

CERTIFICATION TEST REPORT

Report Number. : 4790976555-E6V3

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

Model : SM-S921B/DS, SM-S921B

FCC ID : A3LSMS921B

EUT Description : GSM/WCDMA/LTE 5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax,
NFC and WPT

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

Date Of Issue:
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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2023-10-17	Initial issue	Dexter(Hyunsik) Yun
V2	2023-10-23	Updated to address TCB's question	Dexter(Hyunsik) Yun
V3	2023-10-25	Updated to address TCB's question	Dexter(Hyunsik) Yun

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA/LTE 5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, NFC and WPT

MODEL NUMBER: SM-S921B/DS, SM-S921B

SERIAL NUMBER: R3CW80FKQ6B, R3CW80FKP9Y, R3CW80FKNYD(CONDUCTED); R3CW80FLMMK, R3CW90M7N2J, R3CW90M7MSN (RADIATED);

DATE TESTED: 2023-08-30 ~ 2023-10-24

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
47 CFR 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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Seokhwan Hong
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Tested By:



Dexter(Hyunsik) Yun
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2. TEST METHODOLOGY

1. FCC 47 CFR Part 2.
2. FCC 47 CFR Part 15.
3. KDB 558074 D01 15.247 Meas Guidance v05r02.
4. KDB 662911 D01 v02r01
5. 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(3m semi-anechoic chamber)
☒	Chamber 2(3m semi-anechoic chamber)
☒	Chamber 3(3m semi-anechoic chamber)
☐	Chamber 4(3m Full-anechoic chamber)
☐	Chamber 5(3m Full-anechoic chamber)

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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) +
Cable Loss (dB) – Preamp Gain (dB)

28.9 dBuV/m = 36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB

AC Corrected Reading (dBuV) = Measured Voltage (dBuV) + Extension Cord
Loss (dB) + Cable Loss (dB)

44.72 dBuV = 34.72 dBuV + 9.9 dB + 0.1 dB

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.80 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.92 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.06 dB
Radiated Disturbance, 18 GHz to 40 GHz	6.02 dB

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

4.4. DECISION RULES

Decision rule for statement(s) of conformity is based on Procedure 2, Clause 4.4.3 in IEC Guide 115:2021.

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE 5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, NFC and WPT. This test report addresses the DTS (BLE) operational mode.

Representative model	Difference	Derivative model
		SM-S921B
SM-S921B/DS	Hardware	Different Sim Card tray
	Software	Same

The model SM-S921B/DS was used for final testing and is representative of the test results in this report.

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	1 Mbps (37pkt)	Peak	17.770	59.841
		Average	17.345	54.263
	2Mbps (37 pkt)	Peak	17.860	61.094
		Average	17.326	54.026

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 a internal antenna, with a maximum gain of:

Frequency Band[MHz]	ANT1 Gain [dBi]	ANT2 Gain [dBi]	Correlated Chains Directional Gain[dBi]
DTS 2400 – 2483.5	-2.44	-3.89	-0.12

Directional gain for the MIMO operations is determined using KDB 662911 D01 Multiple Transmitter Output section F (2)(d)(1) for *Unequal antenna gains, with equal transmit powers*. The gain is calculated using the formula for correlated transmissions across the two transmit antennas.

Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$ dBi.

Sample calculation for this device with $N_{ANT} = 2$

Directional gain = $10 \log[(10^{-3.5/20} + 10^{-7.1/20})^2 / 2] = -2.1$ dBi

“Wi-Fi1 - SUB4 ANT” and “Wi-Fi2 - SUB6/SUB1 ANT” as indicated in antenna specification are written as ANT1 and ANT2 in this report.

5.4. WORST-CASE CONFIGURATION AND MODE

Both Bluetooth LE Diversity mode and DUAL mode have been investigated and confirmed.

The fundamentals of the EUT were investigated in three orthogonal orientations X, Y and Z. It was determined that below table's orientation was the worst-case orientation.

ANT1	ANT2	DUAL
X	Z	X

For conducted power test, both Diversity and DUAL mode were verified and reported. In DUAL mode, except power test, no noticeable data was found. Tests was performed on Diversity mode.

Diversity mode test was performed on ePA(PL11) and DUAL mode on iPA(PL 10).

