



CERTIFICATION TEST REPORT

Report Number. : 4789555428-E4V2

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

Model : SM-G781B/DS, SM-G781B

FCC ID : A3LSMG781B

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

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

Date Of Issue:

August 24, 2020

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	08/14/20	Initial issue	Jihyeon Park
V2	08/24/20	Updated to address TCB's question	Jihyeon Park

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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, WPT and NFC

MODEL: SM-G781B/DS, SM-G781B

SERIAL NUMBER: 437d2d4d431e7ece (CONDUCTED)
R3CN7038YAF (RADIATED);

DATE TESTED: JUL 21, 2020 – AUG 07, 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
UL Korea, Ltd. By:



Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Jihyeon Park
Suwon Lab Technician
UL Korea, Ltd.

2. 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.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro	
☒	Chamber 1
☒	Chamber 2
☐	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>.

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. DECISION RULES

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

4.4. 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. EQUIPMENT UNDER TEST

5.1. 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 DTS (BLE) operational mode.

This report covers the Samsung models SM-G781B/DS and SM-G781B. These models are identical in hardware except SM-G781B has single SIM tray. With some pre-scan, model SM-G781B/DS was set for final test.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2 402 ~ 2 480	500kbps	Peak	6.506	4.473
		Average	6.116	4.089
	2Mbps	Peak	6.644	4.617
		Average	5.922	3.910

5.3. 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 -4.12 dBi.

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

Power and the Worst-Case for Symbol Rate and Burst Rate							
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	3.591	2	2Mbps (37 pkt)	2402	3.425
		2440	6.068			2440	5.888
		2480	4.776			2480	4.593
	1Mbps (255 pkt)	2402	3.623		2Mbps (255 pkt)	2402	3.462
		2440	6.081			2440	5.922
		2480	4.758			2480	4.612
1	125 kbps (37 pkt)	2402	3.626				
		2440	6.078				
		2480	4.748				
	125 kbps (255 pkt)	2402	3.612				
		2440	6.054				
		2480	4.705				
	500 kbps (37 pkt)	2402	3.659				
		2440	6.116				
		2480	4.791				
	500 kbps (255 pkt)	2402	3.608				
		2440	6.064				
		2480	4.715				

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA200	R37MCQS5HH1DK3	N/A
Data Cable	SAMSUNG	EP-DR140ABE	N/A	N/A

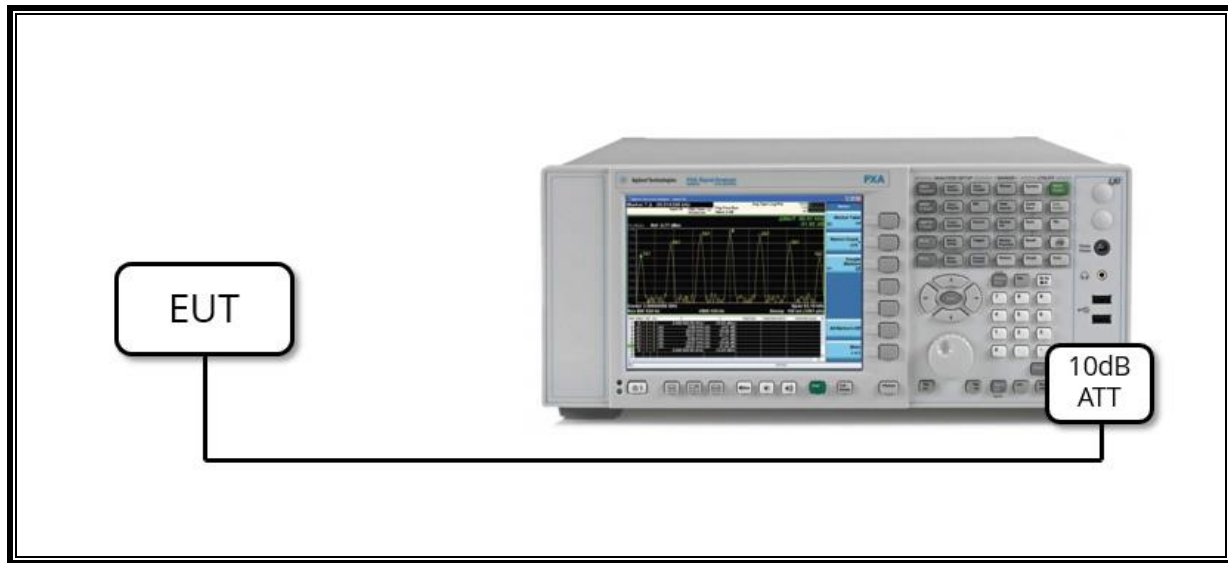
I/O CABLE

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

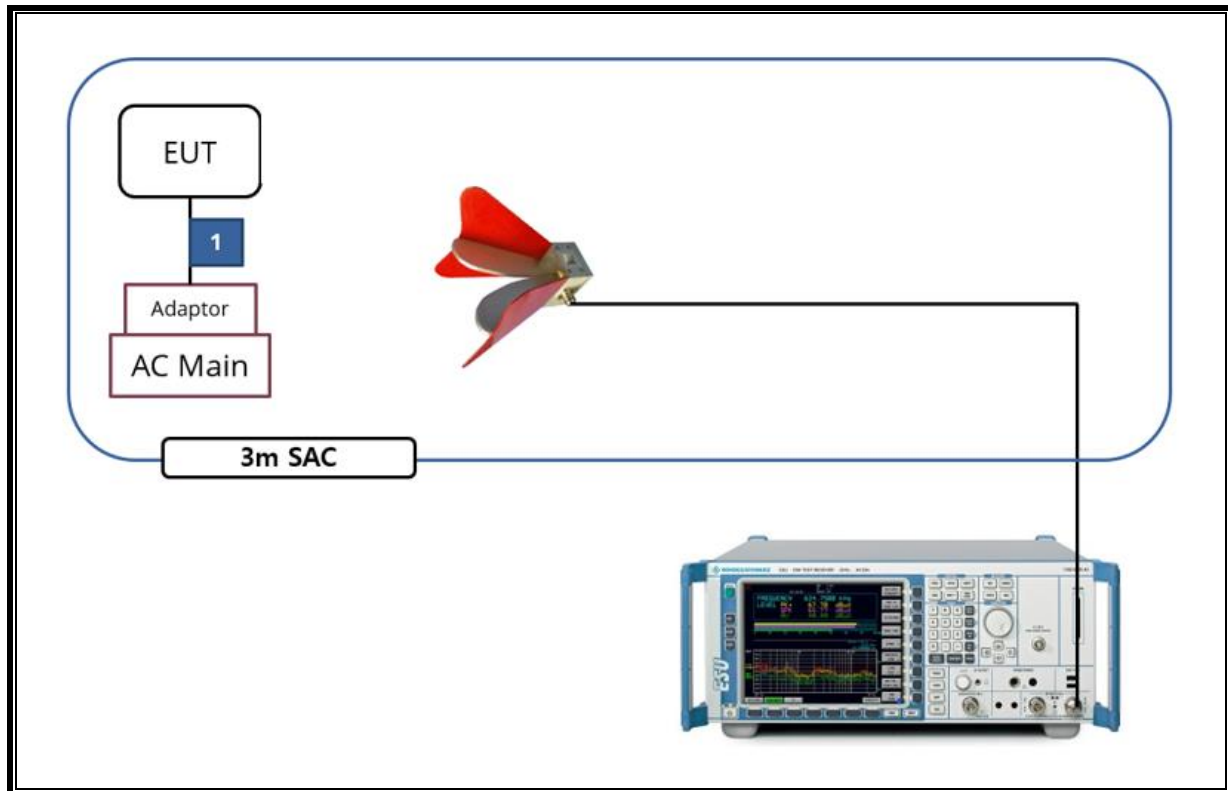
TEST SETUP

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

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. 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

7. 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	845(Note)	08-04-20	08-13-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749(Note)	08-04-20	08-13-22
Antenna, Horn, 18 GHz	ETS	3115	00167211	08-04-20	07-27-22
Antenna, Horn, 18 GHz	ETS	3117	00168724	08-04-20	07-27-22
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-13-20	08-04-22
Antenna, Horn, 40 GHz	ETS	3116C	00168645	10-02-21	
Preamplifier	ETS	3116C-PA	00168841	08-08-20	08-06-21
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-05-20	08-03-21
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-05-20	08-03-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-06-20	08-03-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-06-20	08-03-21
Spectrum Analyzer, 44 GHz	Keysight	N9030B	MY57143717	01-20-21	
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-06-20	08-05-21
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-20	08-05-21
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-09-20	08-05-21
Attenuator	PASTERNAK	PE7087-10	A001	08-08-20	08-03-21
Attenuator	PASTERNAK	PE7087-10	A008	08-08-20	08-03-21
Attenuator	PASTERNAK	PE7087-10	A007	08-08-20	08-03-21
Attenuator	PASTERNAK	PE7087-10	A009	08-08-20	08-05-21
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-20	08-03-21
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-20	08-03-21
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-05-20	08-03-21
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-06-20	08-03-21
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-06-20	08-03-21
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-06-20	08-03-21
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-06-20	08-03-21
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-06-20	08-03-21
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-06-20	08-03-21
LISN	R&S	ENV216	101837	08-09-20	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		

Note. The above antenna was not used for testing from August 4th to August 13th.

8. TEST RESULTS SUMMARY

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

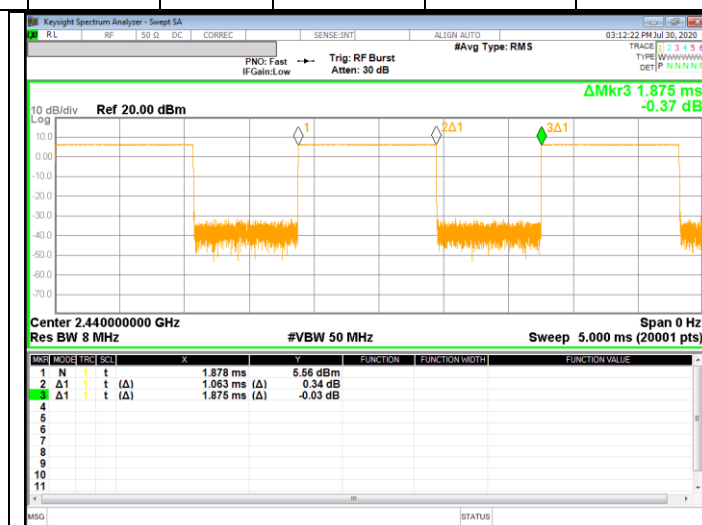
9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

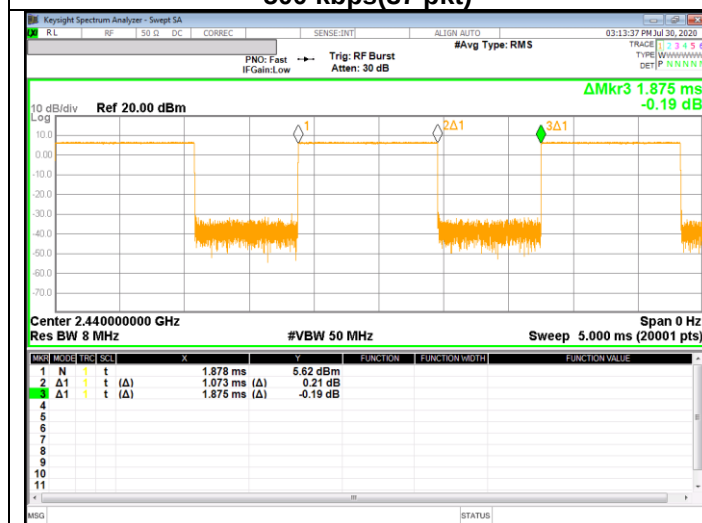
LIMITS

None; for reporting purposes only.

Mode	On time [msec]	Period [msec]	Duty cycle x [Linear]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]	1/T Minimum CBW [kHz]
2 400 ~ 2 483.5 MHz Bands						
BLE 500 kbps [37pkt]	1.063	1.875	0.57	56.69	2.46	0.94
BLE 2 Mbps [255pkt]	1.073	1.875	0.57	57.23	2.42	0.93



500 kbps(37 pkt)



2 Mbps(255 pkt)

9.2. 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

9.2.1. BLE (500kbps)

Channel	Frequency [MHz]	6 dB Bandwidth [kHz]	Minimum Limit [kHz]
Low	2 402	659.9	500.0
Mid	2 440	657.7	500.0
High	2 480	657.2	500.0
Worst		657.2	500.0



9.2.2. BLE (2Mbps)

Channel	Frequency [MHz]	6 dB Bandwidth [kHz]	Minimum Limit [kHz]
Low	2 402	1146.0	500.0
Mid	2 440	1148.0	500.0
High	2 480	1152.0	500.0
Worst		1146.0	500.0



