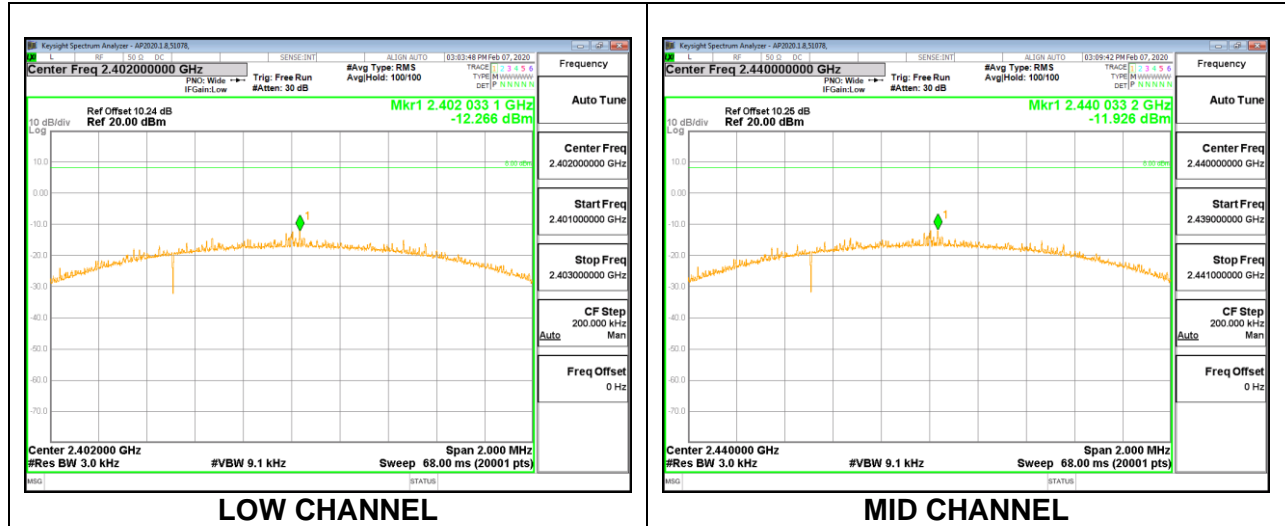
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

9.6.1. BLE (500Kbps)



9.6.2. BLE (2Mbps)



9.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

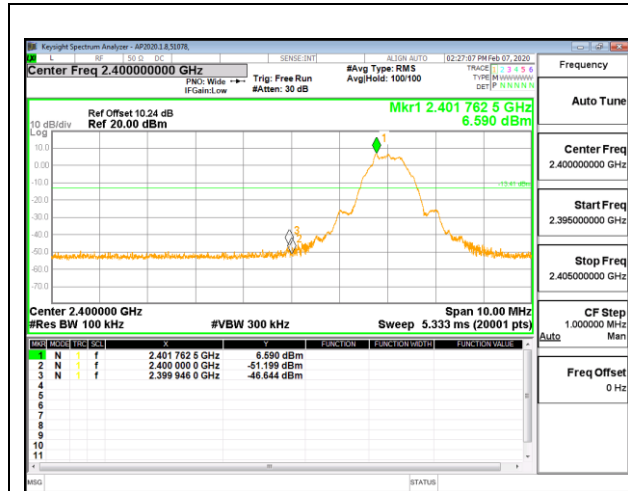
FCC §15.247 (d)

RSS-247 5.5

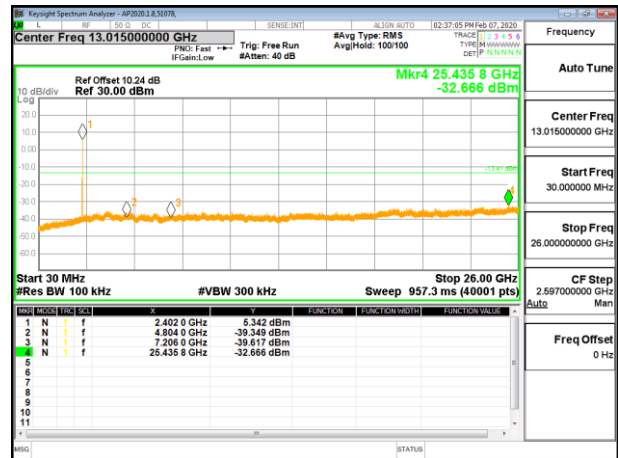
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

RESULTS

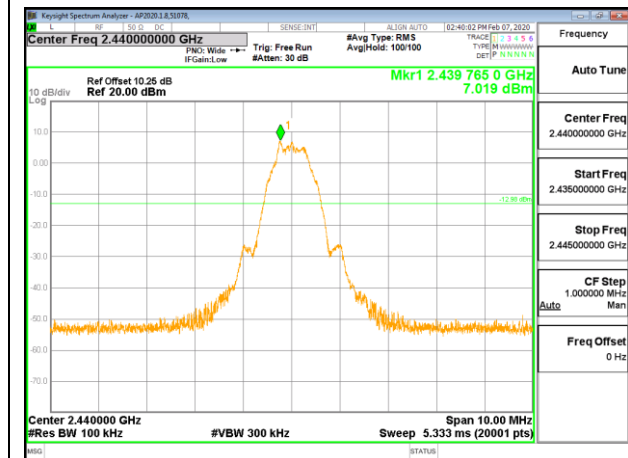
9.7.1. BLE (500Kbps)



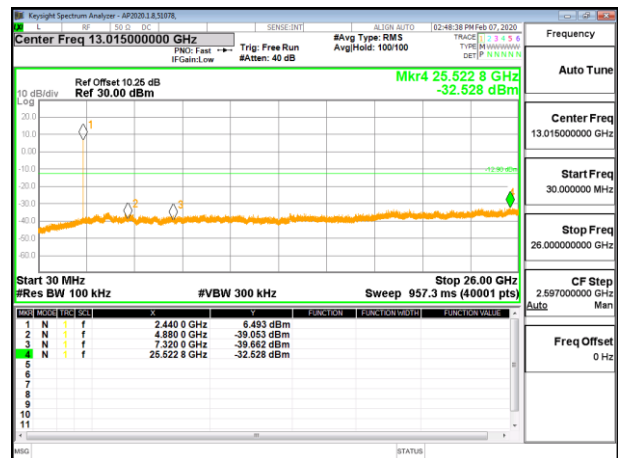
LOW CHANNEL BANDEDGE



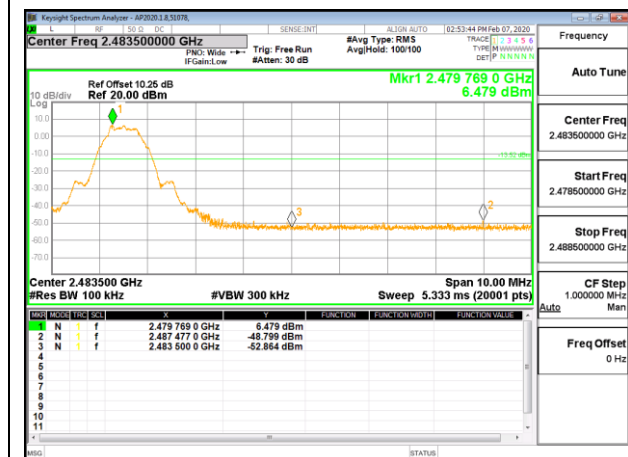
OUT-OF-BAND LOW CHANNEL



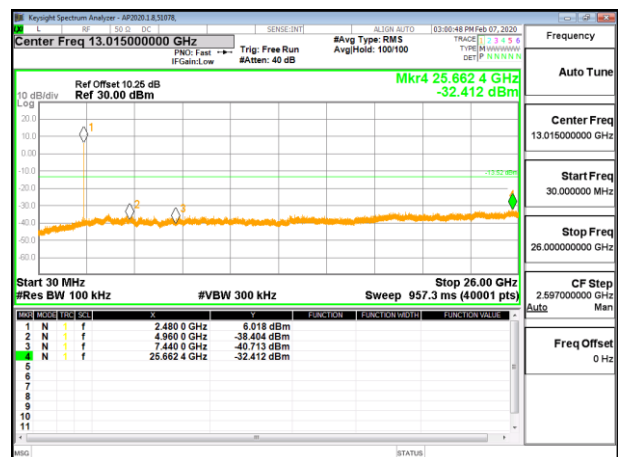
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

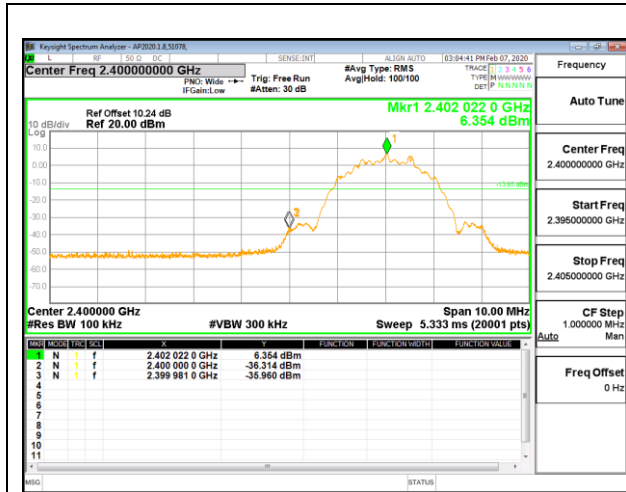


HIGH CHANNEL BANDEDGE

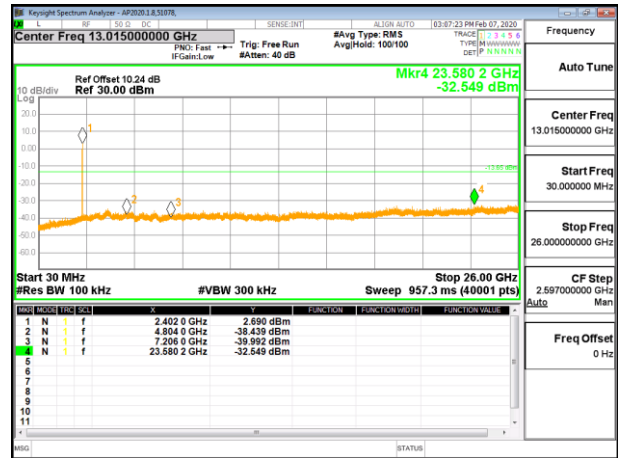


OUT-OF-BAND HIGH CHANNEL

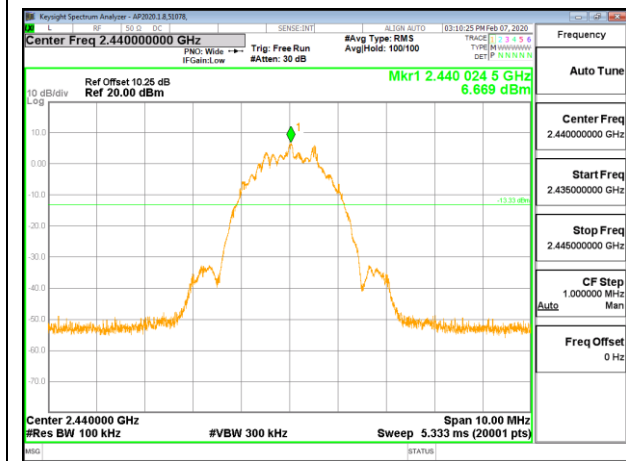
9.7.2. BLE (2Mbps)



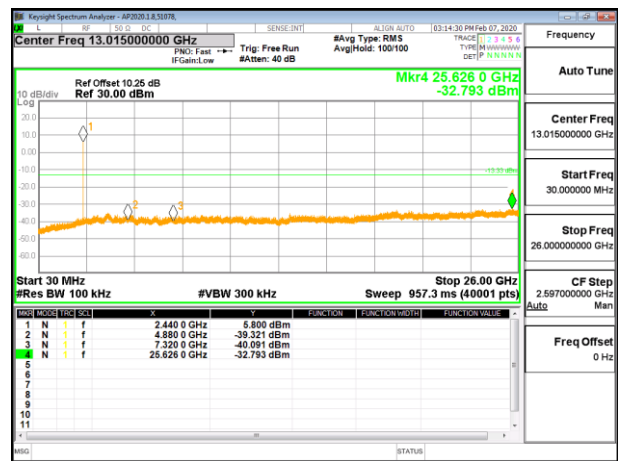
LOW CHANNEL BANDEDGE



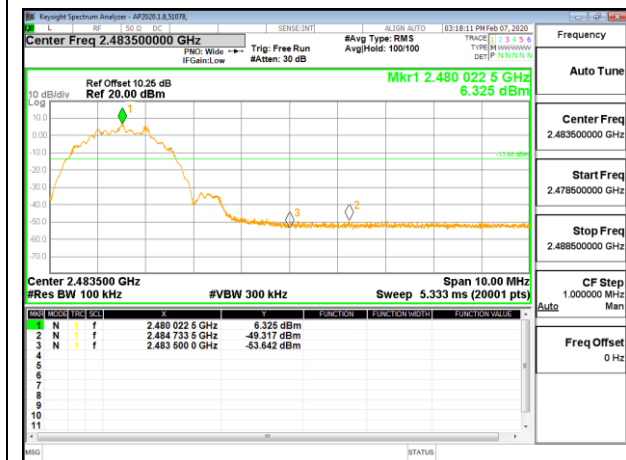
OUT-OF-BAND LOW CHANNEL



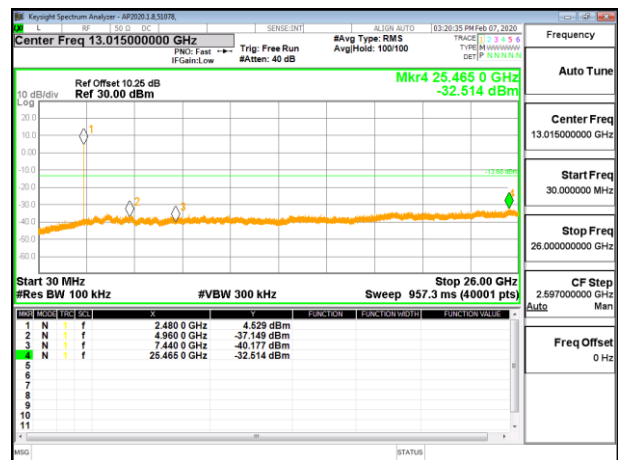
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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.