Radiated and power line conducted tests were performed with EUT connected to AC power adapter as the worst-case configuration. Radiated harmonics spurious 1~18 GHz Low/Mid/High channels,18-26GHz were performed with the EUT set at the Diversity and DUAL mode. Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

For Radiated band-edge and spurious test, tests were performed on Diversity mode and DUAL mode.

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

- Diversity

Symbol Rate [Ms/s]	Mode	Freq. [MHz]	Conducted Burst Avg [dBm]	Symbol Rate [Ms/s]	Mode	Freq. [MHz]	Conducted Burst Avg [dBm]
1	1 Mbps 37 pkt ANT1	2 402	17.064	2	2 Mbps 37 pkt ANT1	2 402	16.882
		2 440	17.250			2 440	17.326
		2 480	17.345			2 480	17.222
	1 Mbps 37 pkt ANT2	2 402	14.793		2 Mbps 37 pkt ANT2	2 402	14.931
		2 440	14.684			2 440	14.726
		2 480	14.737			2 480	14.540
	1 Mbps 255 pkt ANT1	2 402	16.630		2 Mbps 255 pkt ANT1	2 402	16.488
		2 440	16.779			2 440	16.636
		2 480	16.640			2 480	16.512
	1 Mbps 255 pkt ANT2	2 402	15.151		2 Mbps 255 pkt ANT2	2 402	14.984
		2 440	14.691			2 440	14.845
		2 480	14.560			2 480	14.420
1 Coded S=8	125 kbps 37 pkt ANT1	2 402	8.788	1 Coded S=2	500 kbps 37 pkt ANT1	2 402	8.822
		2 440	8.483			2 440	8.528
		2 480	7.298			2 480	7.515
	125 kbps 37 pkt ANT2	2 402	6.651		500 kbps 37 pkt ANT2	2 402	6.671
		2 440	6.491			2 440	6.653
		2 480	6.345			2 480	6.363
	125 kbps 255 pkt ANT1	2 402	7.397		500 kbps 255 pkt ANT1	2 402	8.768
		2 440	8.429			2 440	8.459
		2 480	8.751			2 480	7.418
	125 kbps 255 pkt ANT2	2 402	6.625		500 kbps 255 pkt ANT2	2 402	6.648
		2 440	6.465			2 440	7.016
		2 480	6.314			2 480	6.369

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37T53J8459SEA	N/A
Data Cable	SAMSUNG	EP-DN980	GH39-02111A	N/A