9.3. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

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

- 500 kbps

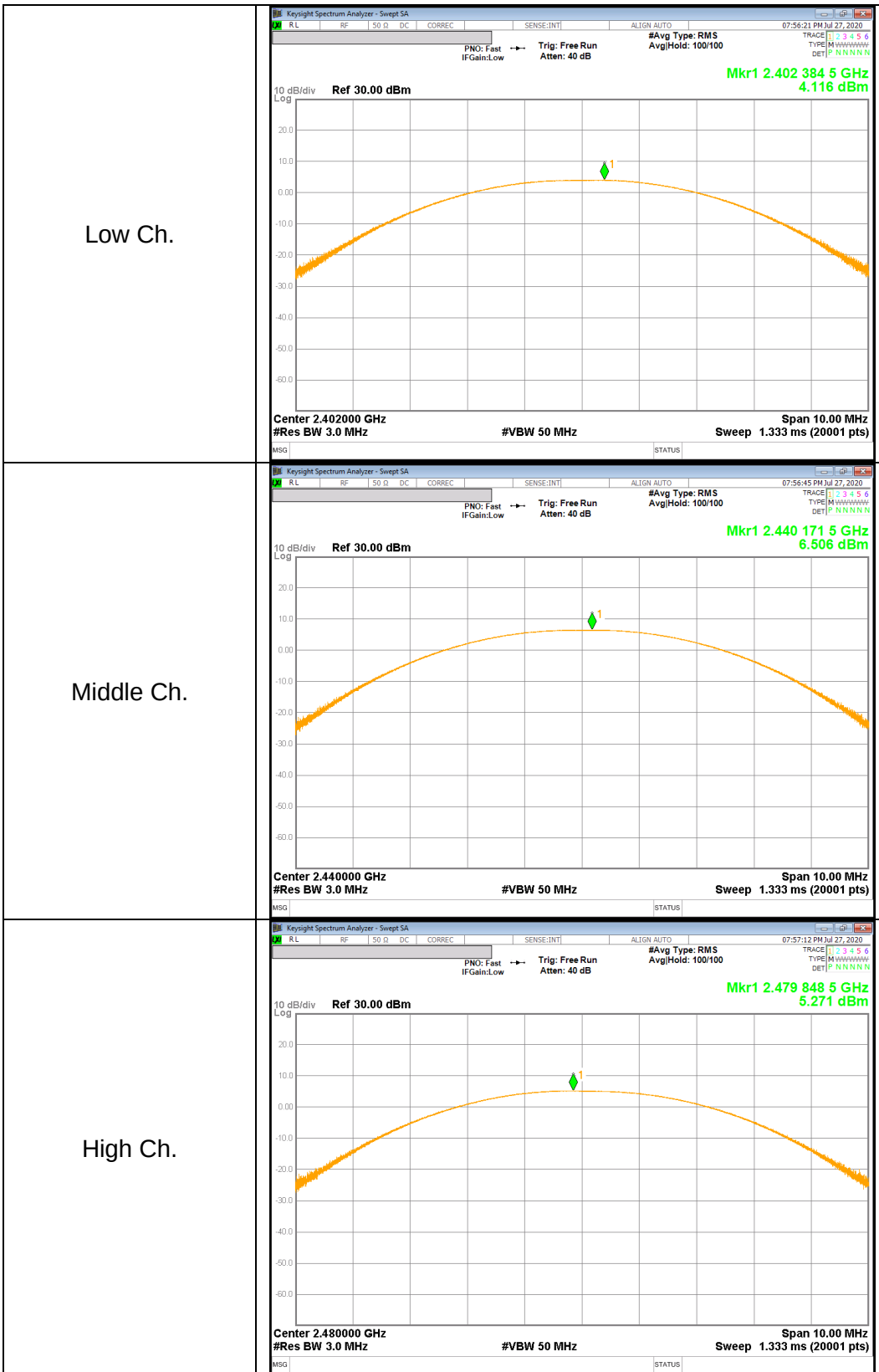
Channel	Frequency [MHz]	Peak Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	4.116	30.000	-25.884
Mid	2440	6.506	30.000	-23.494
High	2480	5.271	30.000	-24.729
Worst		6.506	30.000	-23.494

- 2 Mbps

Channel	Frequency [MHz]	Peak Power [dBm]	Limit [dBm]	Margin [dB]
Low	2402	4.169	30.000	-25.831
Mid	2440	6.644	30.000	-23.356
High	2480	5.322	30.000	-24.678
Worst		6.644	30.000	-23.356

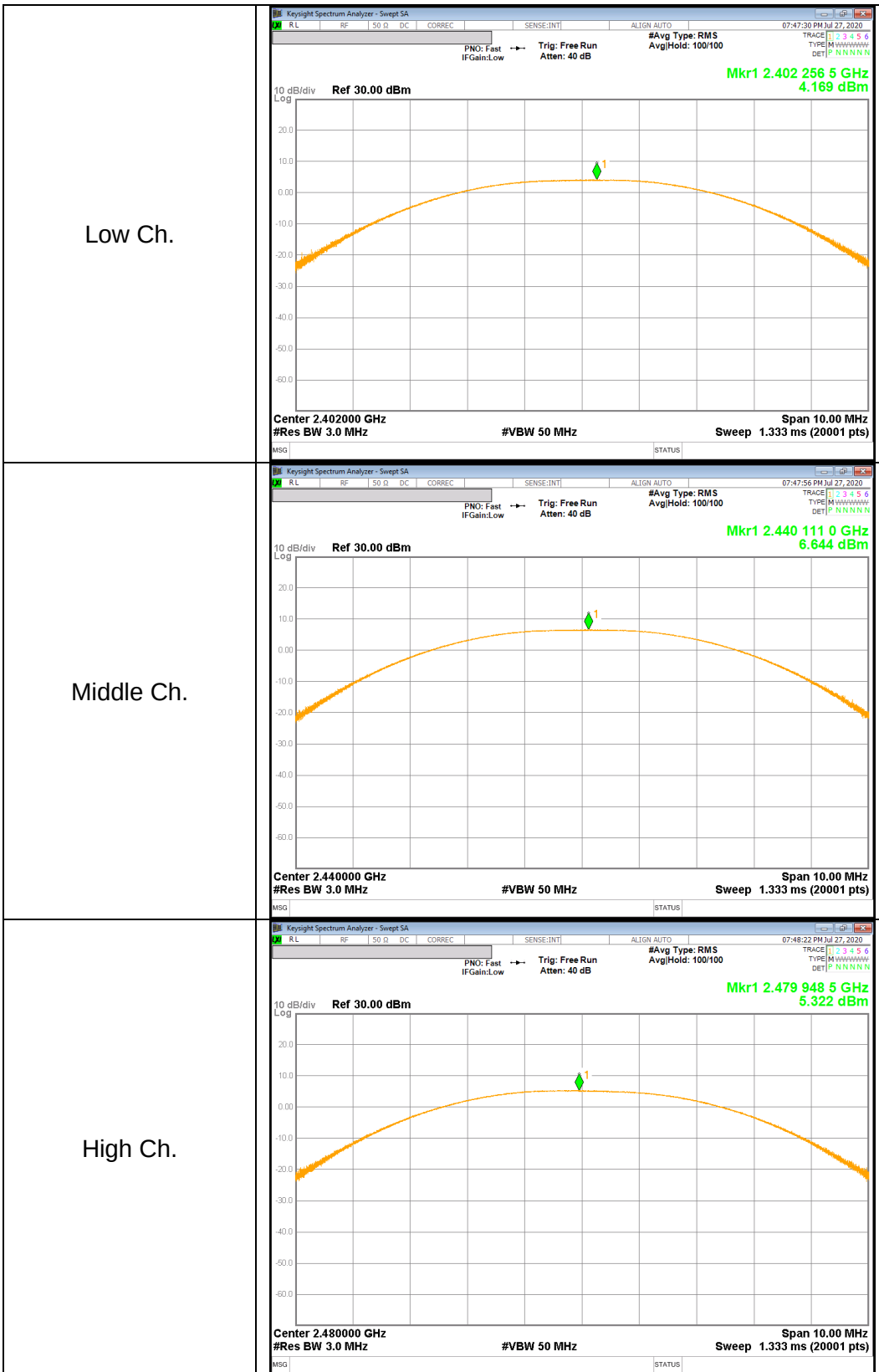
9.3.1. BLE (500 kbps)

PEAK OUTPUT POWER PLOTS



9.3.2. BLE (2 Mbps)

PEAK OUTPUT POWER PLOTS



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.

- 500 kbps

Channel	Frequency [MHz]	AV Power [dBm]	AV Power [mW]
Low	2402	3.659	2.322
Mid	2440	6.116	4.089
High	2480	4.791	3.014

- 2 Mbps

Channel	Frequency [MHz]	AV Power [dBm]	AV Power [mW]
Low	2402	3.462	2.219
Mid	2440	5.922	3.910
High	2480	4.612	2.892

9.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

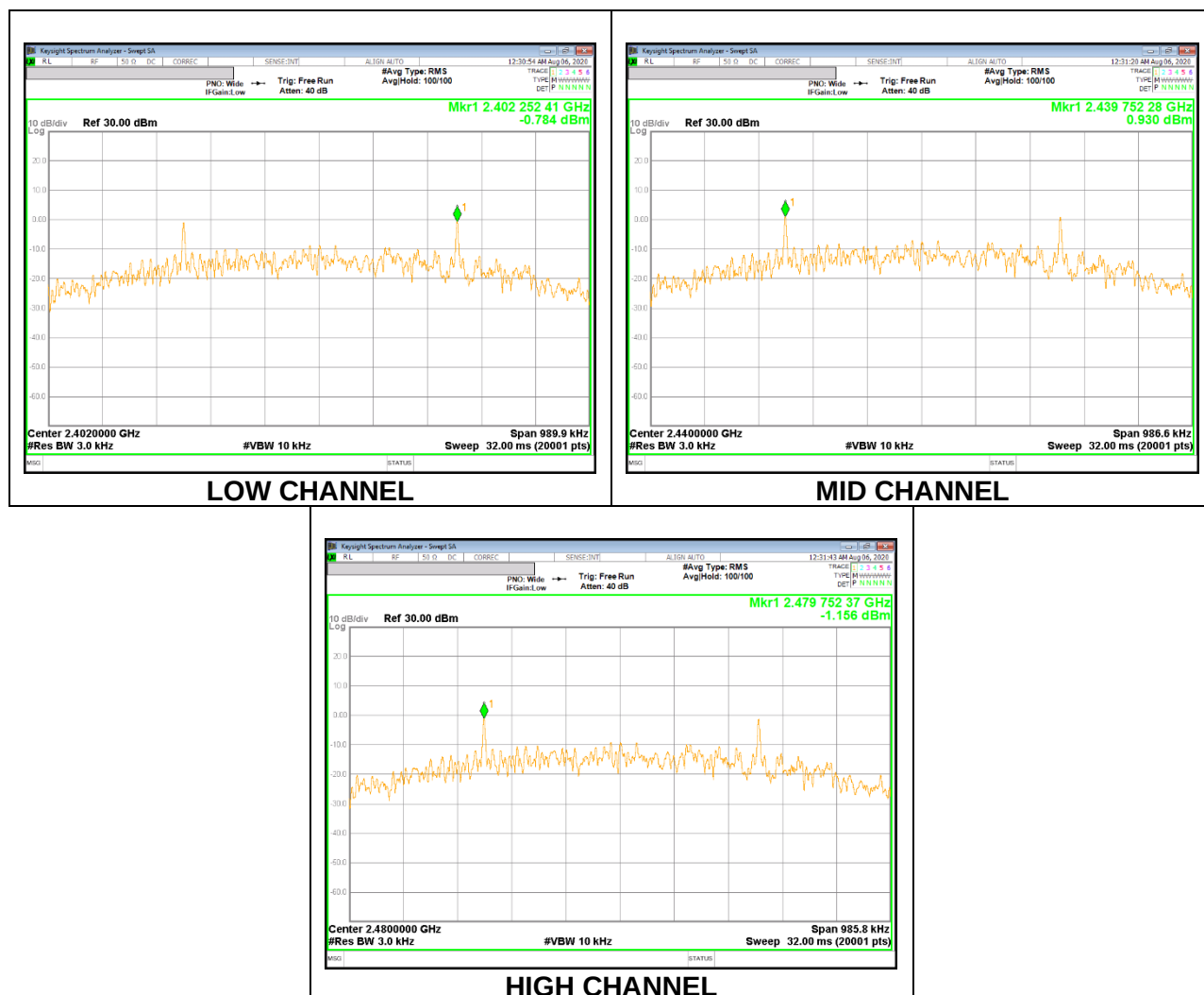
RSS-247 (5.2) (b)

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

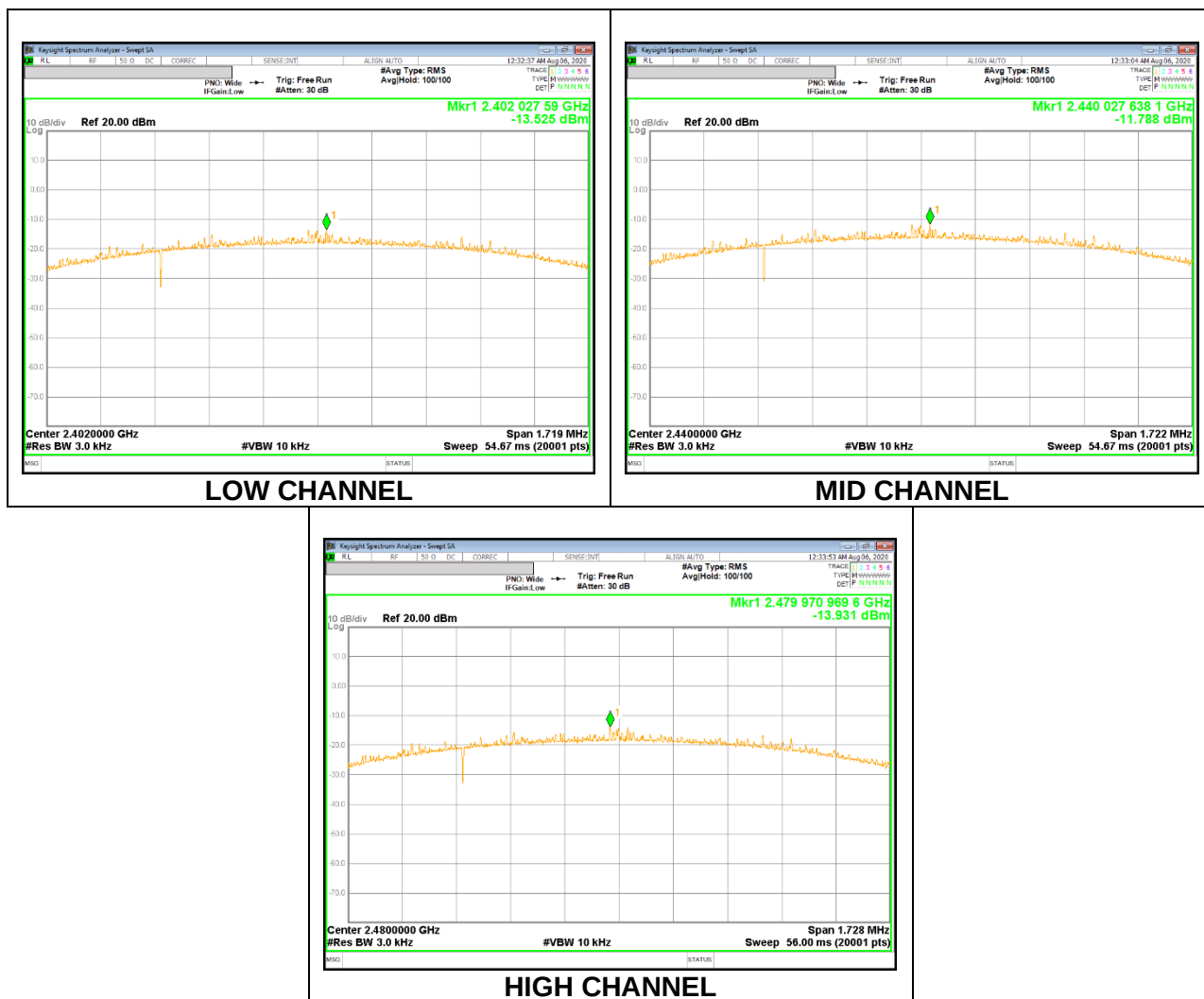
9.5.1. BLE (500 kbps)