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 bandedge, Final detection of spurious harmonic emissions) Duty cycle factor = $10 \log(1/x)$. For this sample: For 1Mbps, DCF = $10 \log(1/0.604) = 2.19 \text{ dB}$ (Spectrum Analyzer round it up to 2.19dB) and for 2Mbps, DCF = $10 \log(1/0.310) = 5.09 \text{ dB}$ (Spectrum Analyzer round it up to 5.10dB)

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 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.

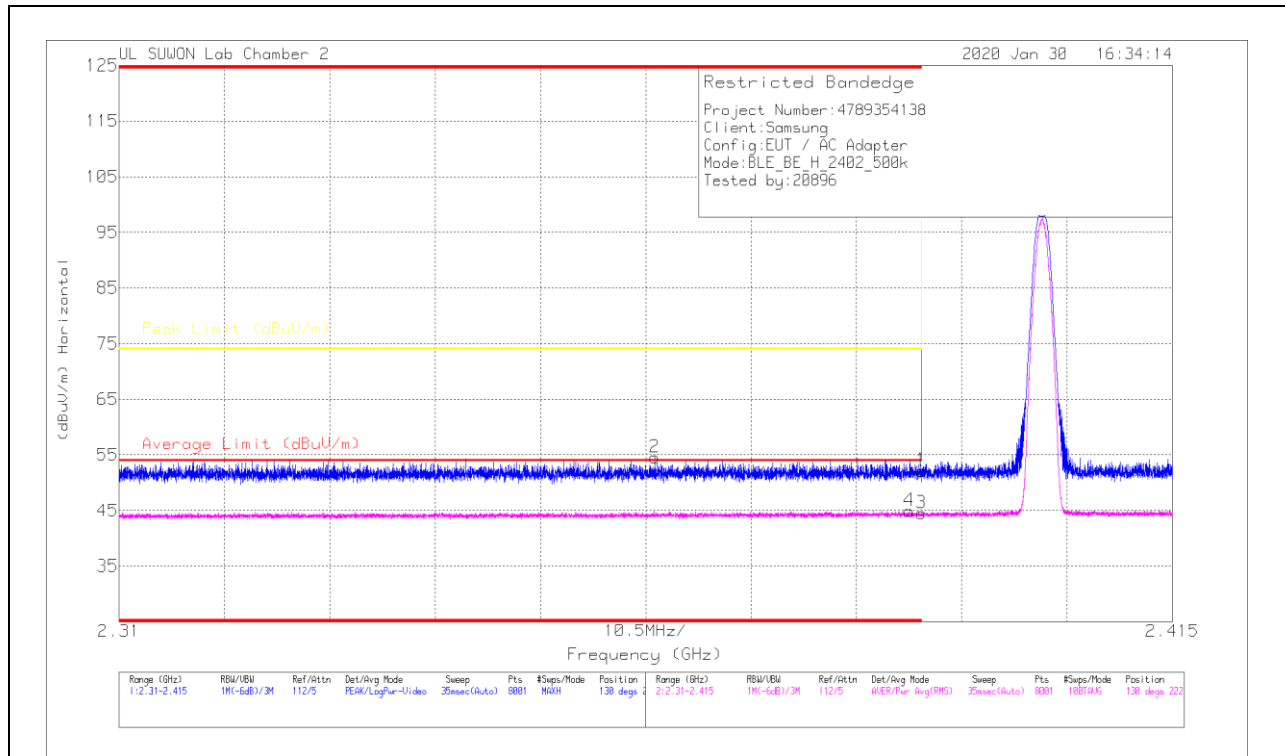
10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (500Kbps)

Antenna 1

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



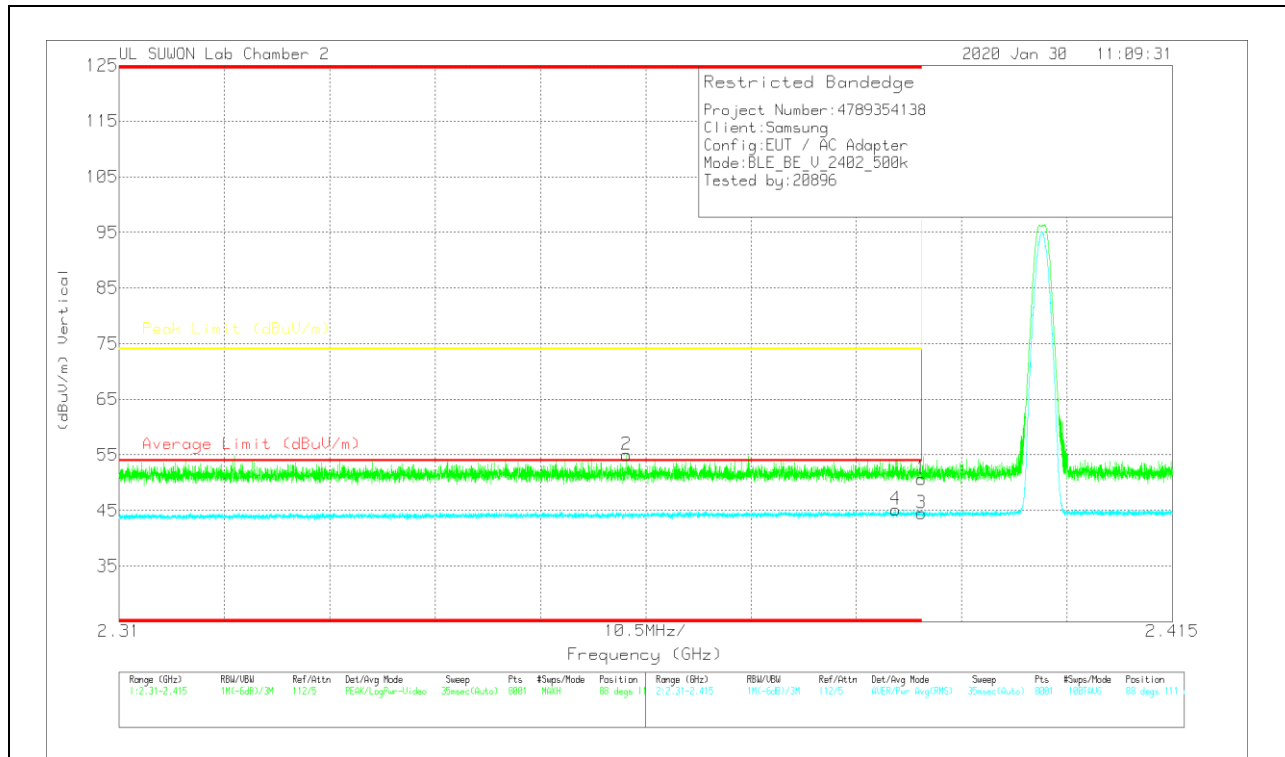
Marker	Frequency(GHz)	MeterReading(dBμV)	Det	3117_00168724	10dB_ATT(dB)	DC Corr (dB)	CorrectedReading(dBuV/m)	Average Limit (dBuV/m)	Margin(dB)	Peak Limit (dBuV/m)	PK Margin(dB)	Azimuth(Degs)	Height(cm)	Polarity
1	*2.39	41.15	Pk	31.6	-20.6	0	52.15	-	-	74	-21.85	130	222	H
2	*2.36338	43.64	Pk	31.6	-20.7	0	54.54	-	-	74	-19.46	130	222	H
3	*2.39	31.08	RMS	31.6	-20.6	2.45	44.53	54	-9.47	-	-	130	222	H
4	*2.38876	31.46	RMS	31.6	-20.6	2.45	44.91	54	-9.09	-	-	130	222	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	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	39.7	Pk	31.6	-20.6	0	50.7	-	-	74	-23.3	88	111	V
2	* 2.3806	44.1	Pk	31.6	-20.7	0	55	-	-	74	-19	88	111	V
3	* 2.39	31.06	RMS	31.6	-20.6	2.45	44.51	54	-9.49	-	-	88	111	V
4	* 2.38741	31.74	RMS	31.6	-20.6	2.45	45.19	54	-8.81	-	-	88	111	V

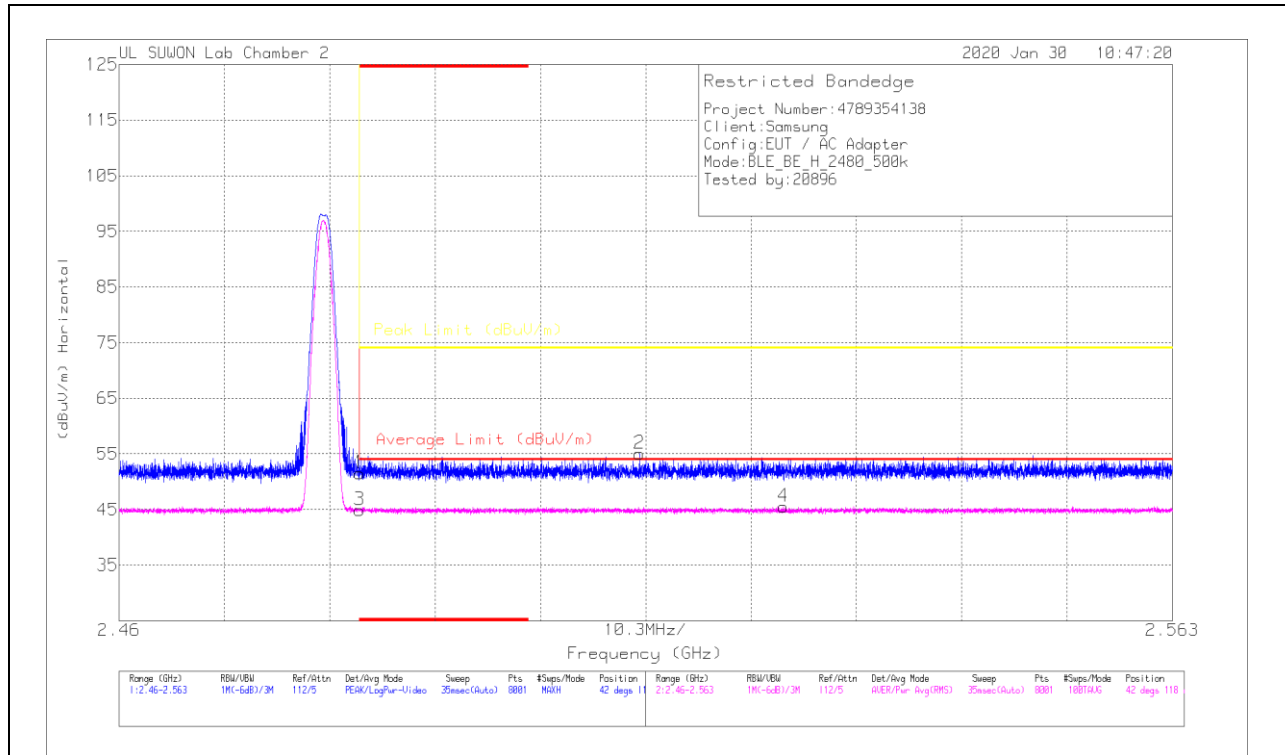
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