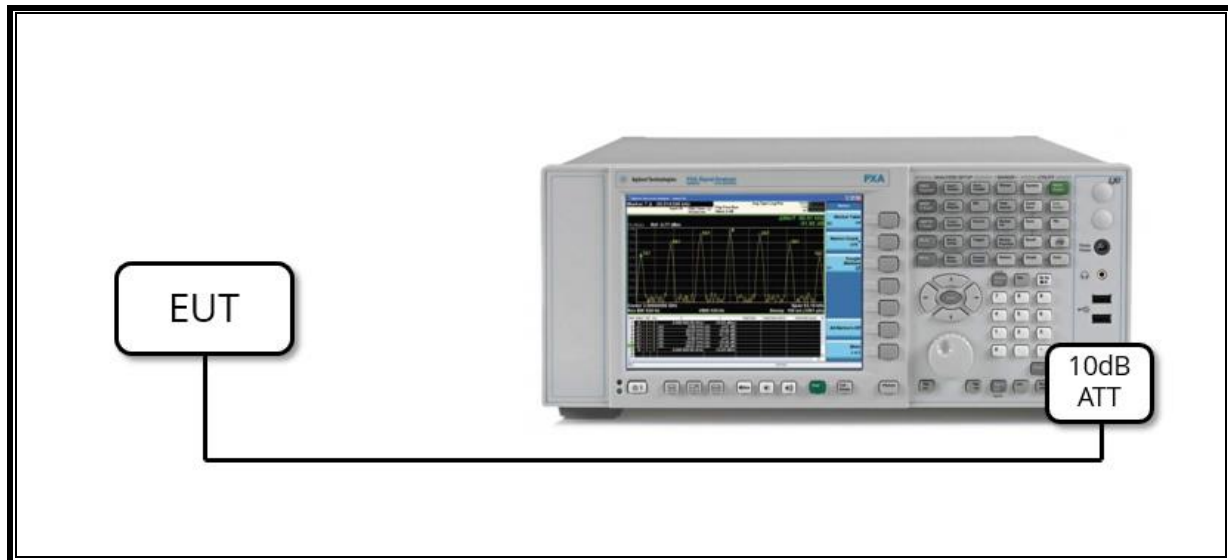
I/O CABLE

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	1.0 m	N/A

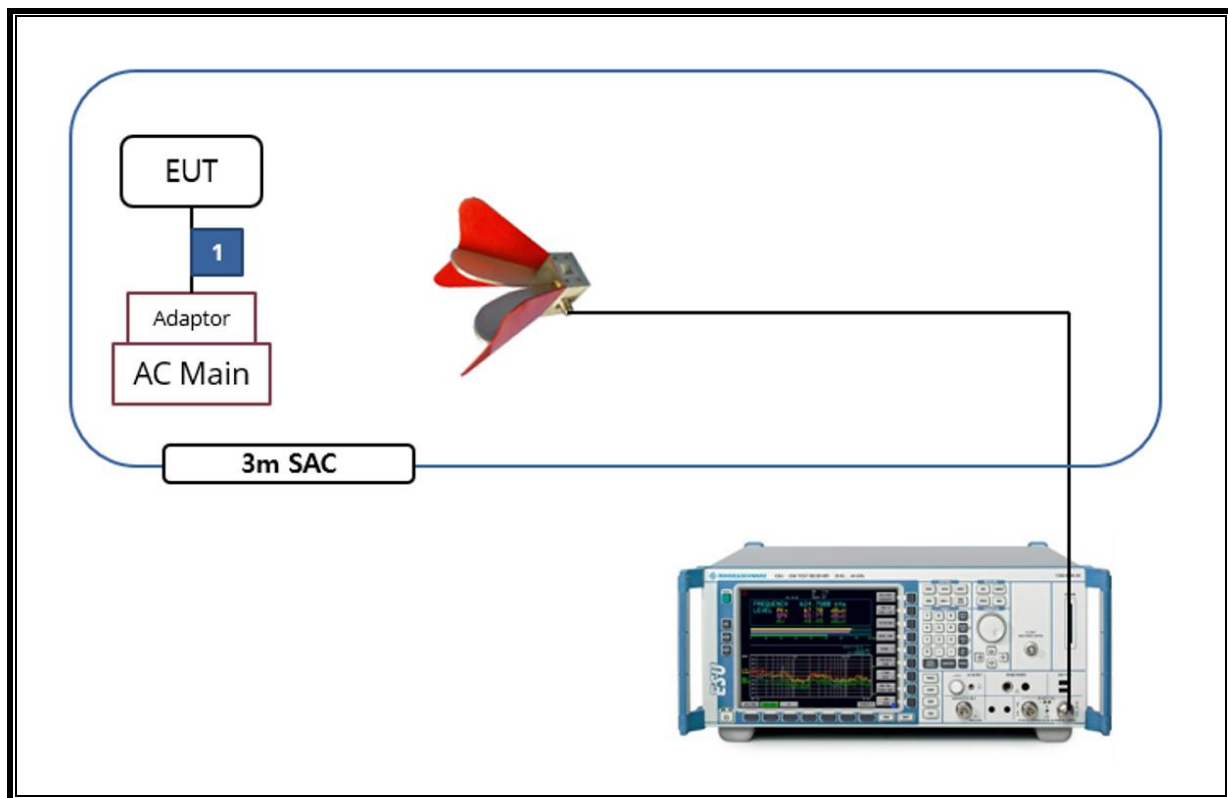
TEST SETUP

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 : ANSI C63.10-2013, Section 11.8.2 Option 2

OUTPUT POWER : ANSI C63.10-2013, Section 11.9.1.1 RBW $\geq$ DTS bandwidth

POWER SPECTRAL DENSITY : ANSI C63.10-2013, Section 11.10.2 Method PKPSD (peak PSD)

Out-of-band Emissions (Conducted) : ANSI C63.10-2013, Section 11.11 Emissions in nonrestricted frequency bands