Channel	Frequency [MHz]	PSD [dBm/3kHz]	Limit [dBm/3kHz]	Margin [dB]
Low	2402	-0.784	8.000	-8.784
Mid	2440	0.930	8.000	-7.070
High	2480	-1.156	8.000	-9.156



9.5.2. BLE (2Mbps)

Channel	Frequency [MHz]	PSD [dBm/3kHz]	Limit [dBm/3kHz]	Margin [dB]
Low	2402	-13.525	8.000	-21.525
Mid	2440	-11.788	8.000	-19.788
High	2480	-13.931	8.000	-21.931



9.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

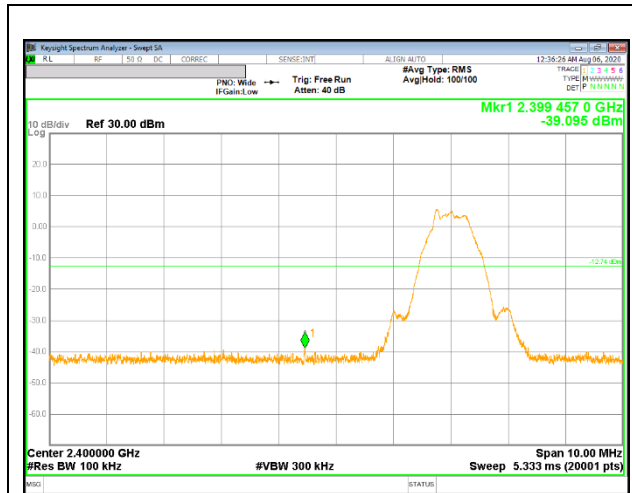
FCC §15.247 (d)

RSS-247 5.5

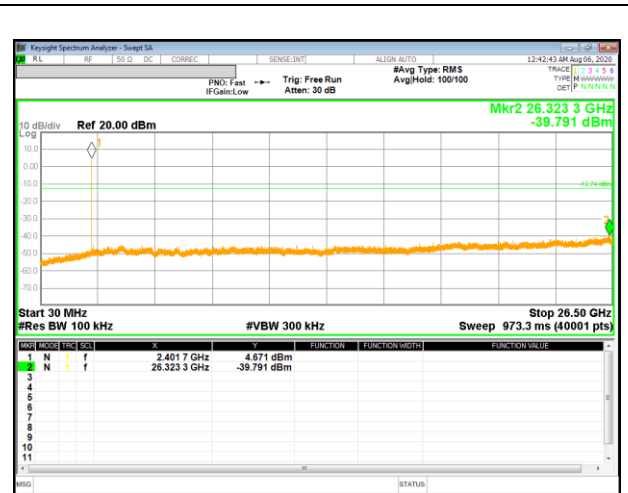
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

RESULTS

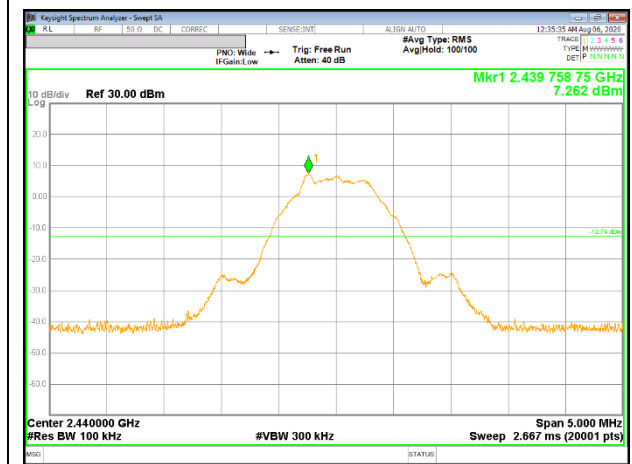
9.6.1. BLE (500 kbps)



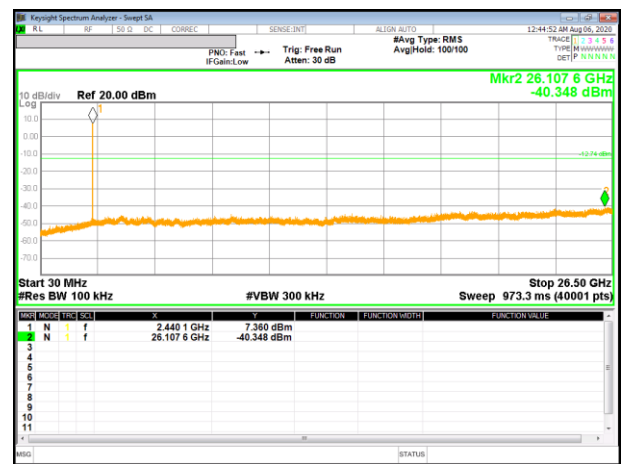
LOW CHANNEL BANDEDGE



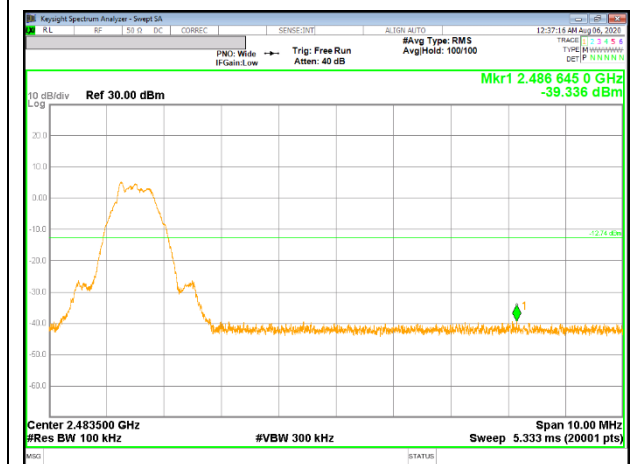
OUT-OF-BAND LOW CHANNEL



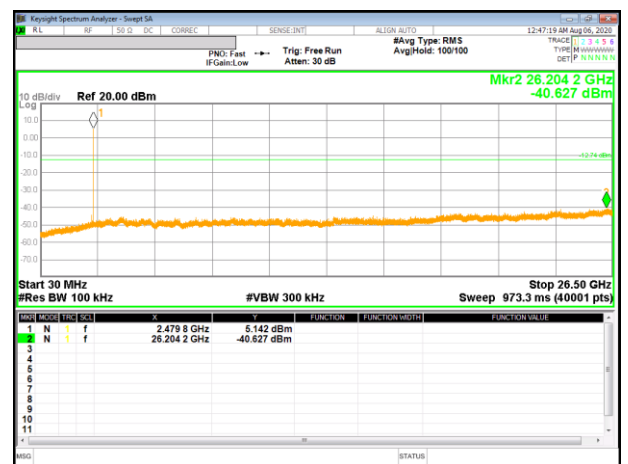
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

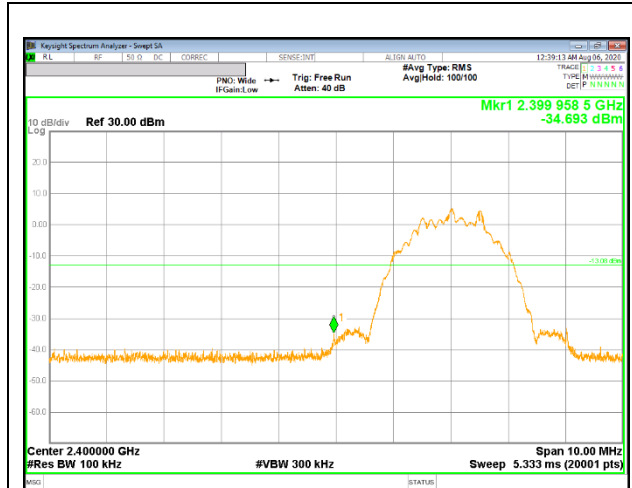


HIGH CHANNEL BANDEDGE

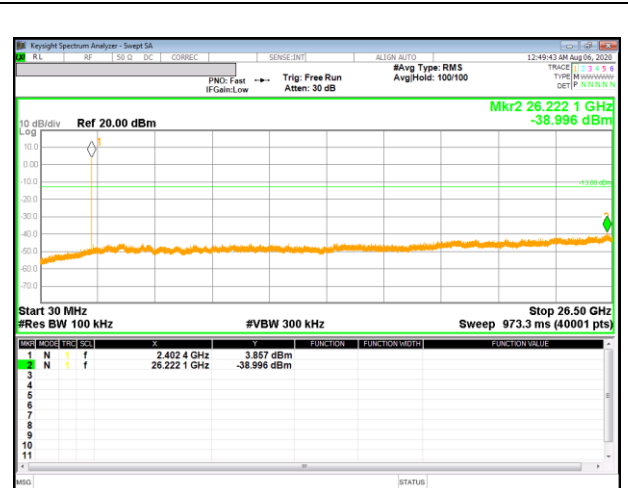


OUT-OF-BAND HIGH CHANNEL

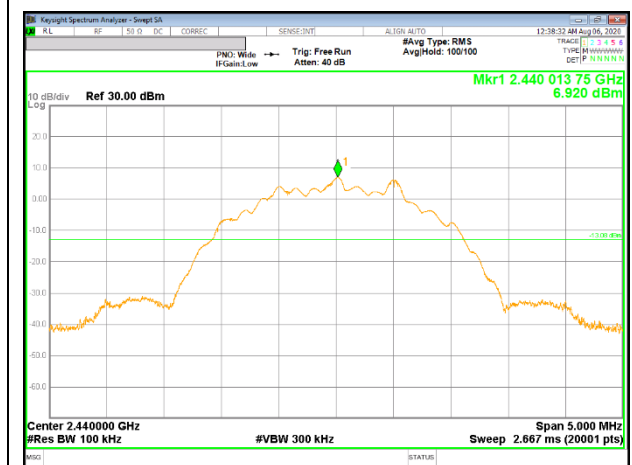
9.6.2. BLE (2Mbps)



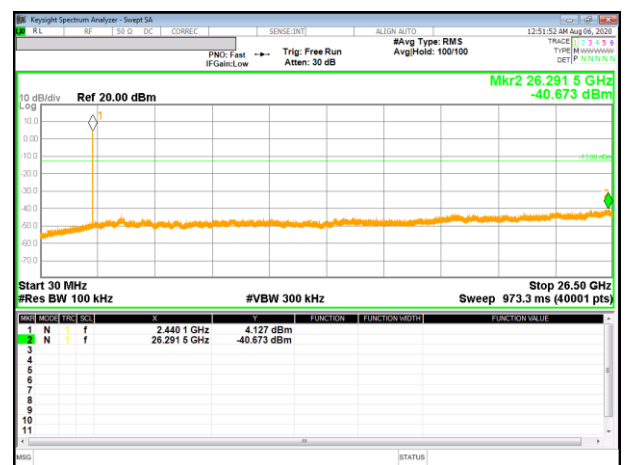
LOW CHANNEL BANDEDGE



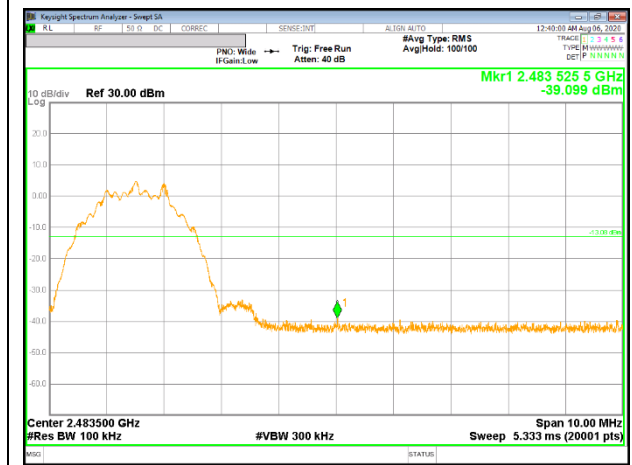
OUT-OF-BAND LOW CHANNEL



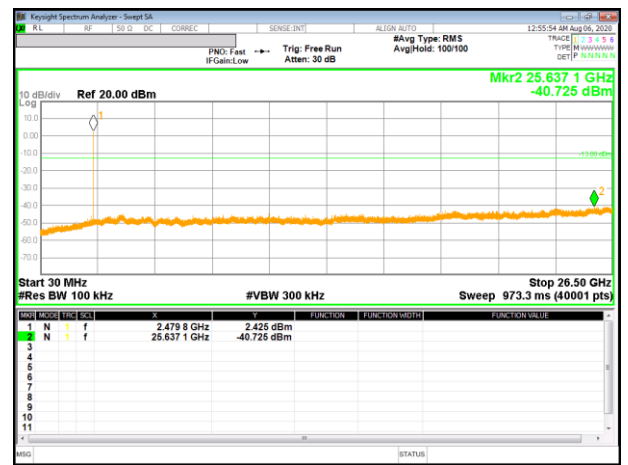
IN-BAND REFERENCE LEVEL



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 500 kbps, DCF = $10 \log(1/0.567) = 2.46$ dB (Spectrum Analyzer round it up to 2.46 dB) and for 2Mbps, DCF = $10 \log(1/0.572) = 2.42$ dB (Spectrum Analyzer round it up to 2.42 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 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.