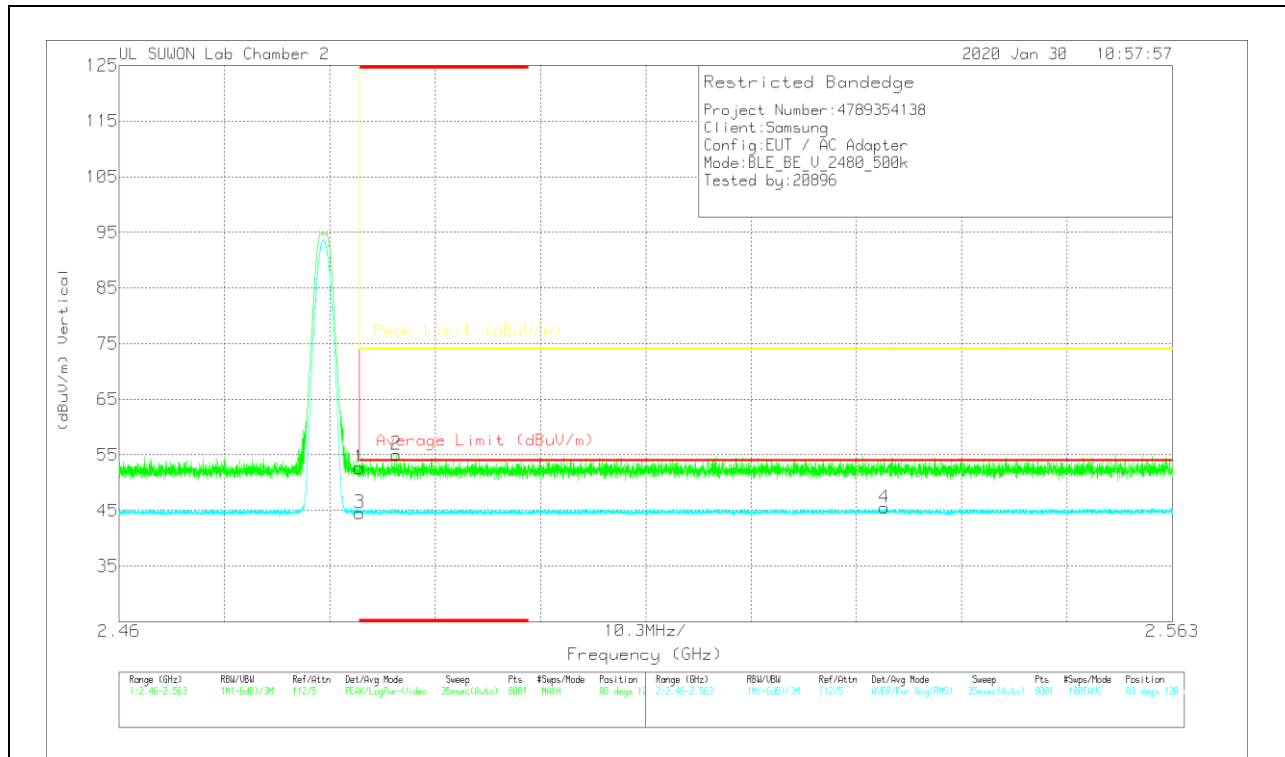
Marker	Frequency (GHz)	Meas Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	40.05	Pk	31.9	-20.4	0	51.55	-	-	74	-22.45	42	118	H
2	2.51098	43.66	Pk	31.9	-20.5	0	55.06	-	-	74	-18.34	42	118	H
3	* 2.48351	30.98	RMS	31.9	-20.4	2.45	44.93	54	-9.07	-	-	42	118	H
4	2.52494	31.57	RMS	31.9	-20.4	2.45	45.52	54	-8.48	-	-	42	118	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	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	* 2.48351	41.19	Pk	31.9	-20.4	0	52.69	-	-	74	-21.31	88	120	V
2	* 2.4871	43.7	PK	31.9	-20.5	0	55.1	-	-	74	-18.9	88	120	V
3	* 2.48351	30.62	RMS	31.9	-20.4	2.45	44.57	54	-9.43	-	-	88	120	V
4	2.53482	31.46	RMS	32	-20.4	2.45	45.51	54	-8.49	-	-	88	120	V

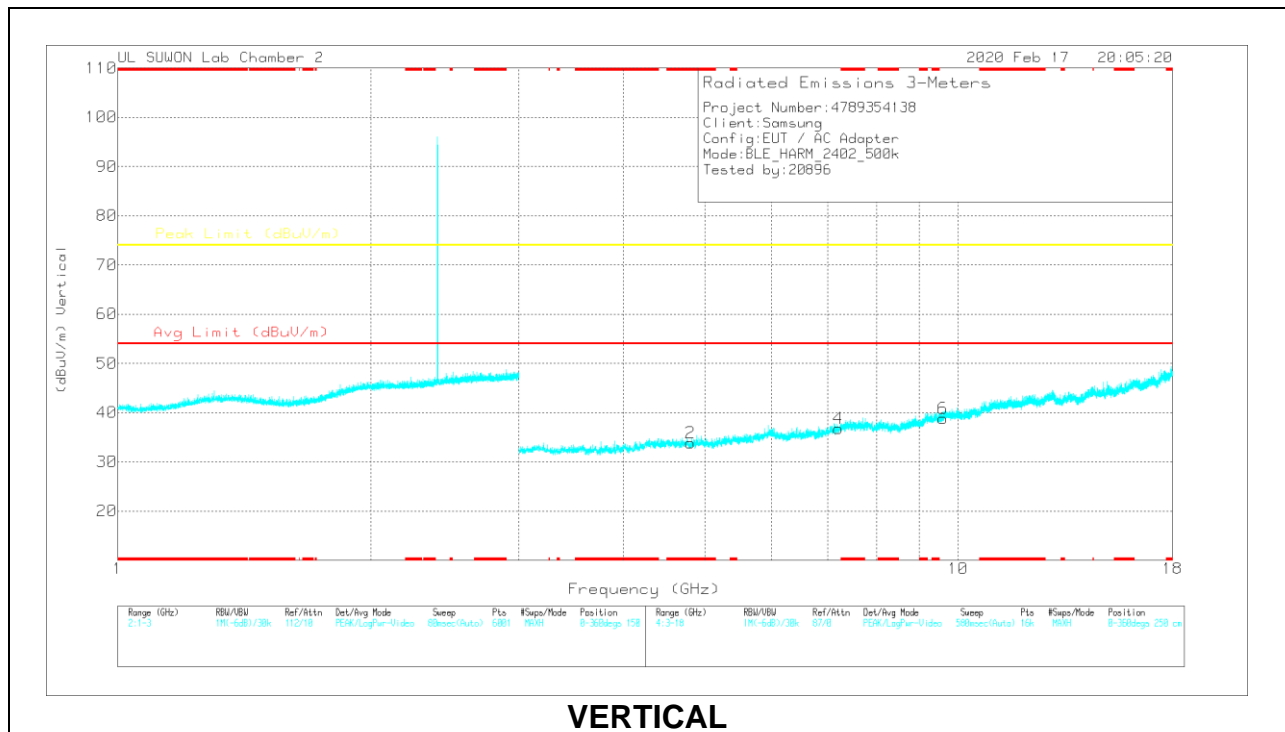
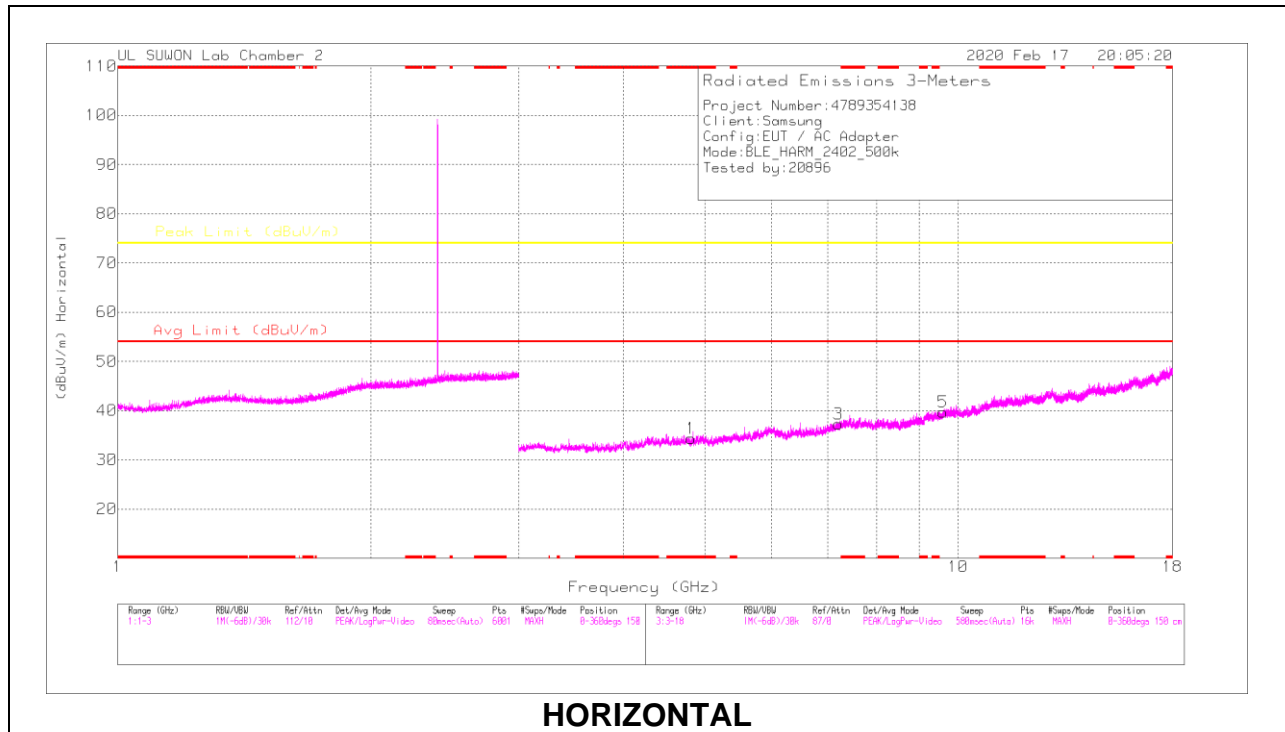
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



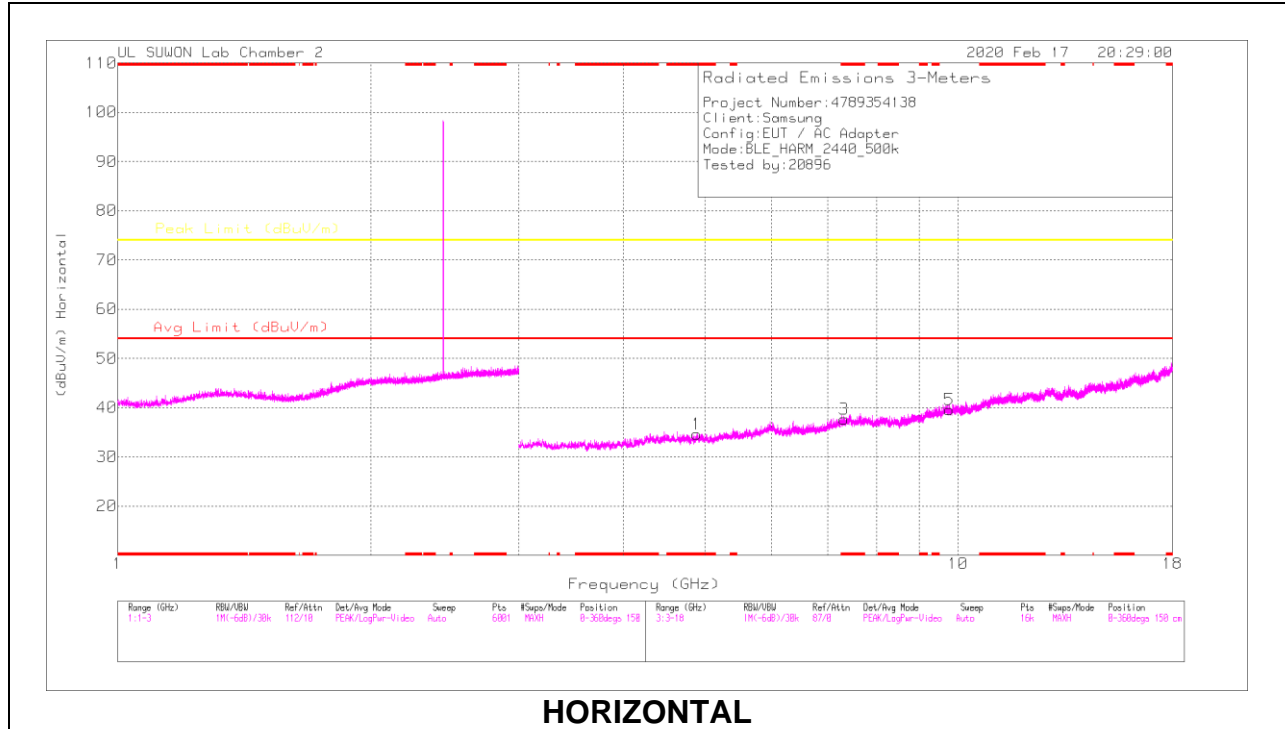
Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