Out-of-band Emissions in Non-restricted Bands: ANSI C63.10-2013, Section 11.11 Emissions in nonrestricted frequency bands

Out-of-band Emissions in Restricted Bands : ANSI C63.10-2013, Section 11.12 Emissions in restricted frequency bands

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	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	2024-08-15
Antenna, Horn, 18 GHz	ETS	3117	00168717	2024-08-21
Antenna, Horn, 40 GHz	ETS	3116C	00166155	2024-08-02
Preamplifier	ETS	3116C-PA	00168841	2024-07-25
Preamplifier, 1000 MHz	Sonoma	310N	341282	2024-07-24
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	2024-07-24
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9030B	MY60070693	2024-01-09
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9040B	MY60080268	2024-01-09
Average Power Sensor	Agilent / HP	U2000A	MY54270007	2024-07-23
Average Power Sensor	Agilent / HP	U2000A	MY54260010	2024-07-24
Attenuator	PASTERNAK	PE7087-10	A001	2024-07-23
Attenuator	PASTERNAK	PE7087-10	A008	2024-07-27
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2024-07-23
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2024-07-24
EMI Test Receive, 3 GHz	R&S	ESR3	101832	2024-07-23
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	2024-07-23
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	2024-07-23
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	2024-07-24
LISN	R&S	ENV-216	101837	2024-07-23
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2025-09-06
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

8. TEST RESULTS SUMMARY

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
15.247 (a)(2)	Occupied Bandwidth(6dB)	> 500kHz	Conducted	Complies
2.1051, 15.247(d)	Band Edge / Conducted Spurious Emission	-20 dBc		Complies
15.247 (b)(3)	TX conducted output power	< 30 dBm		Complies
15.247(e)	PSD	< 8 dBm/3kHz		Complies
15.207(a)	AC Power Line conducted emissions	Section 11	Power Line conducted	Complies
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m(Av)	Radiated	Complies

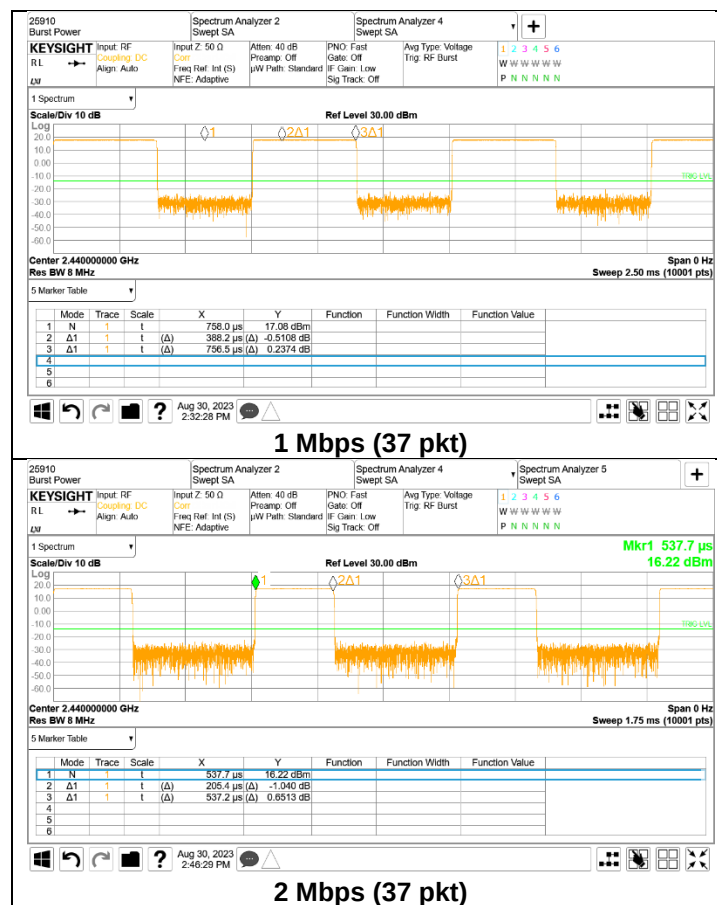
9. ANTENNA PORT TEST RESULTS

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 VBW [kHz]
2 400 ~ 2 483.5 MHz Bands						
1 Mbps [37pkt]	0.388	0.757	0.513	51.315	2.90	2.58
2 Mbps [37pkt]	0.205	0.537	0.382	38.235	4.18	4.87