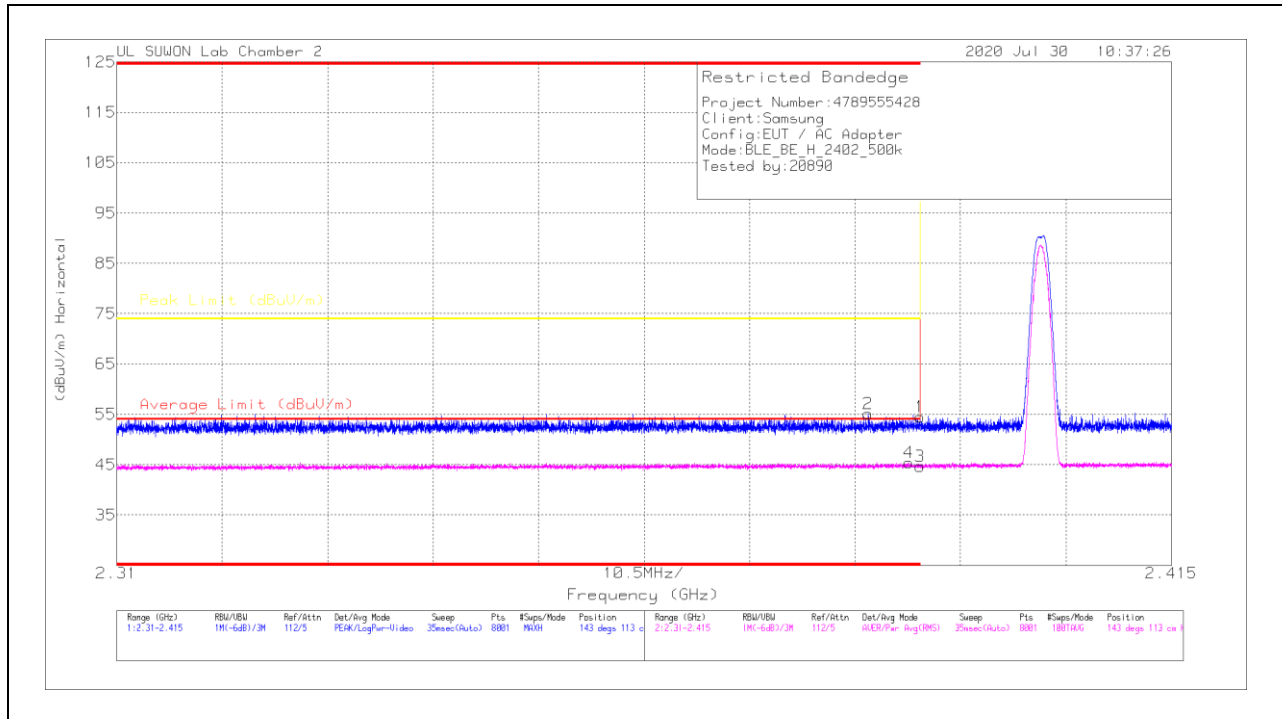
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field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

10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (500kbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_90218957	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	43.04	Pk	32.1	-20.6	0	54.54	-	-	74	-19.46	143	113	H
2	* 2.38481	43.58	Pk	32.1	-20.6	0	55.08	-	-	74	-18.92	143	113	H
3	* 2.39	30.68	RMS	32.1	-20.6	2.46	44.64	54	-9.36	-	-	143	113	H
4	* 2.38886	31.48	RMS	32.1	-20.6	2.46	45.44	54	-8.56	-	-	143	113	H

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

VERTICAL RESULT



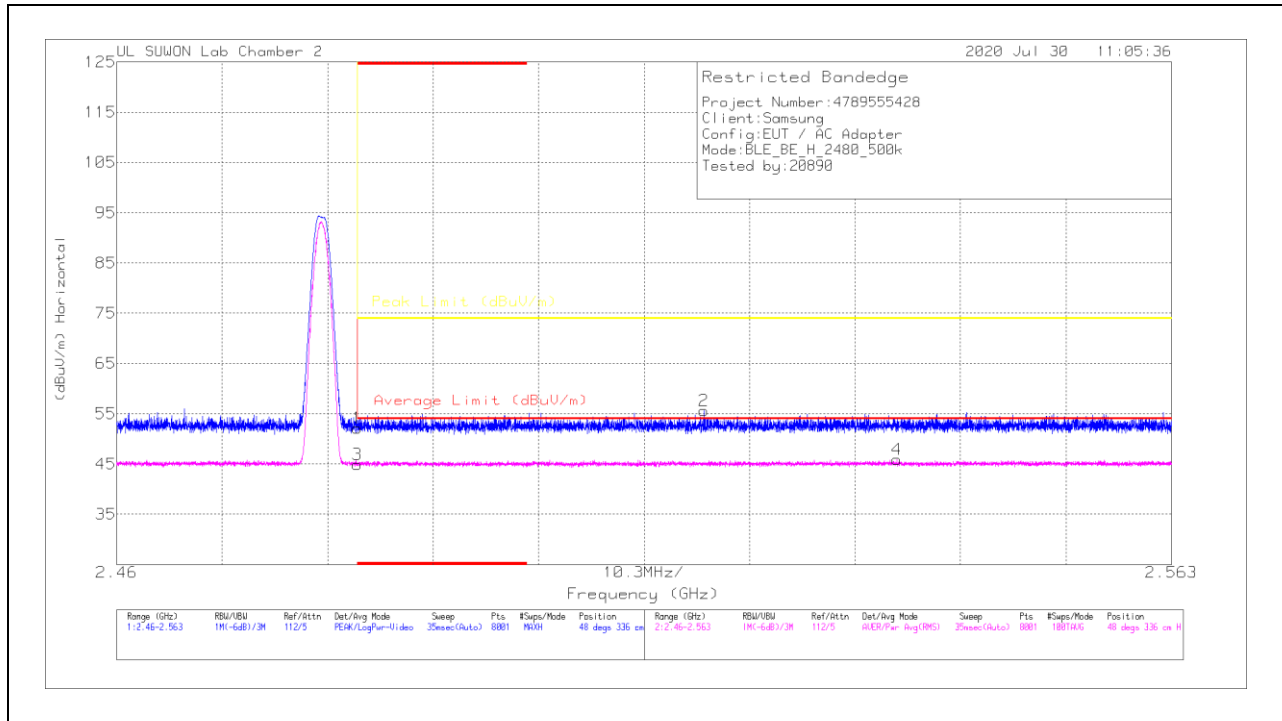
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	10dB_ATT[dB]	DC Cor (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (feet)	Height (m)	Polarity
1	* 2.39	41.9	PK	32.1	-20.6	0	53.4	-	-	74	-20.6	314	132	V
2	* 2.36791	44.17	PK	32	-20.6	0	55.57	-	-	74	-18.43	314	132	V
3	* 2.39	30.57	RMS	32.1	-20.6	2.46	44.53	54	-9.47	-	-	314	132	V
4	* 2.38769	31.4	RMS	32.1	-20.6	2.46	45.36	54	-8.64	-	-	314	132	V

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

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT

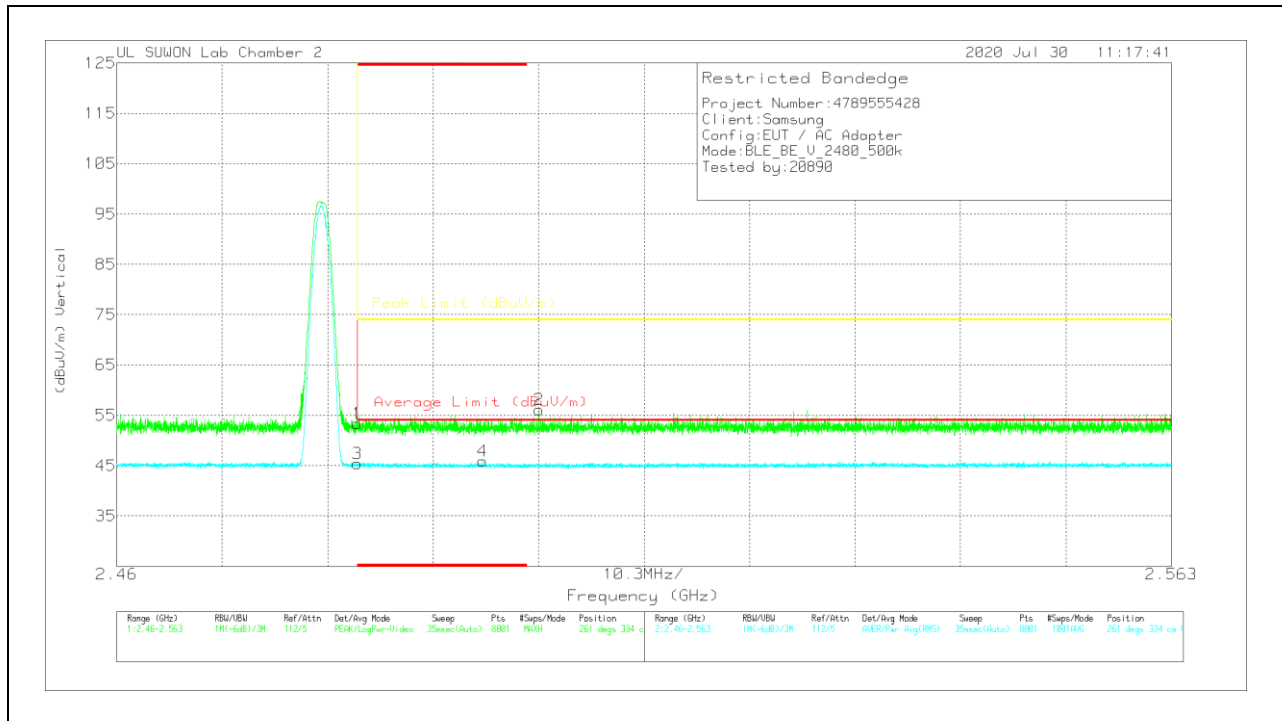


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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	* 2.48351	40.32	PK	32.2	-20.4	0	52.12	-	-	74	-21.88	48	336	H
2	2.51732	43.87	PK	32.2	-20.4	0	55.67	-	-	74	-18.33	48	336	H
3	* 2.48351	30.62	RMS	32.2	-20.4	2.46	44.88	54	-9.12	-	-	48	336	H
4	2.53618	31.52	RMS	32.3	-20.4	2.46	45.88	54	-8.12	-	-	48	336	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_00218957	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	41.61	PK	32.2	-20.4	0	53.41	-	-	74	-20.59	261	334	V
2	2.50123	44.35	PK	32.2	-20.4	0	56.15	-	-	74	-17.85	261	334	V
3	* 2.48351	31.11	RMS	32.2	-20.4	2.46	45.37	54	-8.63	-	-	261	334	V
4	* 2.49575	31.71	RMS	32.2	-20.5	2.46	45.87	54	-8.13	-	-	261	334	V

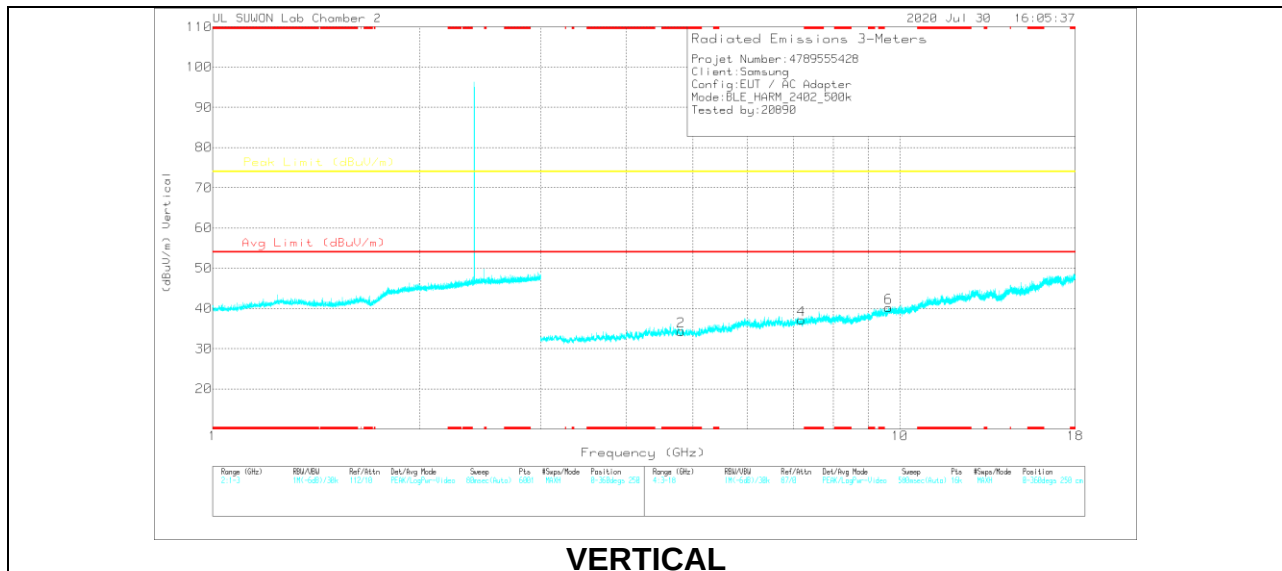
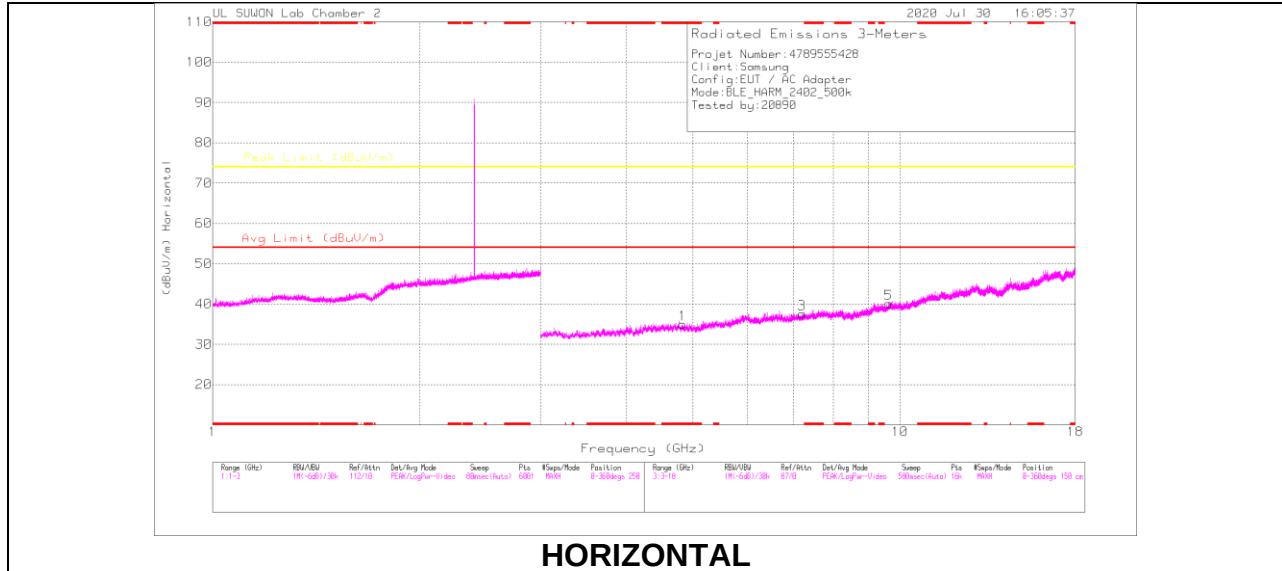
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS

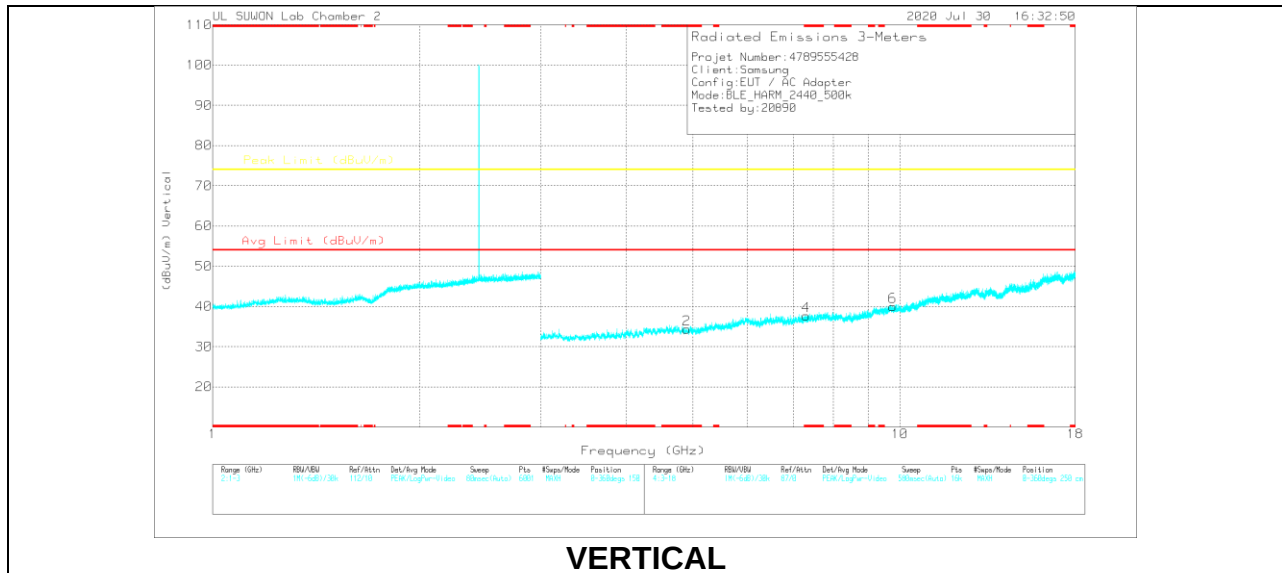
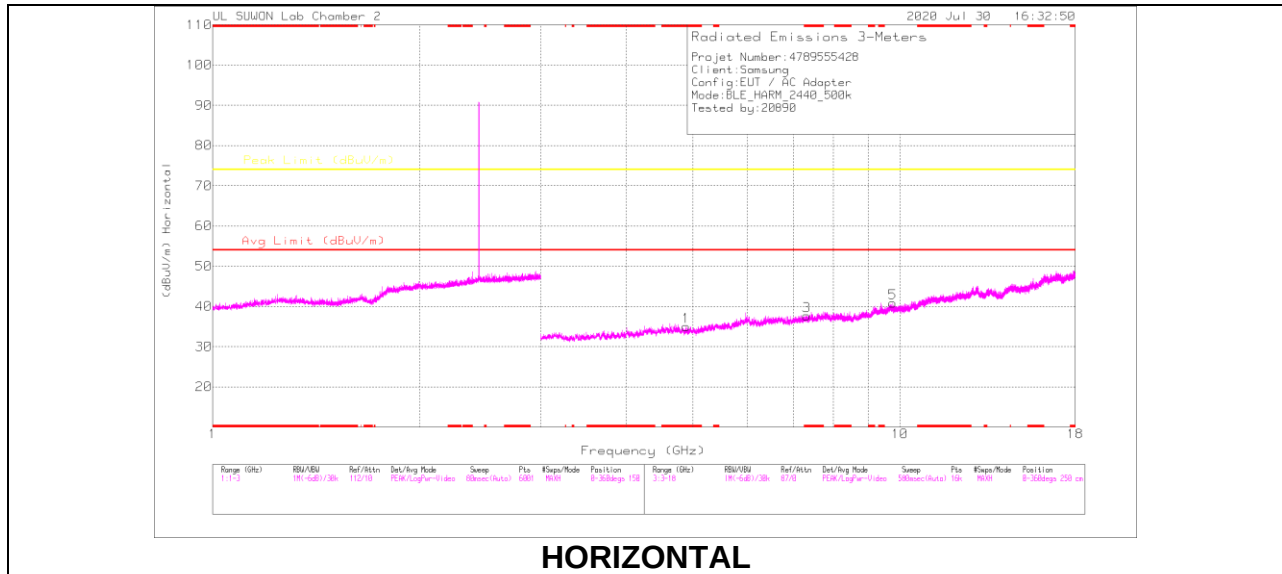


RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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
* 4.82828	37.58	PK2	34.2	-28.1	0	43.68	-	-	74	-30.32	360	100	H
* 4.82795	37.58	PK2	34.2	-28.1	0	43.68	-	-	74	-30.32	360	100	V
7.20234	35.29	PK2	35.9	-25.2	0	45.99	-	-	74	-28.01	360	100	H
7.20031	35.13	PK2	35.9	-25.2	0	45.83	-	-	74	-28.17	360	100	V
9.62779	33.25	PK2	36.9	-21.5	0	48.65	-	-	74	-25.35	360	100	H
9.62633	32.66	PK2	36.9	-21.5	0	48.06	-	-	74	-25.94	360	100	V

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

MID CHANNEL RESULTS

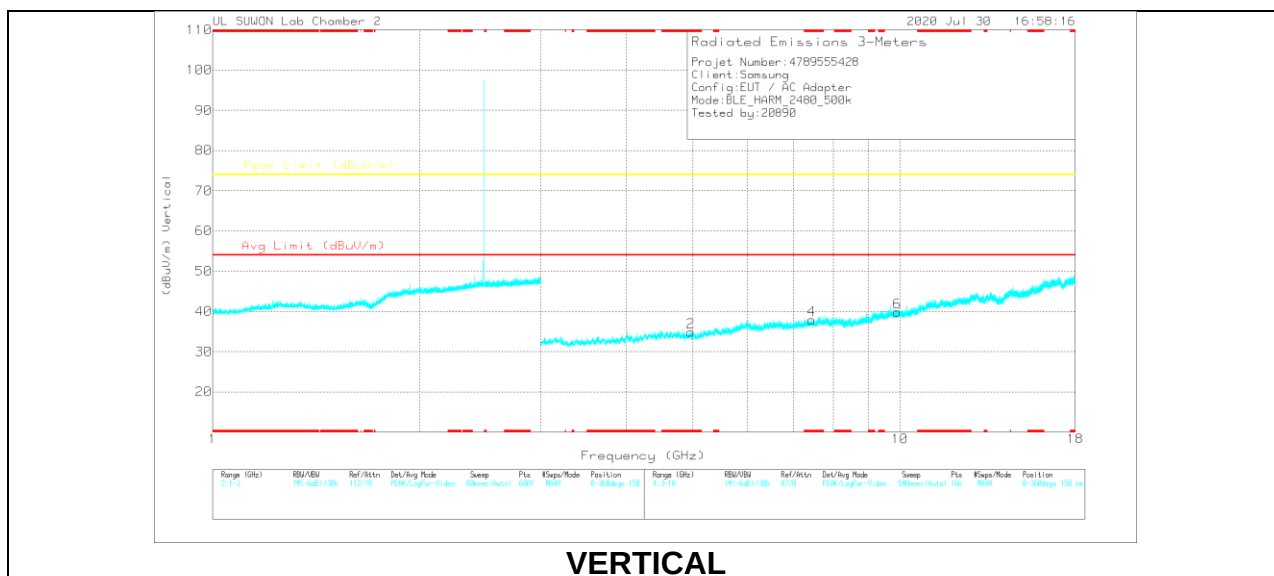
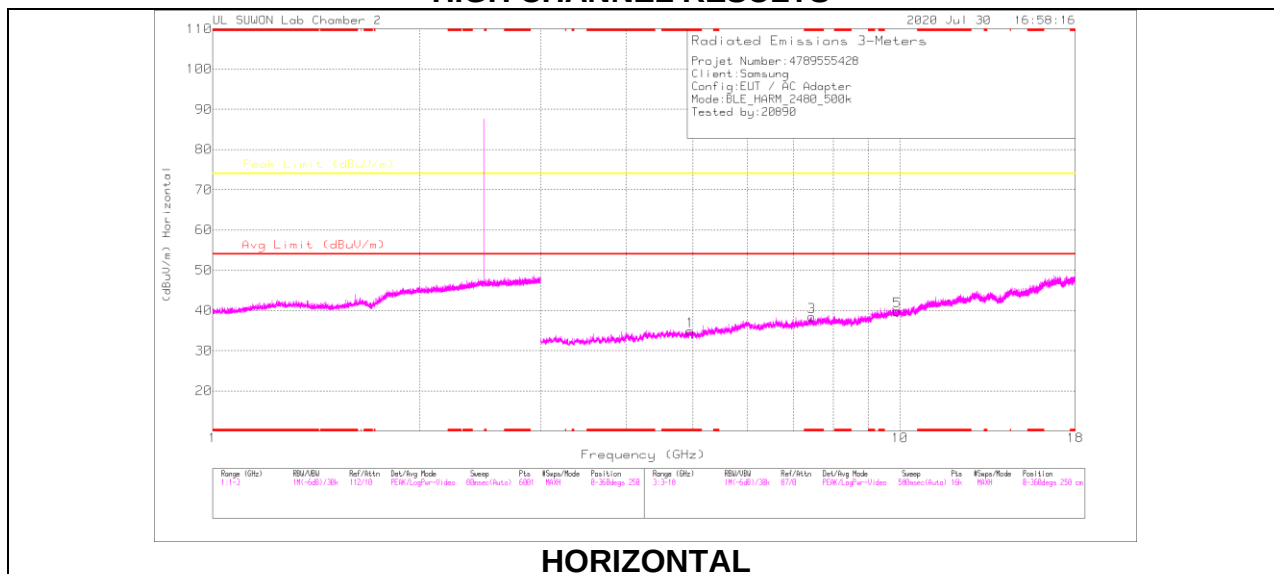


RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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
* 4.88723	37.16	PK2	34.1	-27.7	0	43.56	-	-	74	-30.44	360	100	H
* 4.88652	37.17	PK2	34.1	-27.7	0	43.57	-	-	74	-30.43	360	100	V
* 7.31371	35.63	PK2	35.9	-24.9	0	46.63	-	-	74	-27.37	360	100	H
* 7.31359	35.44	PK2	35.9	-24.9	0	46.44	-	-	74	-27.56	360	100	V
9.76075	32.32	PK2	37	-21.2	0	48.12	-	-	74	-25.88	360	100	H
9.76334	33.14	PK2	37	-21.2	0	48.94	-	-	74	-25.06	360	100	V

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

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

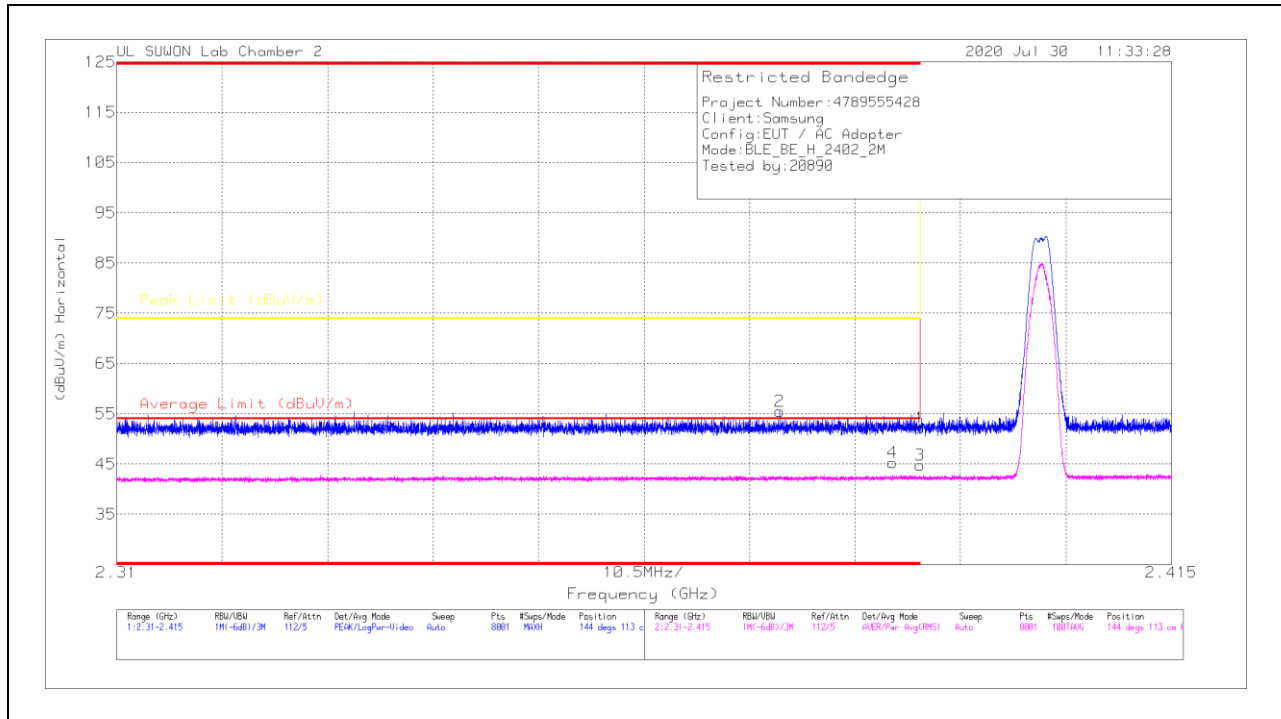
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.95355	36.01	PK2	34.1	-27	0	43.11	-	-	74	-30.89	360	100	H
* 4.94841	36.21	PK2	34.1	-27	0	43.31	-	-	74	-30.69	360	100	V
* 7.44206	34.87	PK2	35.9	-23.9	0	46.87	-	-	74	-27.13	360	100	H
* 7.45475	34.69	PK2	35.9	-24	0	46.59	-	-	74	-27.41	360	100	V
9.9282	32.08	PK2	37.3	-20.8	0	48.58	-	-	74	-25.42	360	100	H
9.92122	32.14	PK2	37.2	-21	0	48.34	-	-	74	-25.66	360	100	V