RADIATED EMISSIONS

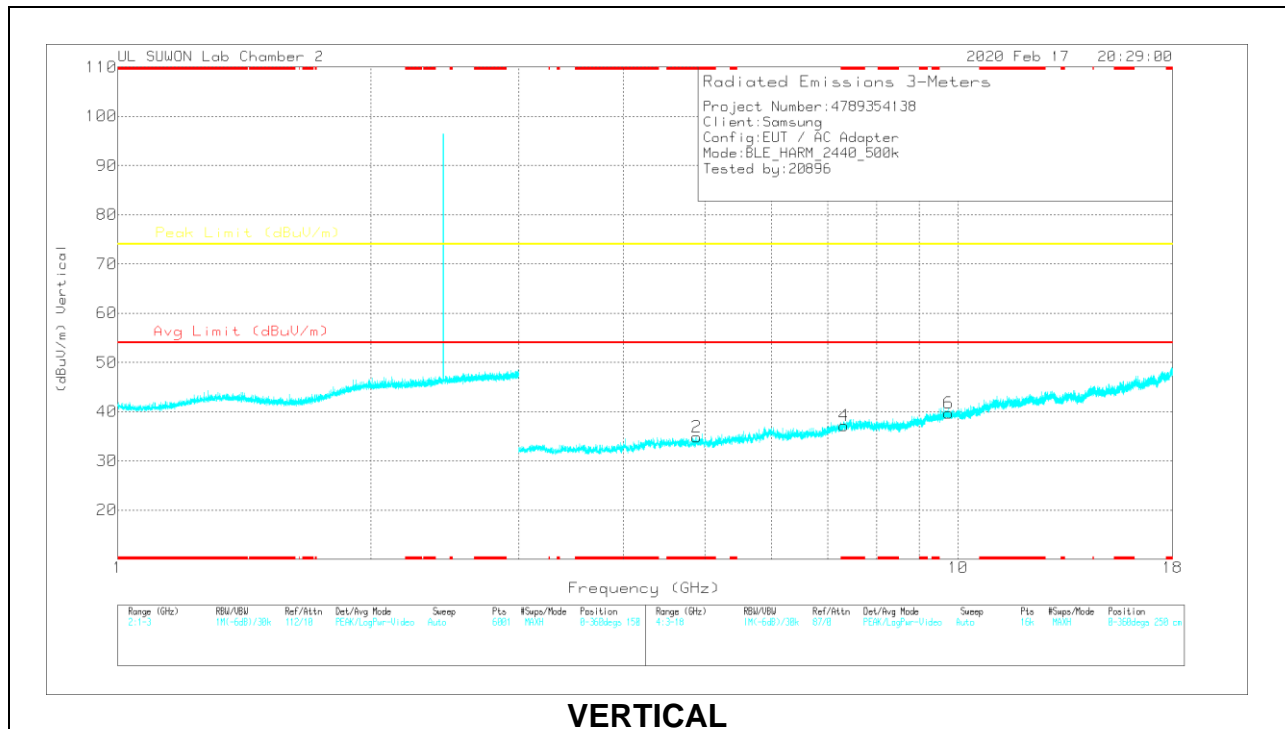
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.81145	36.27	PK2	34	-28	0	42.27	-	-	74	-31.73	0	100	H
* 4.81106	37.07	PK2	34	-28	0	43.07	-	-	74	-30.93	0	100	V
7.20167	35.15	PK2	36.1	-25.2	0	46.05	-	-	74	-27.95	0	100	H
7.2034	35.29	PK2	36.1	-25.2	0	46.19	-	-	74	-27.81	0	100	V
9.60666	33.29	PK2	37	-21.7	0	48.59	-	-	74	-25.41	0	100	H
9.60498	33.6	PK2	37	-21.7	0	48.9	-	-	74	-25.1	0	100	V

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

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

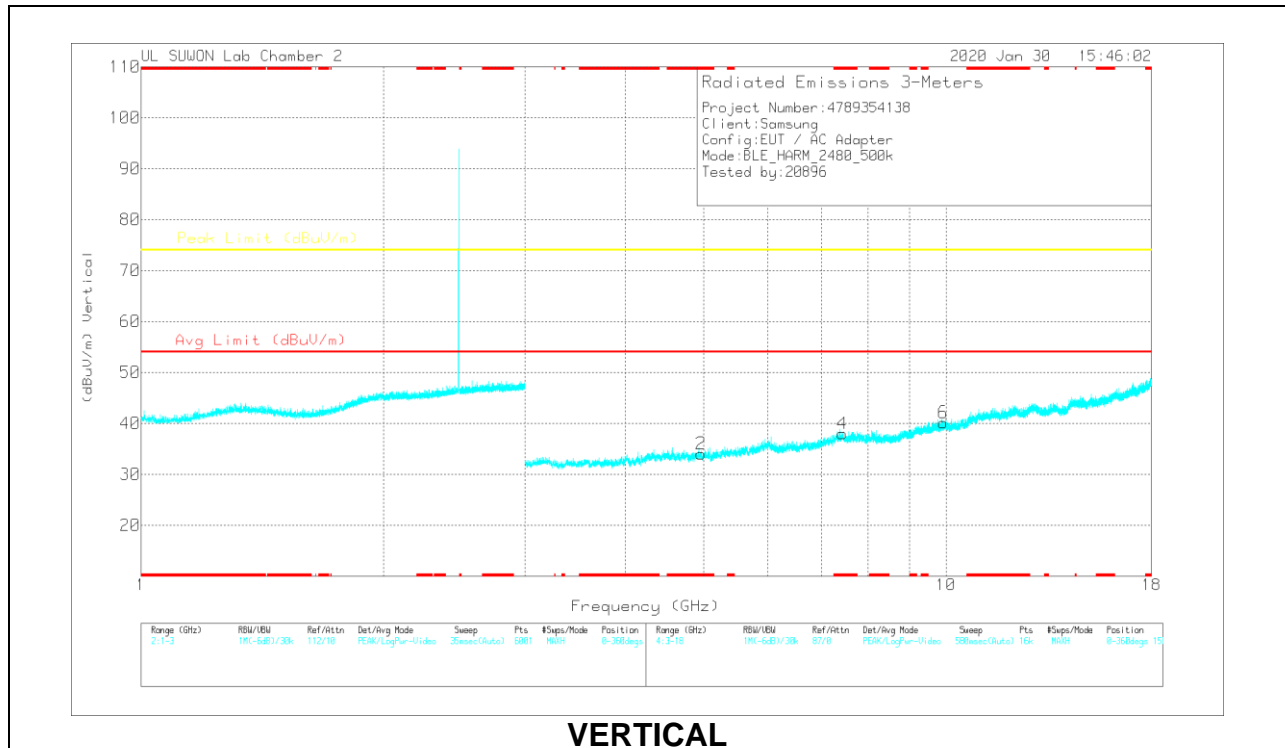
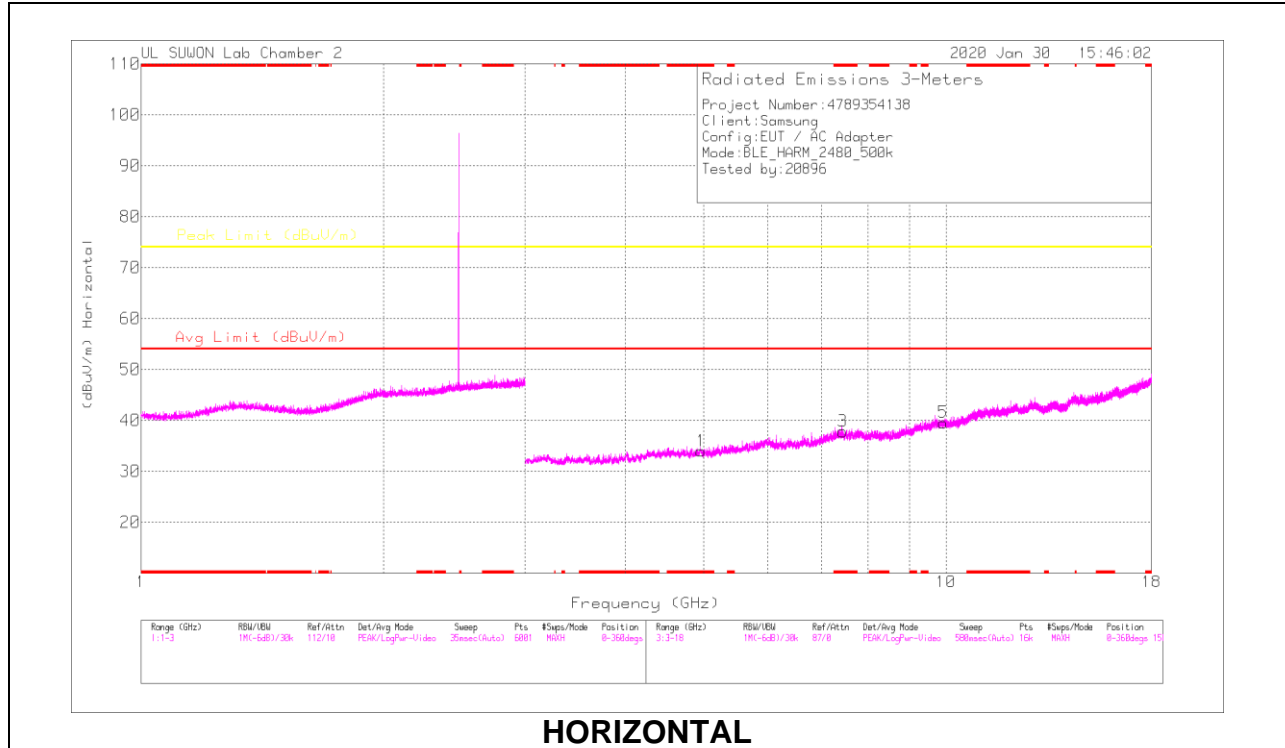
Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	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
* 4.88626	37.09	PK2	34	-27.7	0	43.39	-	-	74	-30.61	0	100	H
* 4.88825	36.8	PK2	34	-27.7	0	43.1	-	-	74	-30.9	0	100	V
* 7.32068	35.16	PK2	36.2	-24.8	0	46.56	-	-	74	-27.44	0	100	H
* 7.32203	35.54	PK2	36.2	-24.8	0	46.94	-	-	74	-27.06	0	100	V
9.76223	32.82	PK2	37.2	-21.2	0	48.82	-	-	74	-25.18	0	100	H
9.76439	33.02	PK2	37.2	-21.3	0	48.92	-	-	74	-25.08	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_00168724	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
* 4.96018	35.85	PK2	34.1	-27	0	42.95	-	-	74	-31.05	0	100	H
* 4.96326	35.71	PK2	34.1	-27	0	42.81	-	-	74	-31.19	0	100	V
* 7.43755	34.08	PK2	36.2	-23.9	0	46.38	-	-	74	-27.62	0	100	H
* 7.43865	34.31	PK2	36.2	-23.9	0	46.61	-	-	74	-27.39	0	100	V
9.91833	32.05	PK2	37.4	-20.9	0	48.55	-	-	74	-25.45	0	100	H
9.92158	31.44	PK2	37.4	-20.9	0	47.94	-	-	74	-26.06	0	100	V