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

10.2.2. BLE (2Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT

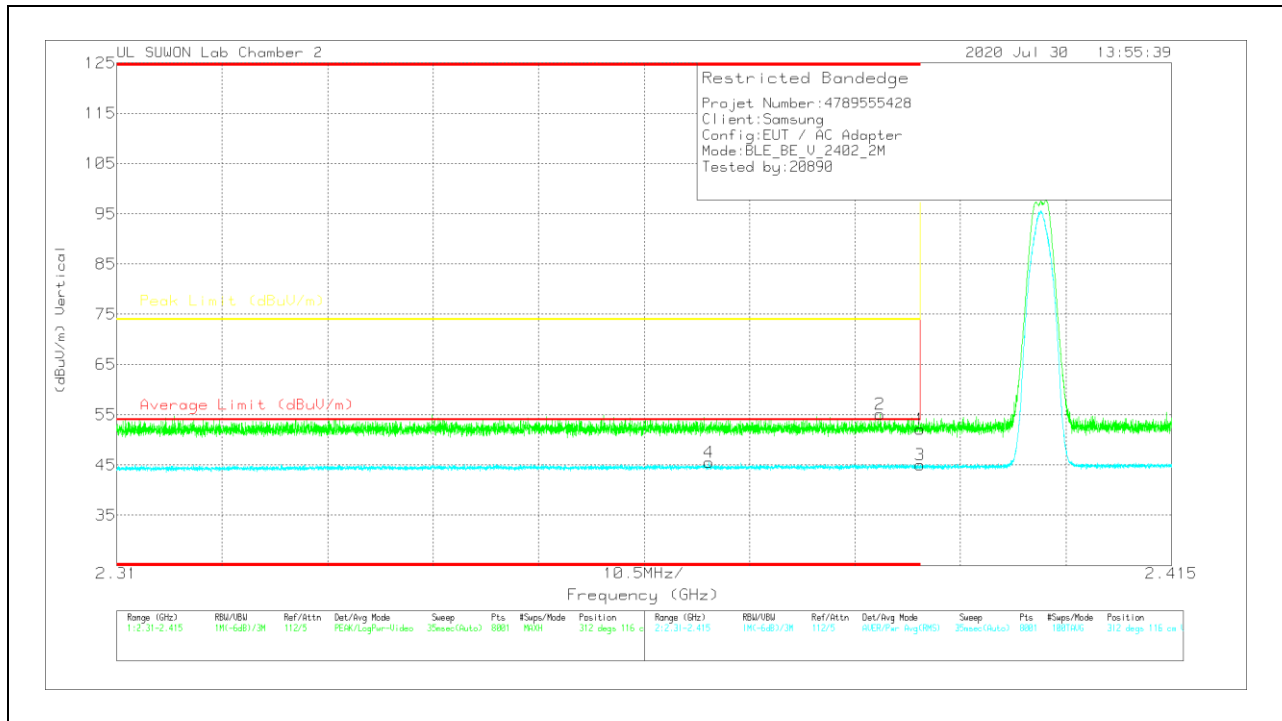


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_20218957	1088_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (deg)	Height (cm)	Polarity
1	* 2.39	40.66	Pk	32.1	-20.6	0	52.15	-	-	74	-21.84	144	113	H
2	* 2.37599	43.96	Pk	32.1	-20.6	0	55.46	-	-	74	-18.54	144	113	H
3	* 2.39	30.87	RMS	32.1	-20.6	2.42	44.79	54	-9.21	-	-	144	113	H
4	* 2.38723	31.34	RMS	32.1	-20.6	2.42	45.26	54	-8.74	-	-	144	113	H

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

VERTICAL RESULT



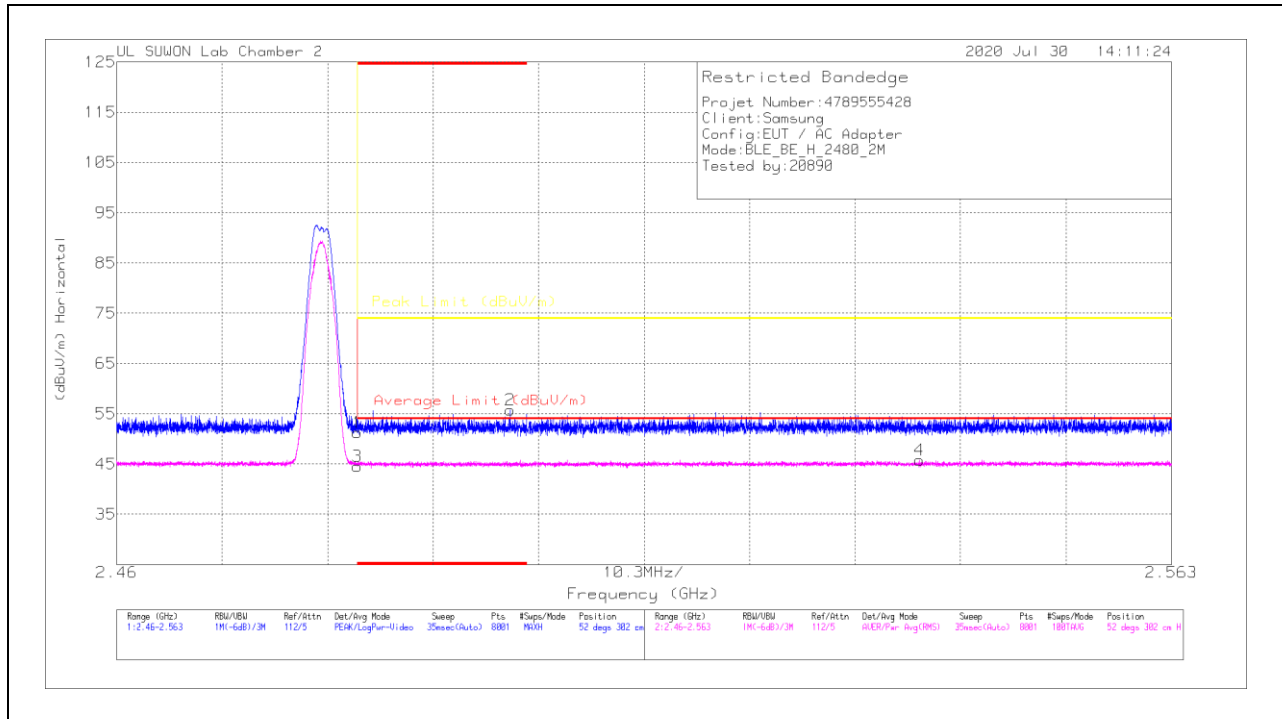
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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	40.59	PK	32.1	-20.6	0	52.09	-	-	74	-21.91	312	116	V
2	* 2.36801	43.6	PK	32.1	-20.6	0	55.1	-	-	74	-18.9	312	116	V
3	* 2.39	31.12	RMS	32.1	-20.6	2.42	45.04	54	-8.96	-	-	312	116	V
4	* 2.36897	31.73	RMS	32	-20.6	2.42	45.55	54	-8.45	-	-	312	116	V

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

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Trace Markers

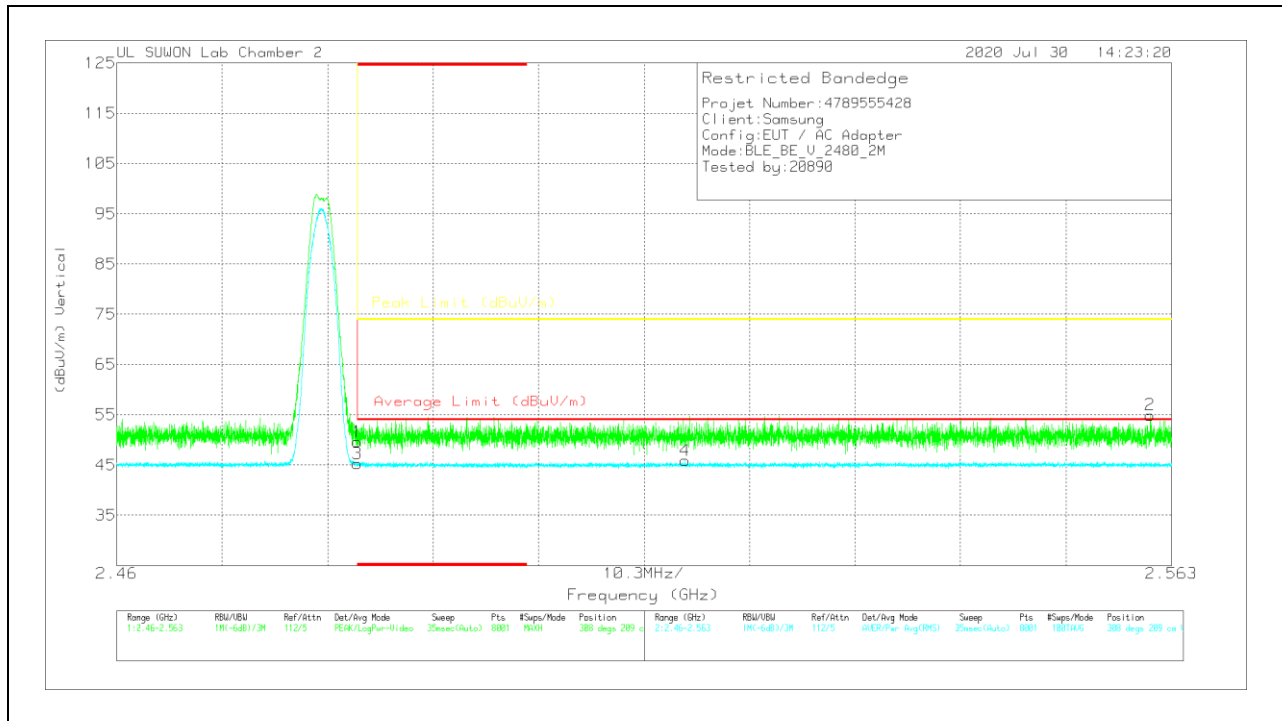
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	10dB_ATT[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.48351	39.49	PK	32.2	-20.4	0	51.29	-	-	74	-22.71	52	302	H
2	* 2.49842	44.01	PK	32.2	-20.5	0	55.71	-	-	74	-18.29	52	302	H
3	* 2.48351	30.31	RMS	32.2	-20.4	2.42	44.53	54	-9.47	-	-	52	302	H
4	2.5384	31.59	RMS	32.3	-20.5	2.42	45.81	54	-8.19	-	-	52	302	H