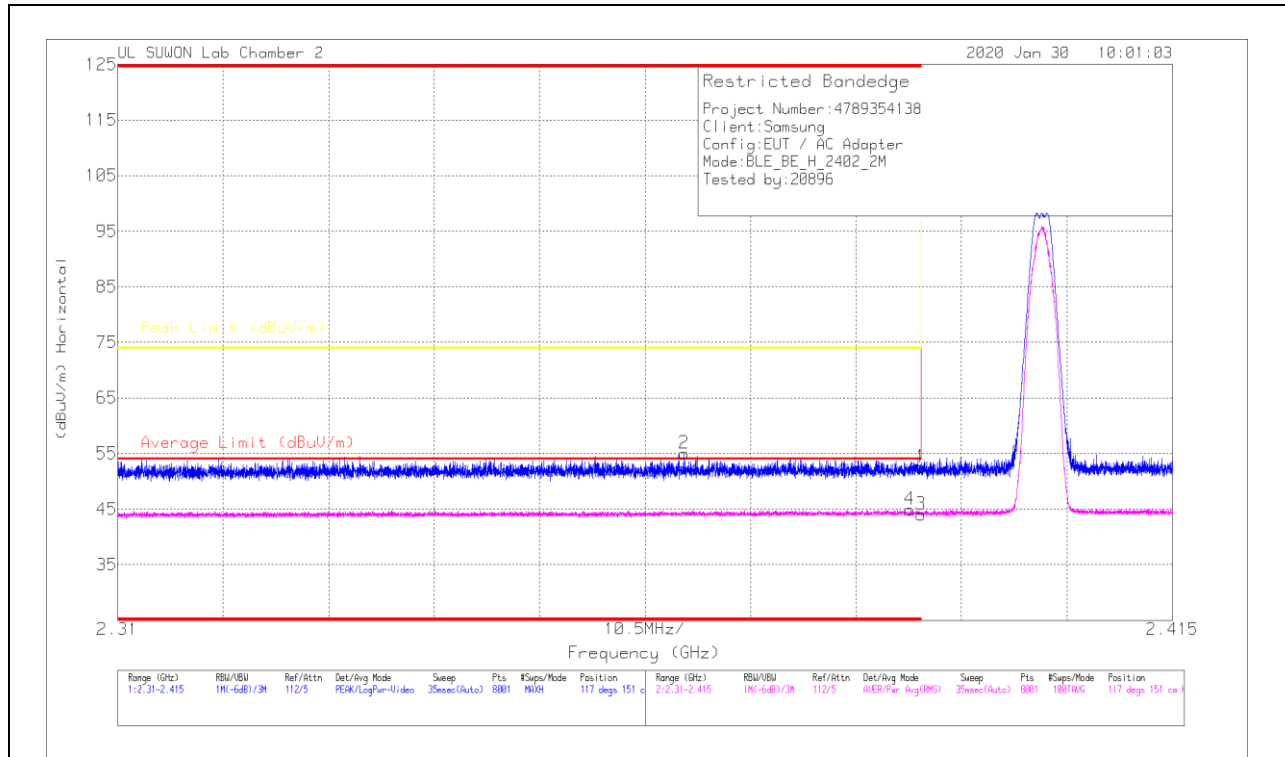
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PK2 - KDB558074 Method: Maximum Peak

10.2.2. BLE (2Mbps)

Antenna 1

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



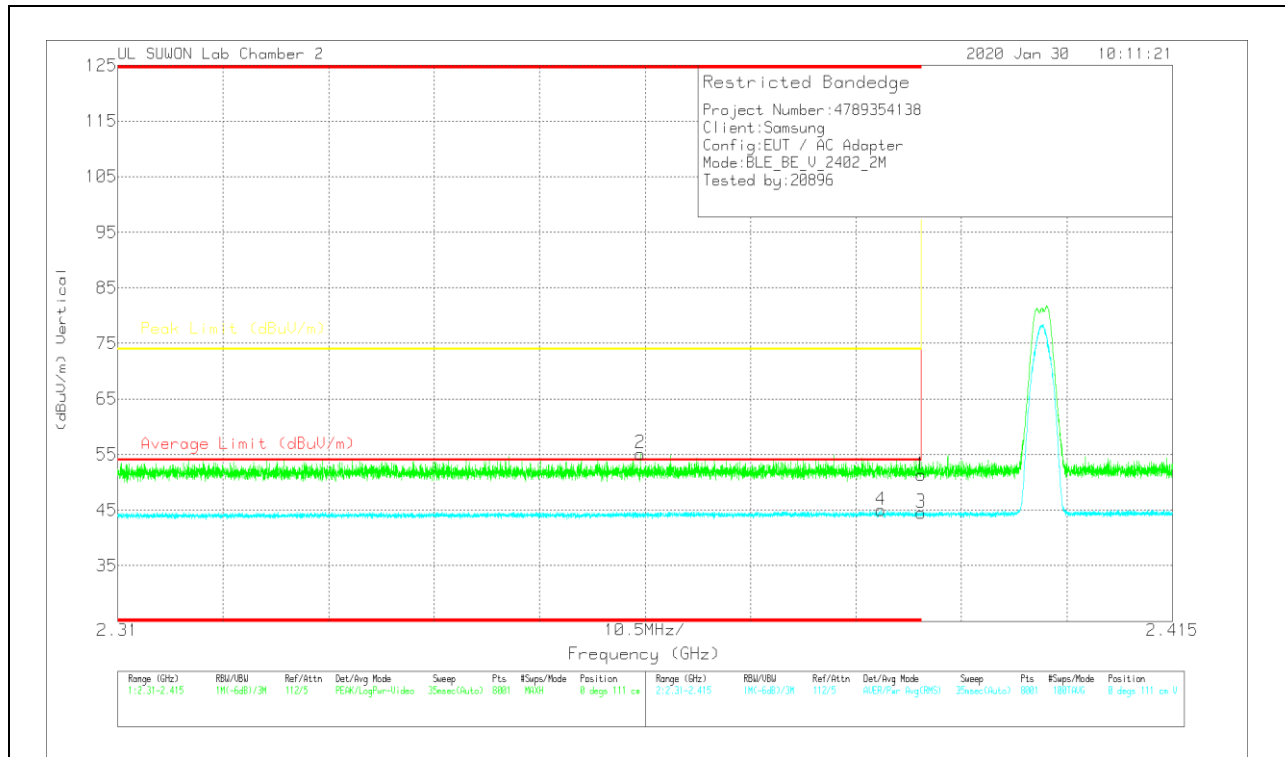
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.55	Pk	31.6	-20.6	0	52.55	-	-	74	-21.45	117	151	H
2	* 2.3664	44.07	Pk	31.6	-20.7	0	54.97	-	-	74	-19.03	117	151	H
3	* 2.39	30.66	RMS	31.6	-20.6	2.41	44.07	54	-9.93	-	-	117	151	H
4	* 2.38887	31.52	RMS	31.6	-20.6	2.41	44.93	54	-9.07	-	-	117	151	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT

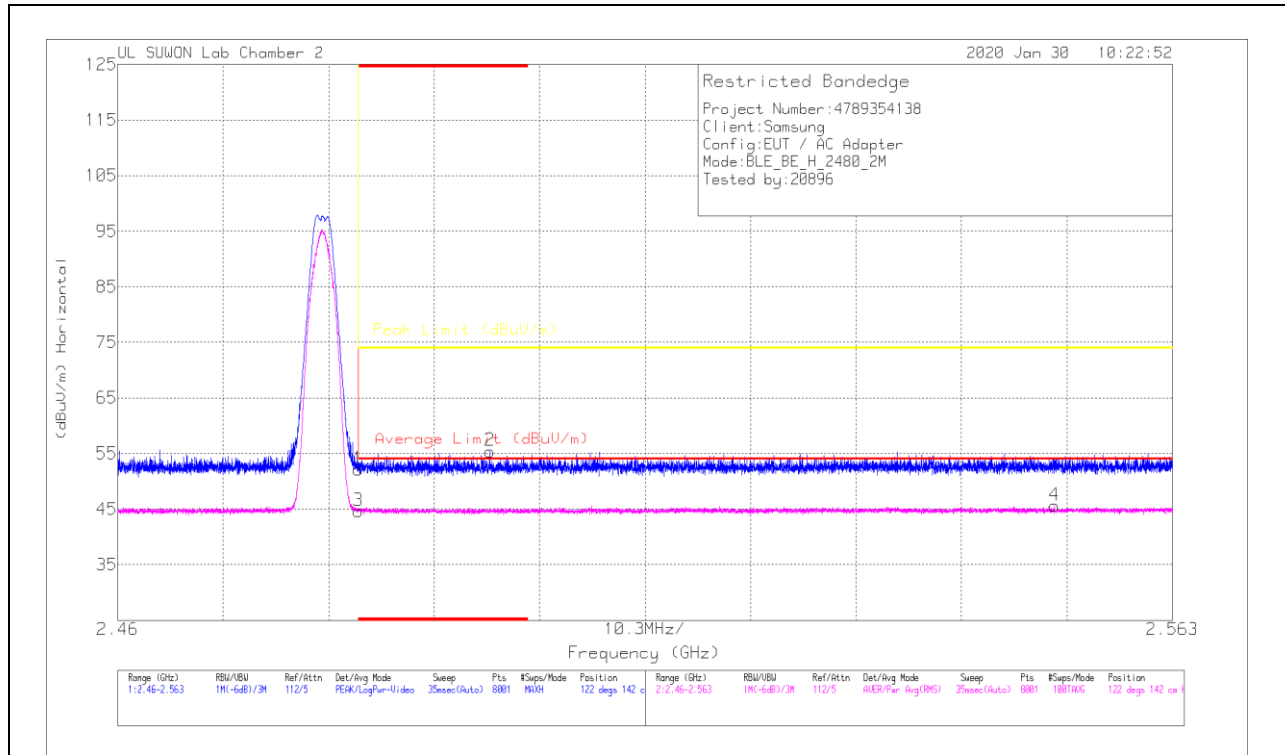


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.4	Pk	31.6	-20.6	0	51.4	-	-	74	-22.6	0	111	V
2	* 2.38201	44.28	Pk	31.6	-20.7	0	55.18	-	-	74	-18.82	0	111	V
3	* 2.39	31.17	RMS	31.6	-20.6	2.41	44.58	54	-9.42	-	-	0	111	V
4	* 2.38598	31.61	RMS	31.6	-20.6	2.41	45.02	54	-8.98	-	-	0	111	V

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

BANDEDGE (HIGH CHANNEL)

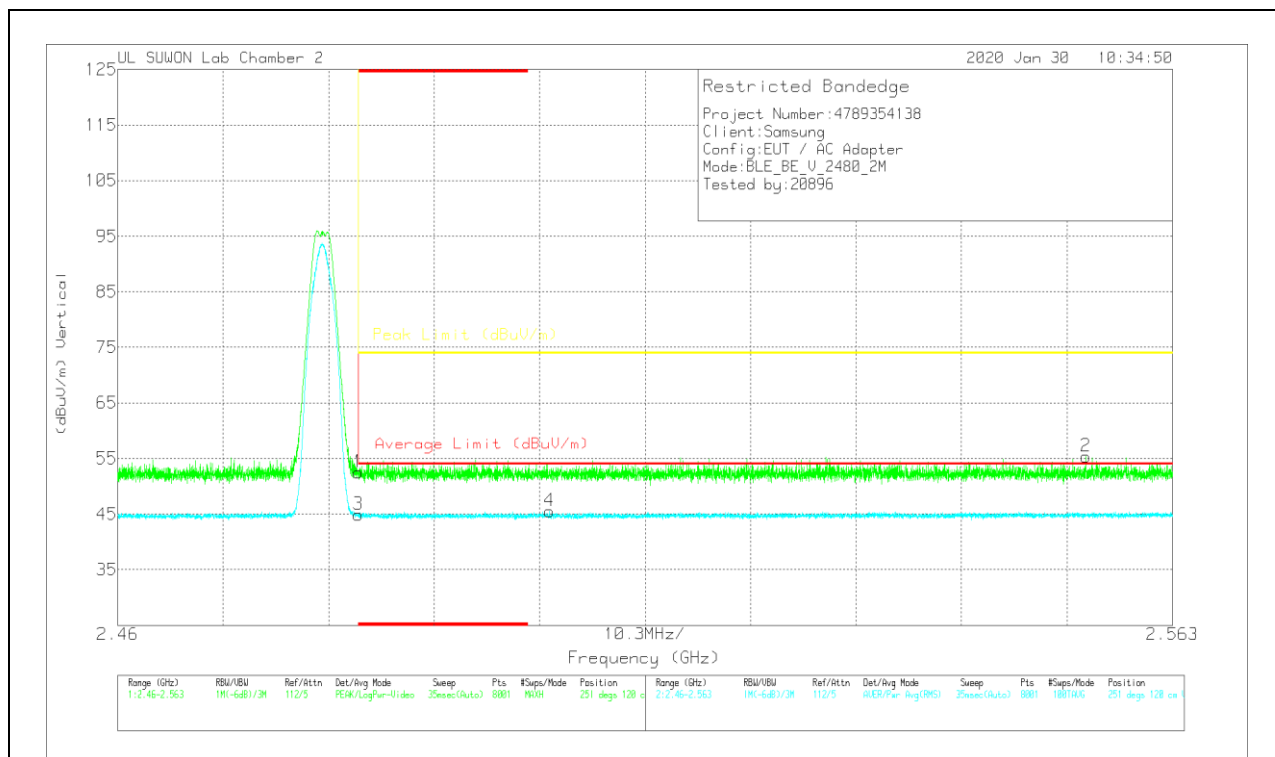
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meas Reading (dBuV)	Det	3117_00168724	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	* 2.48351	40.57	Pk	31.9	-20.4	0	52.07	-	-	74	-21.93	122	142	H
2	* 2.49635	44.03	Pk	31.9	-20.5	0	55.43	-	-	74	-18.57	122	142	H
3	* 2.48351	30.69	RMS	31.9	-20.4	2.41	44.6	54	-9.4	-	-	122	142	H
4	2.55149	31.67	RMS	32	-20.4	2.41	45.68	54	-8.32	-	-	122	142	H

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

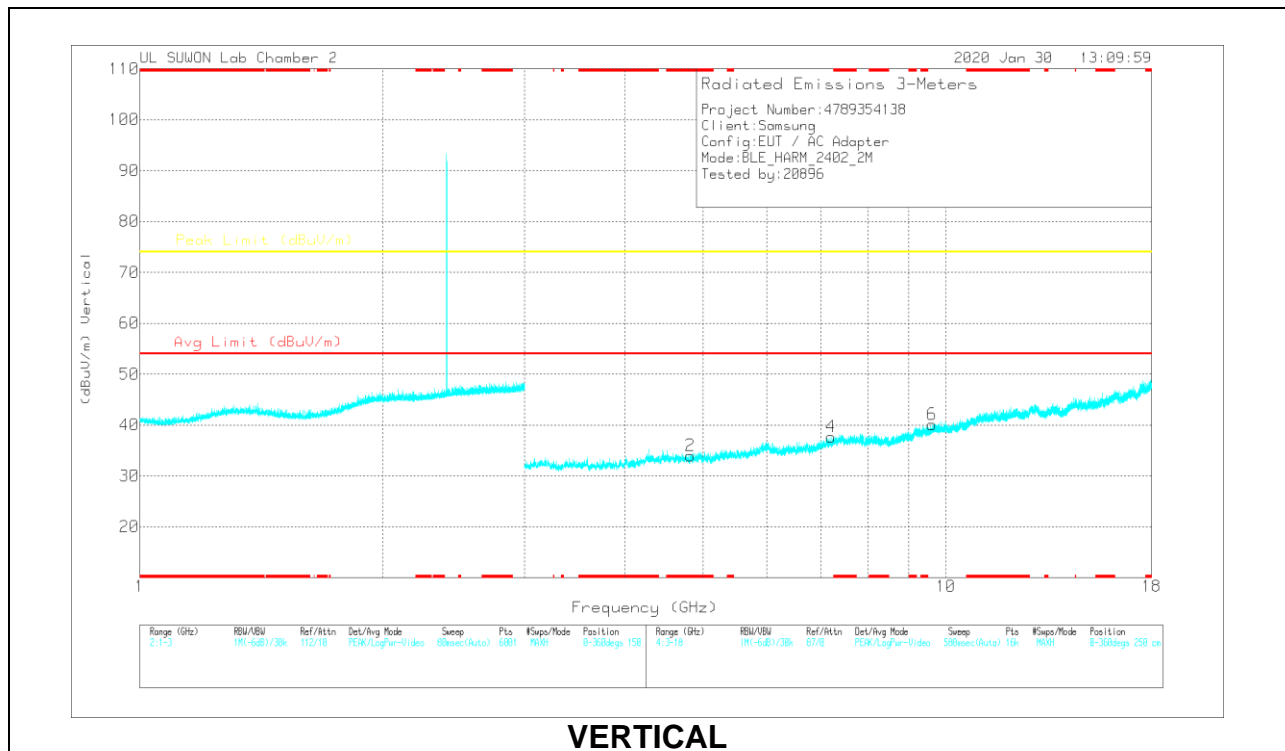
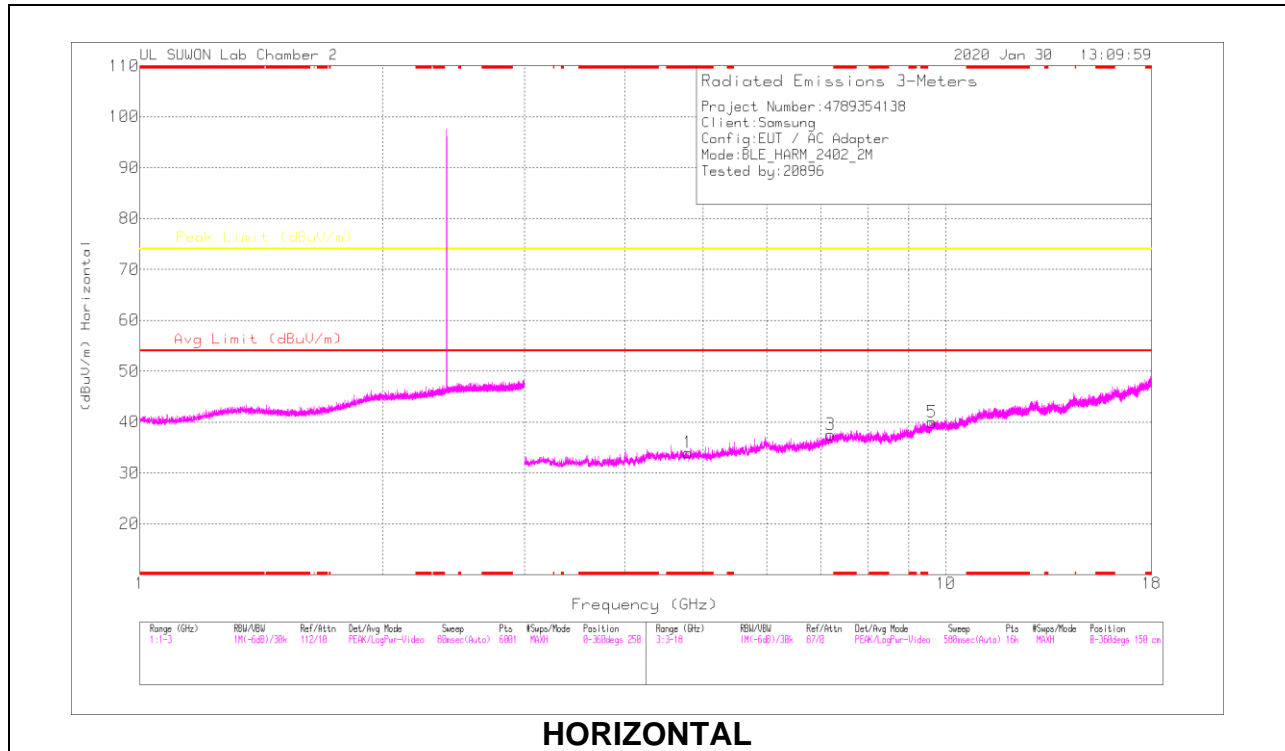
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBu/m)	Det	3117_00168724	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBu/m)	Average Limit (dBu/m)	Margin (dB)	Peak Limit (dBu/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	41.04	Pk	31.9	-20.4	0	52.54	-	-	74	-21.46	251	120	V
2	2.55453	43.82	Pk	32	-20.4	0	55.42	-	-	74	-18.58	251	120	V
3	* 2.48351	30.98	RMS	31.9	-20.4	2.41	44.89	54	-9.11	-	-	251	120	V
4	2.50215	31.69	RMS	31.9	-20.5	2.41	45.5	54	-8.5	-	-	251	120	V

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

HARMONICS AND SPURIOUS EMISSIONS LOW CHANNEL RESULTS



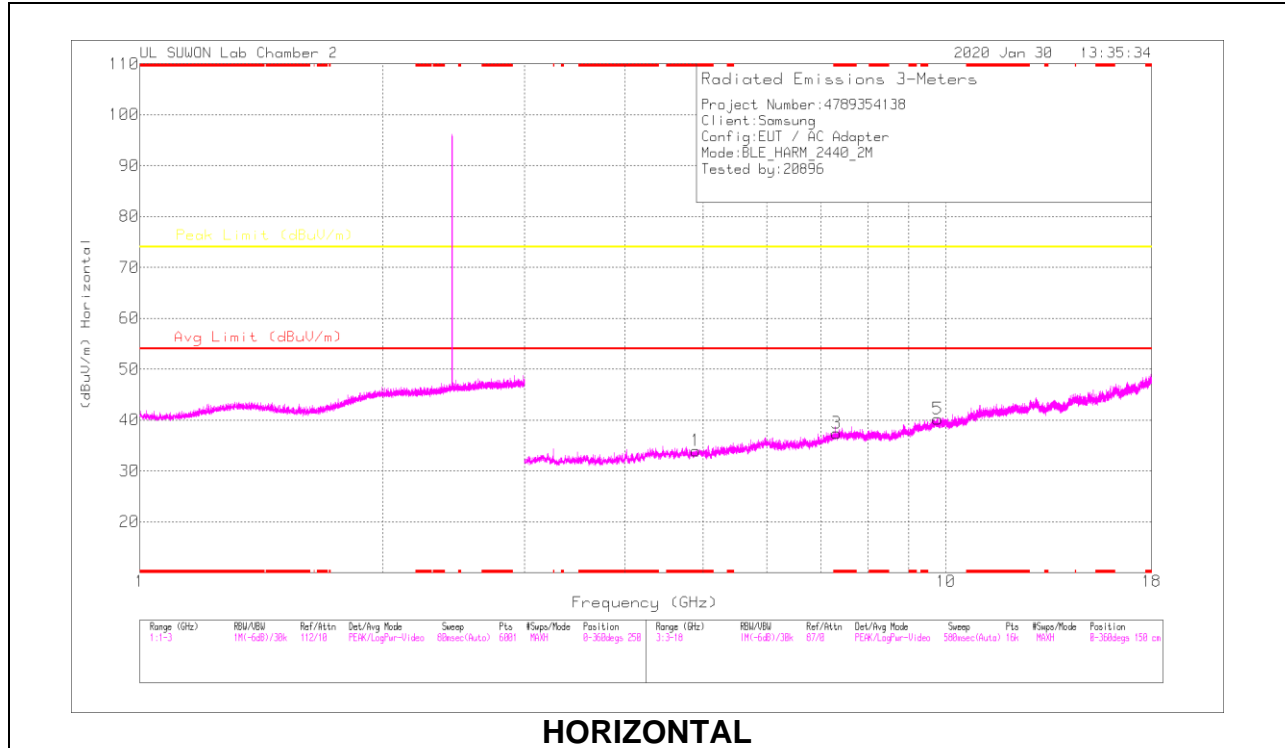
Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