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

PK - Peak detector

RMS - RMS detection

VERTICAL RESULT



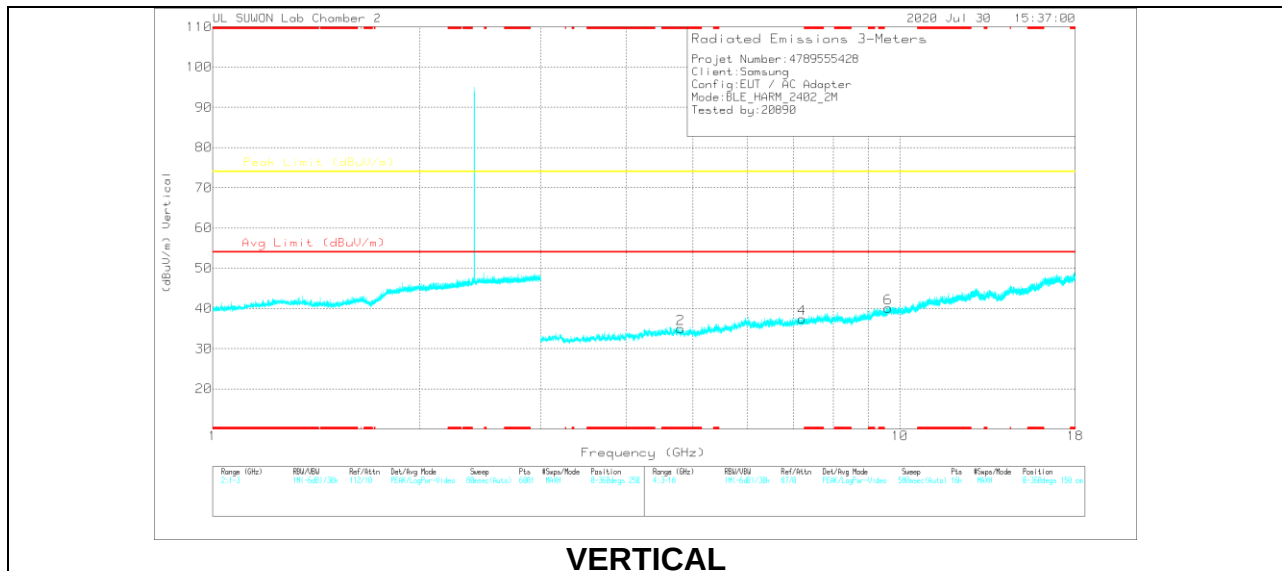
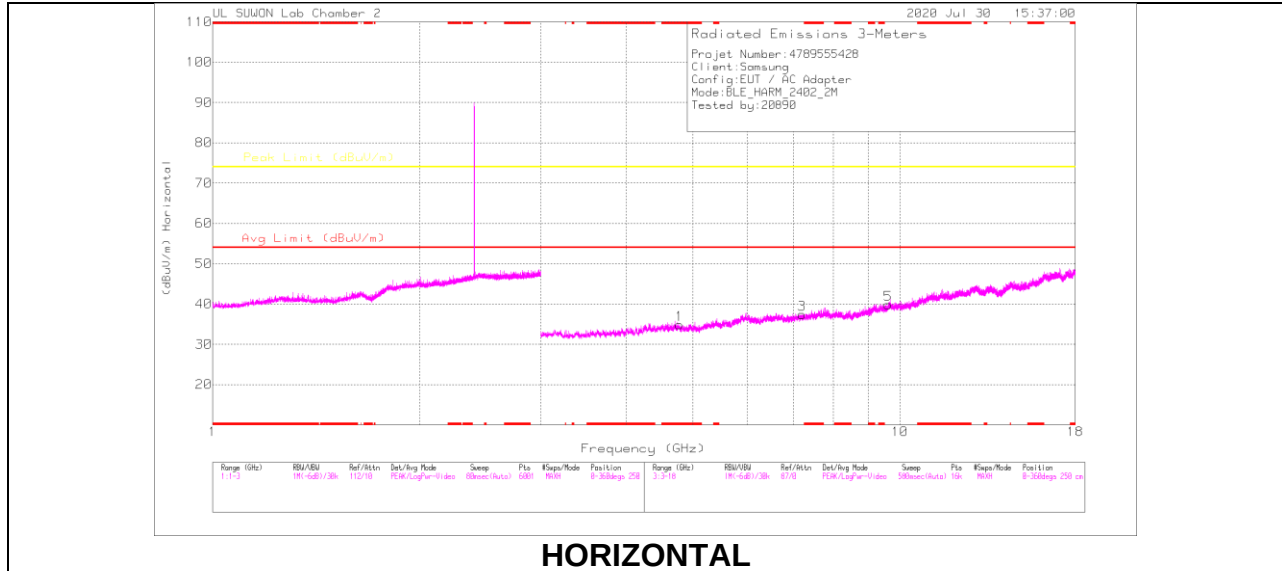
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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 (m)	Polarity
1	* 2.46351	37.79	PK	32.2	-20.4	0	49.59	-	-	74	-24.41	308	209	V
2	2.56094	42.93	PK	32.3	-20.3	0	54.93	-	-	74	-19.07	308	209	V
3	* 2.46351	31.08	RMS	32.2	-20.4	2.42	45.3	54	-8.7	-	-	308	209	V
4	2.5155	31.69	RMS	32.2	-20.4	2.42	45.91	54	-8.09	-	-	308	209	V

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

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS

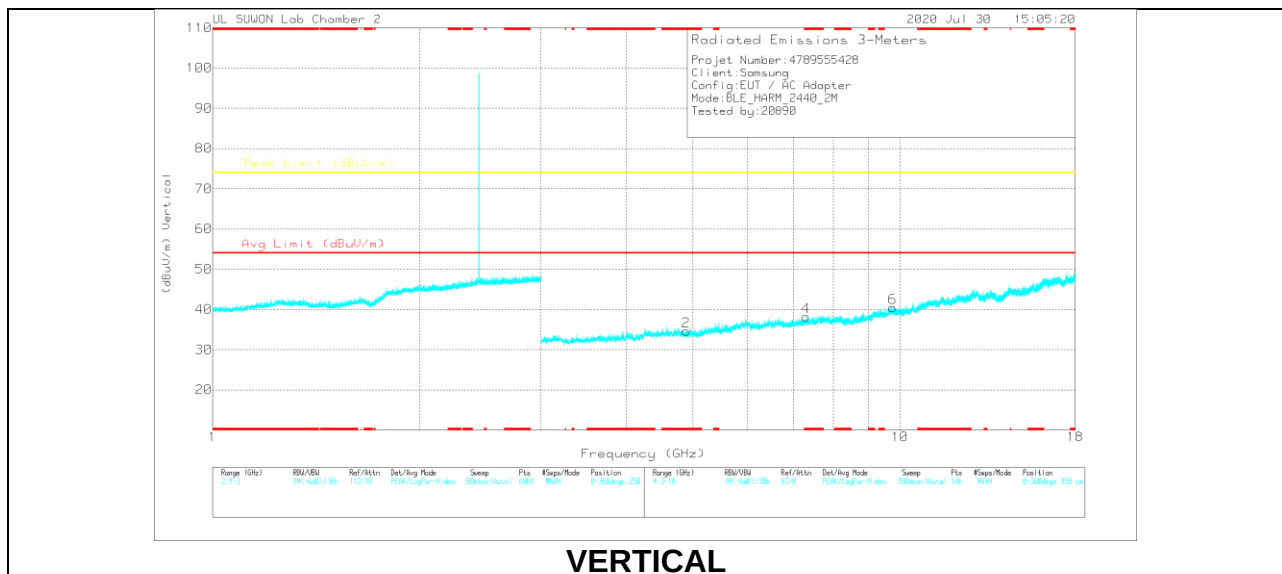
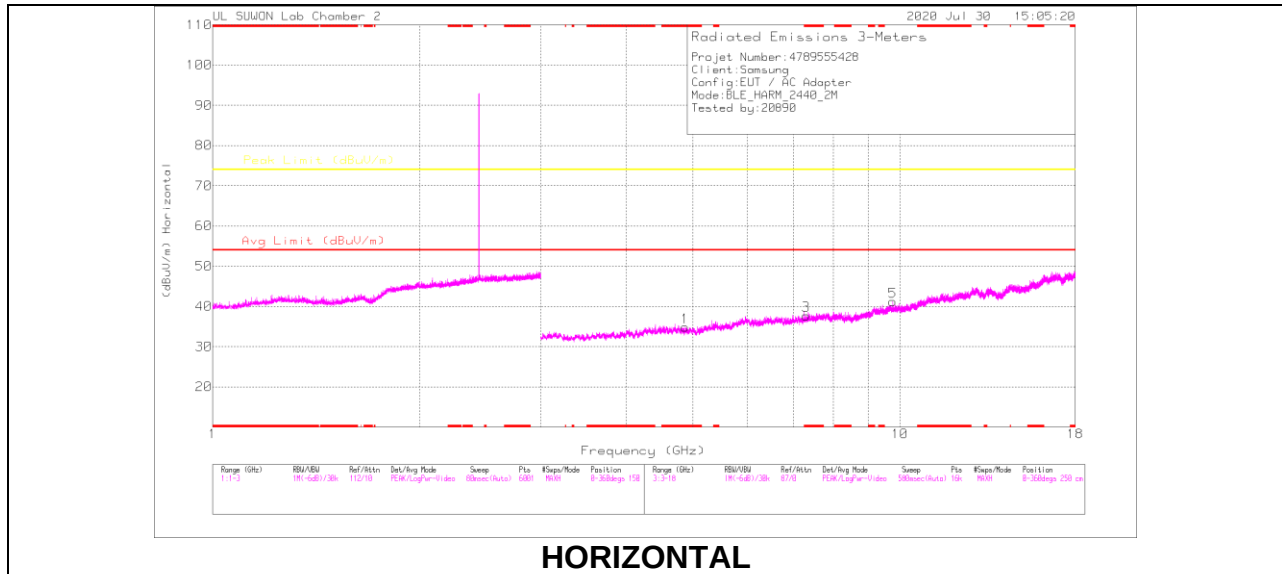


RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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
* 4.7806	36.75	PK2	34.2	-27.8	0	43.15	-	-	74	-30.85	360	100	H
* 4.78016	36.64	PK2	34.2	-27.8	0	43.04	-	-	74	-30.96	360	100	V
7.2007	35.38	PK2	35.9	-25.2	0	46.08	-	-	74	-27.92	360	100	H
7.20346	35.54	PK2	35.9	-25.2	0	46.24	-	-	74	-27.76	360	100	V
9.61981	32.84	PK2	36.8	-21.6	0	48.04	-	-	74	-25.96	360	100	H
9.61942	33.23	PK2	36.8	-21.6	0	48.43	-	-	74	-25.57	360	100	V

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

MID CHANNEL RESULTS

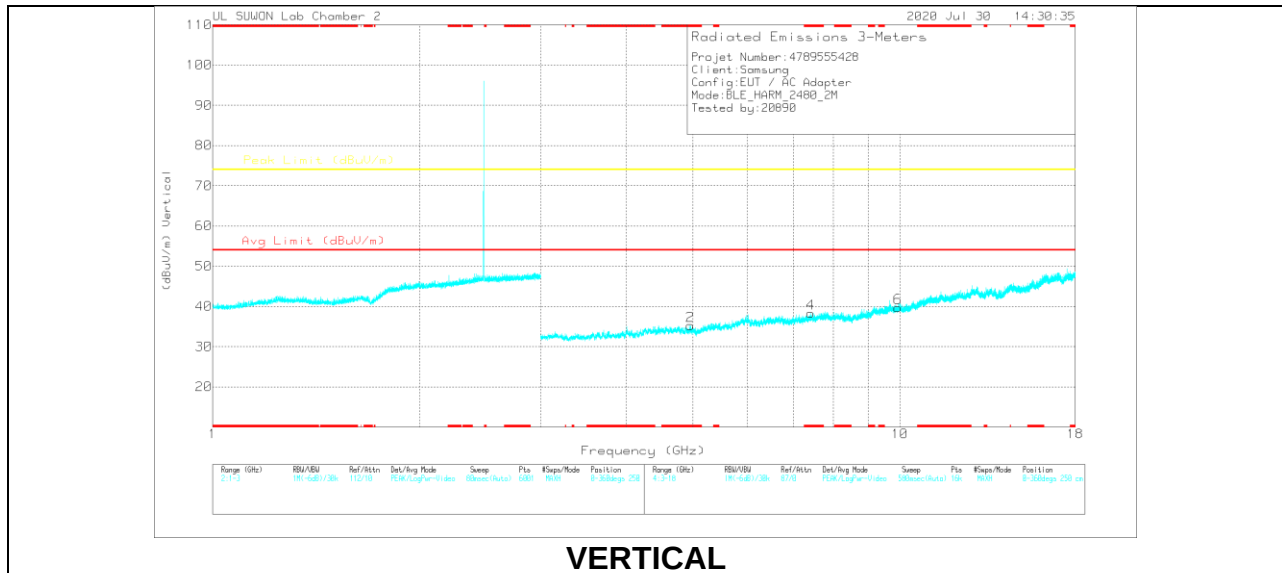
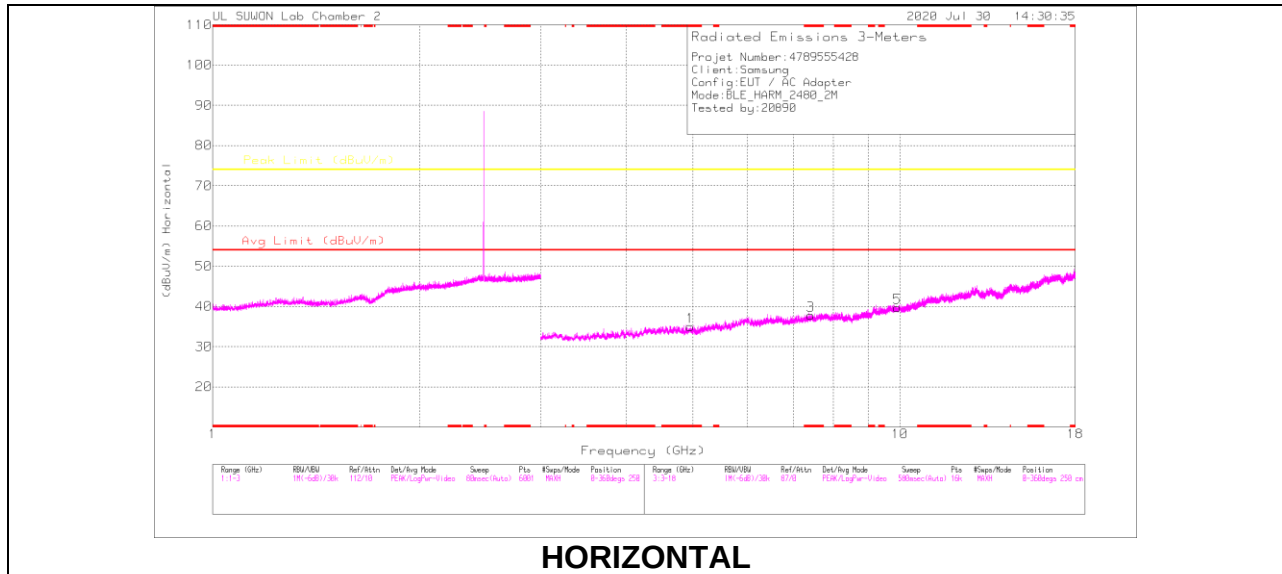


RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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
* 4.87149	37.27	PK2	34.2	-27.9	0	43.57	-	-	74	-30.43	360	100	H
* 4.87303	36.79	PK2	34.2	-27.9	0	43.09	-	-	74	-30.91	360	100	V
* 7.30604	35.47	PK2	35.9	-24.9	0	46.47	-	-	74	-27.53	360	100	H
* 7.30441	35.95	PK2	35.9	-24.9	0	46.95	-	-	74	-27.05	360	100	V
9.7718	31.21	PK2	37	-21.3	0	46.91	-	-	74	-27.09	360	100	H
9.77316	32.28	PK2	37	-21.4	0	47.88	-	-	74	-26.12	360	100	V

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

HIGH CHANNEL RESULTS



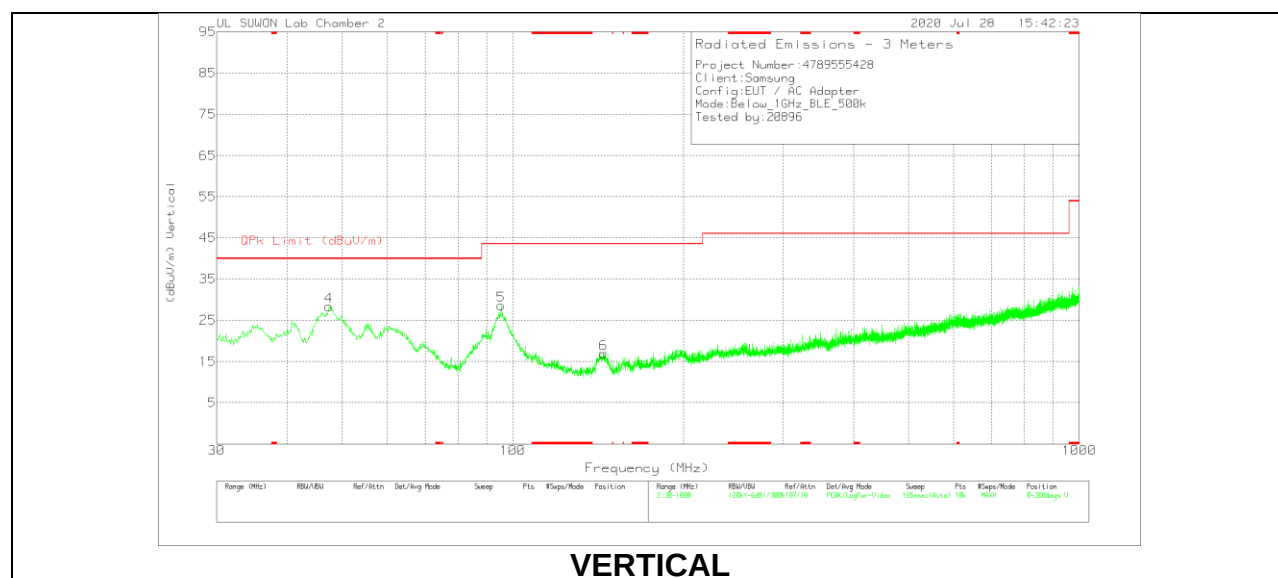
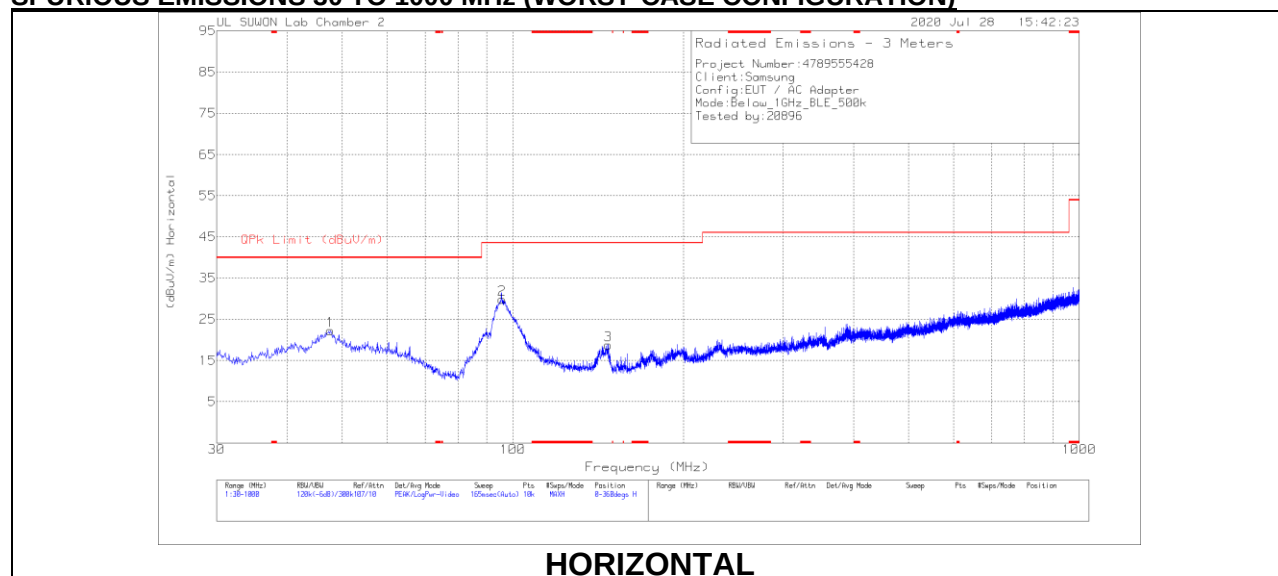
RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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
* 4.95683	35.87	PK2	34.1	-27	0	42.97	-	-	74	-31.03	360	100	H
* 4.95477	36.51	PK2	34.1	-27	0	43.61	-	-	74	-30.39	360	100	V
* 7.41842	34.32	PK2	35.8	-23.9	0	46.22	-	-	74	-27.78	360	100	H
* 7.41734	34.37	PK2	35.8	-23.9	0	46.27	-	-	74	-27.73	360	100	V
9.91596	32.46	PK2	37.2	-20.9	0	48.76	-	-	74	-25.24	360	100	H
9.91434	32.25	PK2	37.2	-20.9	0	48.55	-	-	74	-25.45	360	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

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Below_1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	47.654	34.23	Pk	19.8	-31.8	22.23	40	-17.77	0-360	300	H
2	95.669	43.9	Pk	17.3	-31.4	29.8	43.52	-13.72	0-360	300	H
3	147.37	35.77	Pk	14.1	-31.1	18.77	43.52	-24.75	0-360	200	H
4	47.363	40.23	Pk	19.8	-31.7	28.33	40	-11.67	0-360	100	V
5	95.378	42.65	Pk	17.3	-31.4	28.55	43.52	-14.97	0-360	100	V
6	144.751	33.91	Pk	14.1	-31.1	16.91	43.52	-26.61	0-360	100	V

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

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

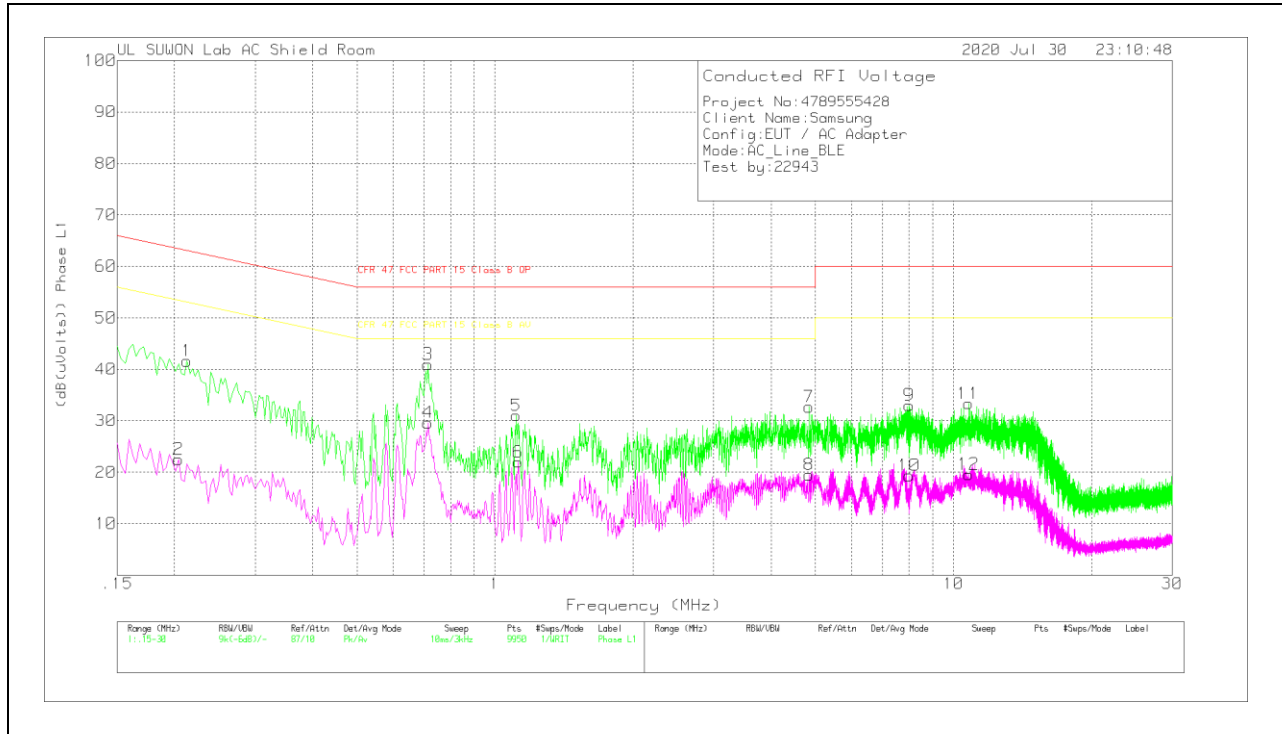
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

RESULTS

11.1.1. AC Power Line

LINE 1 RESULTS



Trace Markers

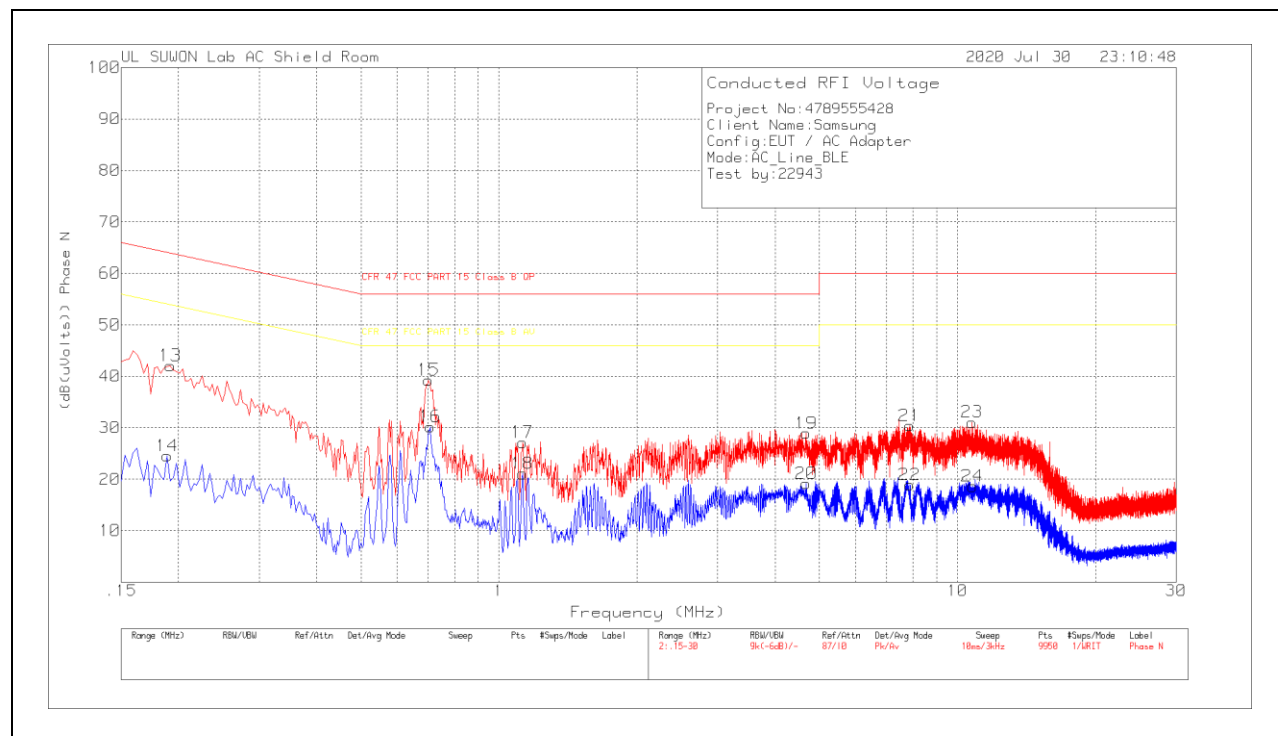
Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_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	.213	31.53	Pk	9.9	.2	41.63	63.09	-21.46	-	-
2	.204	12.42	Av	9.9	.2	22.52	-	-	53.45	-30.93
3	.714	30.85	Pk	9.9	.2	40.95	56	-15.05	-	-
4	.714	19.53	Av	9.9	.2	29.63	-	-	46	-16.37
5	1.113	20.93	Pk	9.8	.3	31.03	56	-24.97	-	-
6	1.122	11.86	Av	9.8	.3	21.96	-	-	46	-24.04
7	4.839	22.59	Pk	9.8	.3	32.69	56	-23.31	-	-
8	4.842	9.4	Av	9.8	.3	19.5	-	-	46	-26.5
9	8.004	22.8	Pk	9.9	.3	33	60	-27	-	-
10	8.004	9.16	Av	9.9	.3	19.36	-	-	50	-30.64
11	10.776	23.05	Pk	10	.3	33.35	60	-26.65	-	-
12	10.794	9.27	Av	10	.3	19.57	-	-	50	-30.43

Pk - Peak detector

Av - Average detection

LINE 2 RESULTS



Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_Wit h 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	.192	31.85	Pk	10	.2	42.05	63.95	-21.9	-	-
14	.189	14.34	Av	10	.2	24.54	-	-	54.08	-29.54
15	.702	29.17	Pk	9.9	.2	39.27	56	-16.73	-	-
16	.708	20.12	Av	9.9	.2	30.22	-	-	46	-15.78
17	1.125	17.05	Pk	9.8	.3	27.15	56	-28.85	-	-
18	1.125	10.98	Av	9.8	.3	21.08	-	-	46	-24.92
19	4.68	18.84	Pk	9.8	.3	28.94	56	-27.06	-	-
20	4.68	9.05	Av	9.8	.3	19.15	-	-	46	-26.85
21	7.863	20.21	Pk	9.9	.3	30.41	60	-29.59	-	-
22	7.86	8.71	Av	9.9	.3	18.91	-	-	50	-31.09
23	10.755	20.79	Pk	10	.3	31.09	60	-28.91	-	-
24	10.776	8.33	Av	10	.3	18.63	-	-	50	-31.37

Pk - Peak detector

Av - Average detection

END OF TEST REPORT