RADIATED EMISSIONS

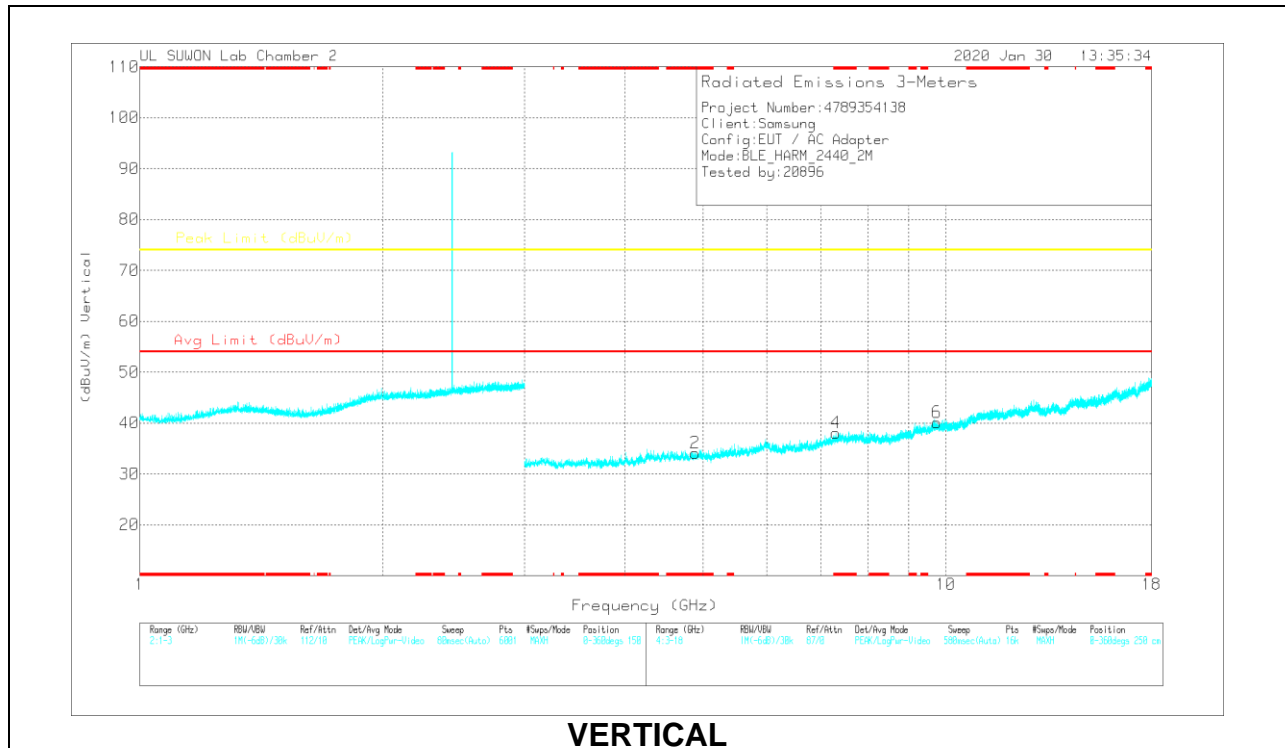
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.7899	36.16	PK2	34	-27.9	0	42.26	-	-	74	-31.74	0	100	H
* 4.79055	36.07	PK2	34	-27.9	0	42.17	-	-	74	-31.83	0	100	V
7.19308	34.99	PK2	36.1	-25.1	0	45.99	-	-	74	-26.01	0	100	V
7.19214	35.79	PK2	36.1	-25.1	0	46.79	-	-	74	-27.21	0	100	H
9.61834	33.04	PK2	37	-21.6	0	48.44	-	-	74	-25.56	0	100	H
9.62054	32.7	PK2	37	-21.6	0	48.1	-	-	74	-25.9	0	100	V

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

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

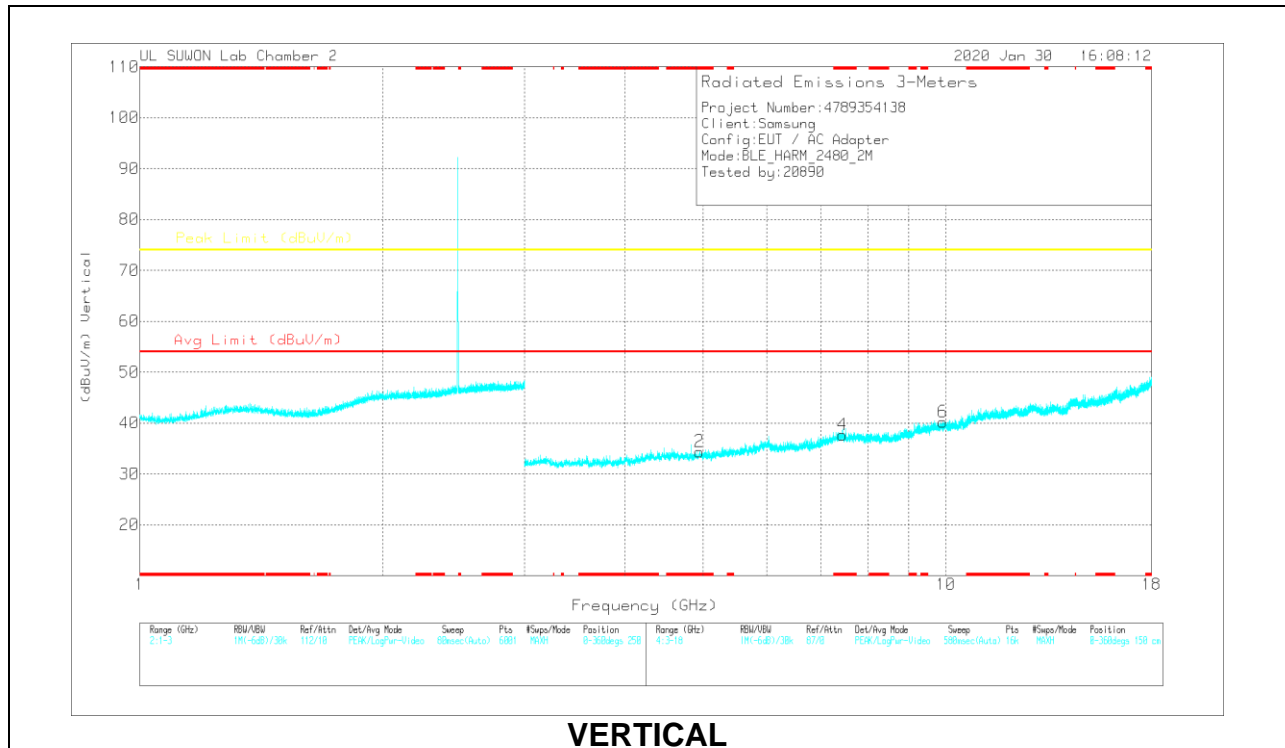
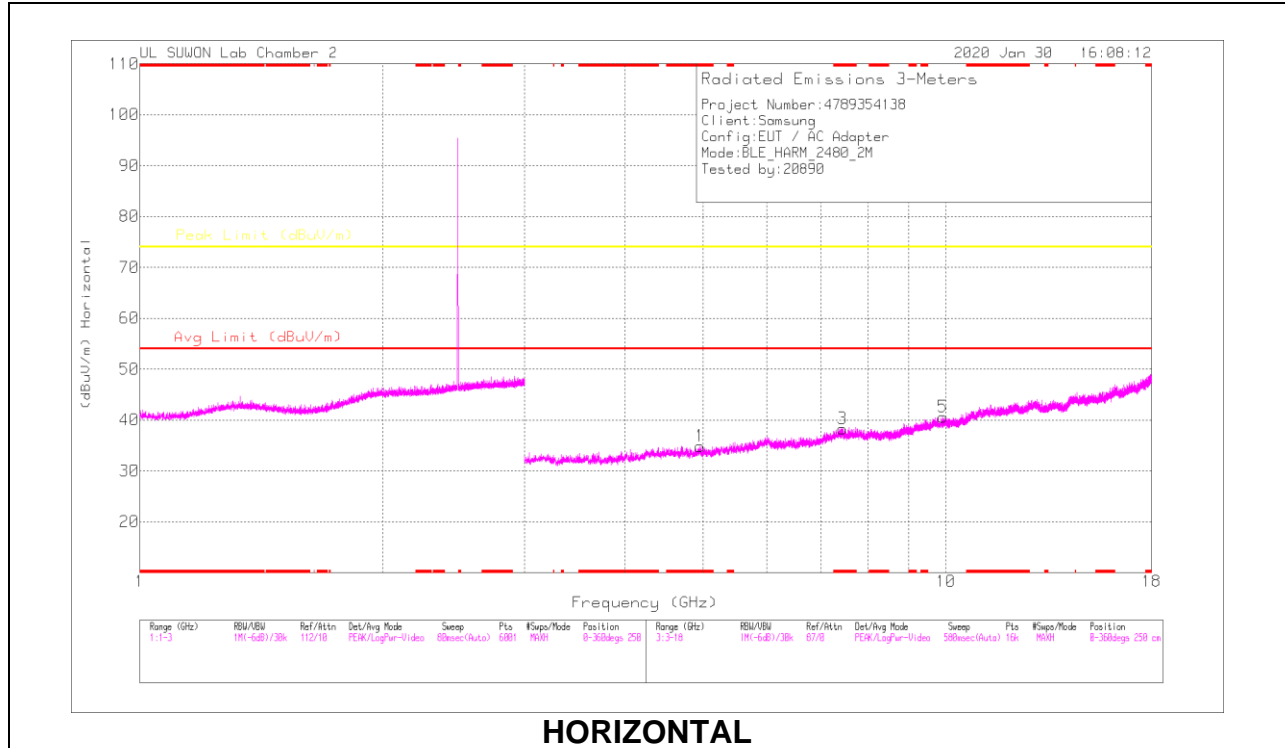
Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	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
* 4.89668	36.73	PK2	34	-27.6	0	43.13	-	-	74	-30.87	0	100	H
* 4.89798	36.48	PK2	34	-27.6	0	42.88	-	-	74	-31.12	0	100	V
* 7.32412	35.35	PK2	36.2	-24.8	0	46.75	-	-	74	-27.25	0	100	H
* 7.32504	35.16	PK2	36.2	-24.8	0	46.56	-	-	74	-27.44	0	100	V
9.77276	32.2	PK2	37.2	-21.4	0	48	-	-	74	-26	0	100	H
9.77471	32.61	PK2	37.2	-21.3	0	48.51	-	-	74	-25.49	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.

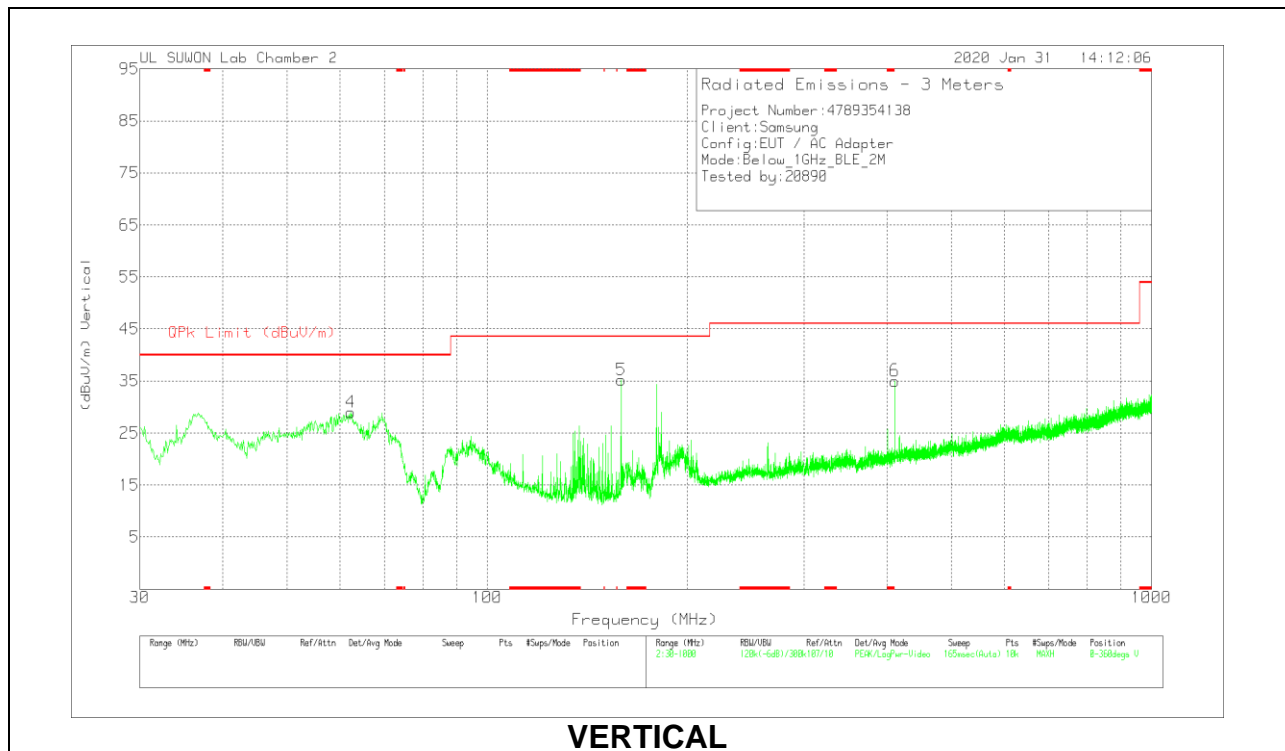
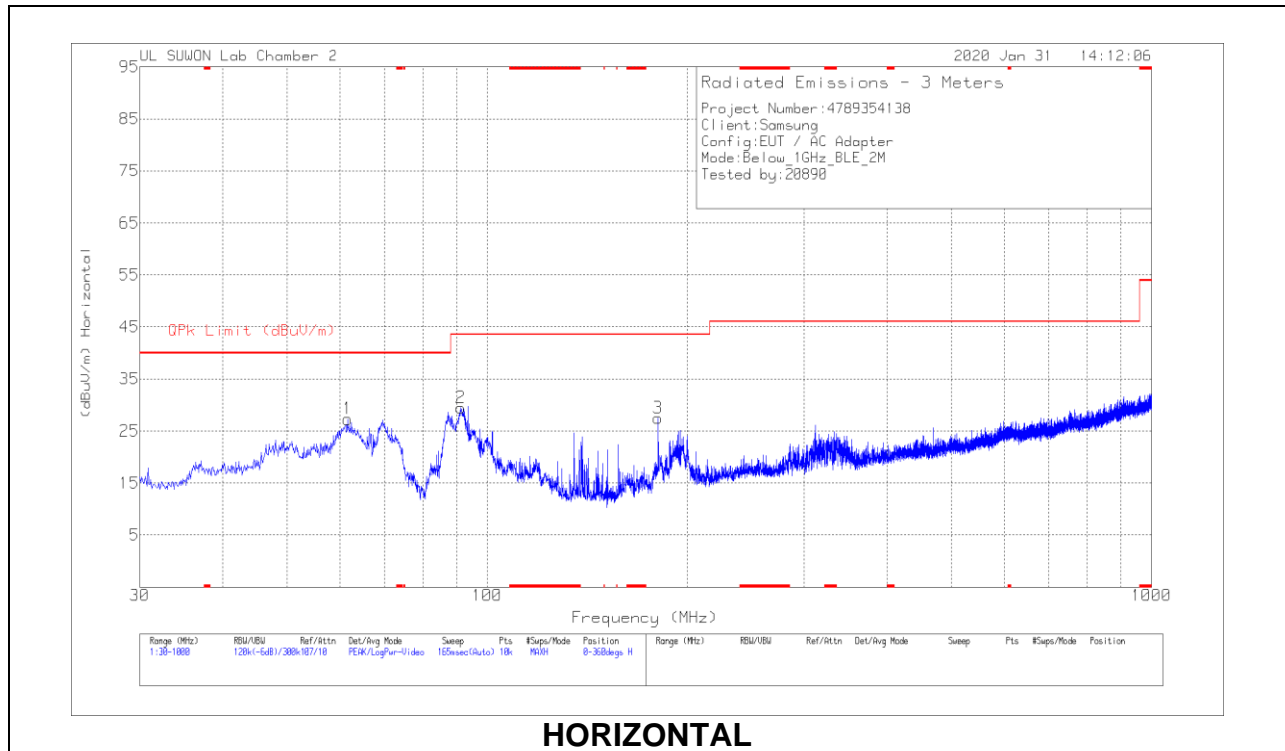
RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	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
* 4.95804	35.63	PK2	34.1	-27	0	42.73	-	-	74	-31.27	0	100	H
* 4.96034	35.82	PK2	34.1	-27	0	42.92	-	-	74	-31.08	0	100	V
* 7.44185	34.53	PK2	36.2	-23.9	0	46.83	-	-	74	-27.17	0	100	H
* 7.4444	34.56	PK2	36.2	-23.9	0	46.86	-	-	74	-27.14	0	100	V
9.92496	32.23	PK2	37.4	-20.9	0	48.73	-	-	74	-25.27	0	100	H
9.92302	31.97	PK2	37.4	-20.9	0	48.47	-	-	74	-25.53	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(2Mbps)

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	61.622	40.8	Pk	18.1	-31.6	0	27.3	40	-12.7	0-360	400	H
2	91.207	44.99	Pk	16.1	-31.6	0	29.49	43.52	-14.03	0-360	300	H
3	180.835	42.53	Pk	15.8	-30.8	0	27.53	43.52	-15.99	0-360	100	H
4	62.301	42.56	Pk	18	-31.6	0	28.96	40	-11.04	0-360	300	V
5	159.01	51.66	Pk	14.5	-31	0	35.16	43.52	-8.36	0-360	100	V
6	410.628	43.22	Pk	21.7	-29.9	0	35.02	46.02	-11	0-360	100	V

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

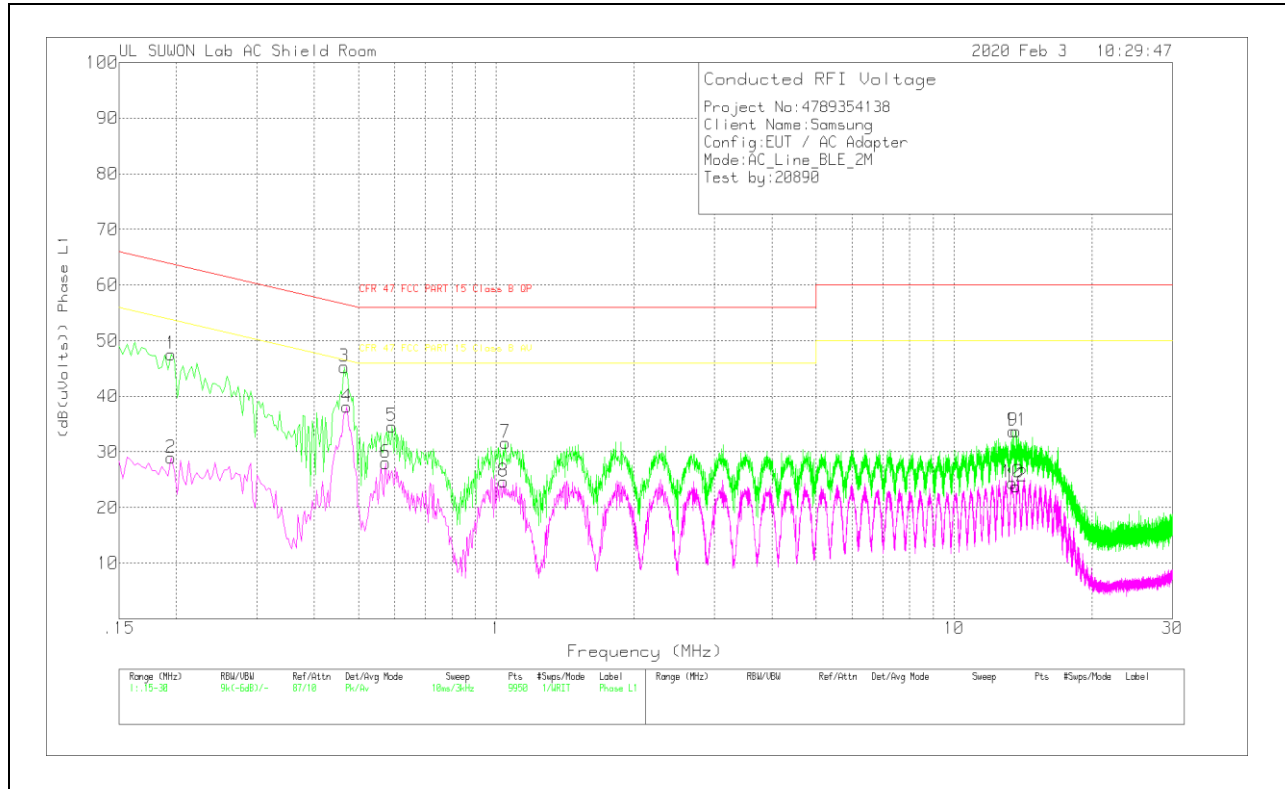
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

RESULTS

11.1.1. AC Power Line (2Mbps)

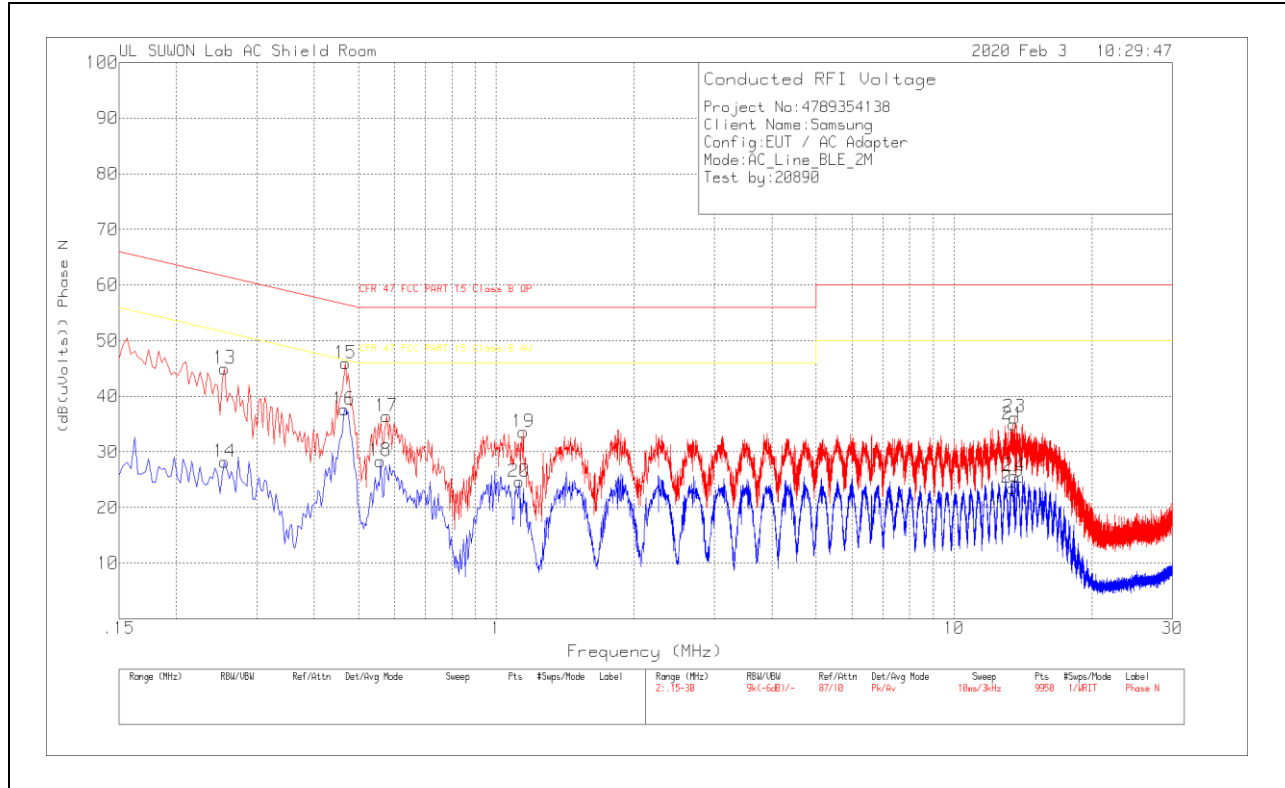
LINE 1 RESULTS



Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_Wit h 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	.195	37.5	Pk	9.9	.2	47.6	63.82	-16.22	-	-
2	.195	18.85	Av	9.9	.2	28.95	-	-	53.82	-24.87
3	.465	35.18	Pk	9.9	.2	45.28	56.6	-11.32	-	-
4	.471	27.99	Av	9.9	.2	38.09	-	-	46.5	-8.41
5	.591	24.54	Pk	9.9	.2	34.64	56	-21.36	-	-
6	.573	17.94	Av	9.9	.2	28.04	-	-	46	-17.96
7	1.047	21.56	Pk	9.8	.3	31.66	56	-24.34	-	-
8	1.038	14.58	Av	9.8	.3	24.68	-	-	46	-21.32
9	13.452	23.27	Pk	10.1	.4	33.77	60	-26.23	-	-
10	13.428	13.98	Av	10.1	.4	24.48	-	-	50	-25.52
11	13.683	23.27	Pk	10.1	.4	33.77	60	-26.23	-	-
12	13.68	13.36	Av	10.1	.4	23.86	-	-	50	-26.14

LINE 2 RESULTS



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	.255	35.08	Pk	9.7	.2	44.98	61.59	-16.61	-	-
14	.255	18.32	Av	9.7	.2	28.22	-	-	51.59	-23.37
15	.468	35.83	Pk	9.9	.2	45.93	56.55	-10.62	-	-
16	.465	27.51	Av	9.9	.2	37.61	-	-	46.6	-8.99
17	.576	26.29	Pk	9.9	.2	36.39	56	-19.61	-	-
18	.558	18.28	Av	9.9	.2	28.38	-	-	46	-17.62
19	1.146	23.48	Pk	9.8	.3	33.58	56	-22.42	-	-
20	1.122	14.57	Av	9.8	.3	24.67	-	-	46	-21.33
21	13.464	24.44	Pk	10.1	.4	34.94	60	-25.06	-	-
22	13.431	13	Av	10.1	.4	23.5	-	-	50	-26.5
23	13.563	25.72	Pk	10.1	.4	36.22	60	-23.78	-	-
24	13.56	15.16	Av	10.1	.4	25.66	-	-	50	-24.34

END OF TEST REPORT