9.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

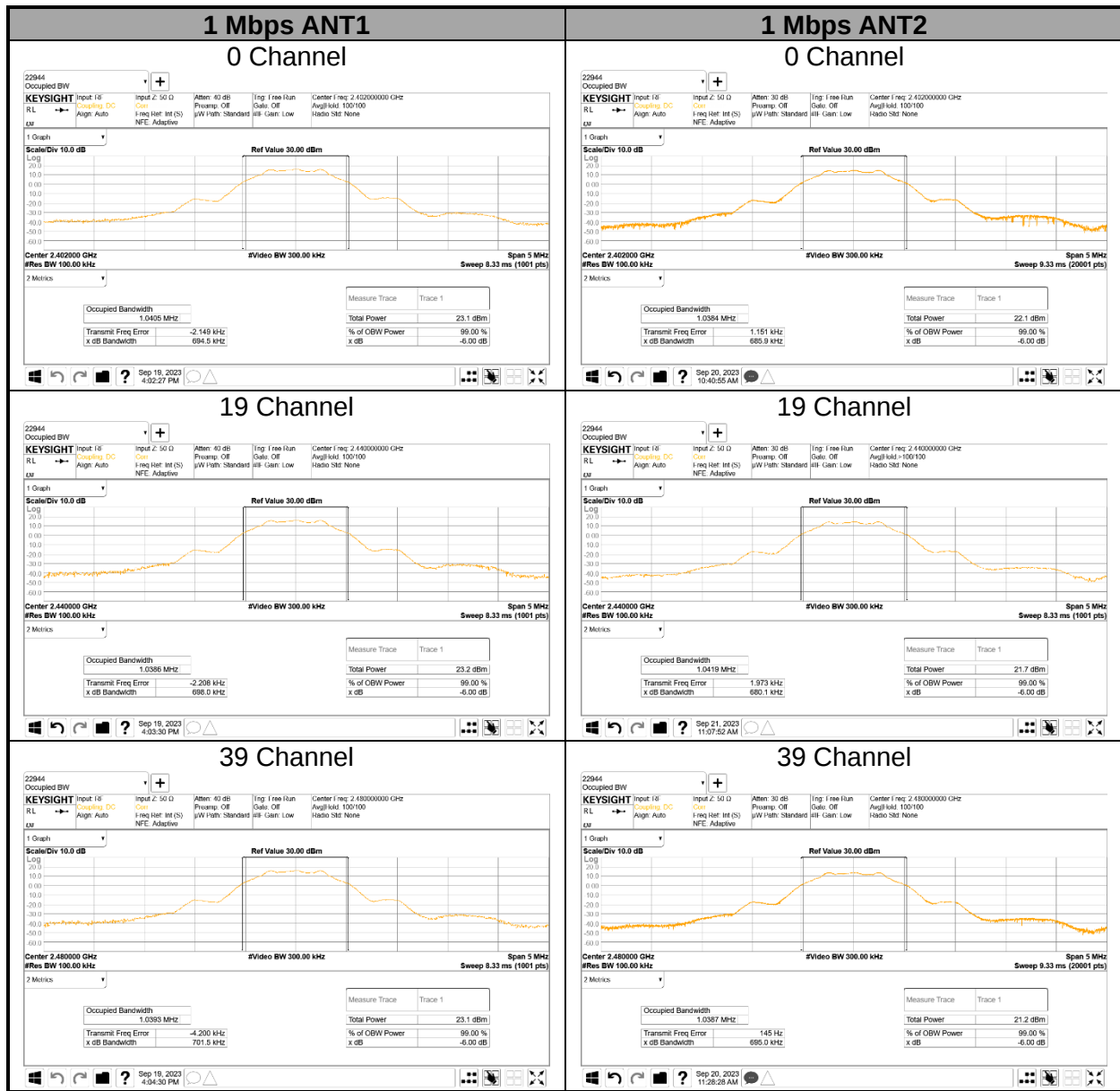
The minimum 6 dB bandwidth shall be at least 500 kHz.

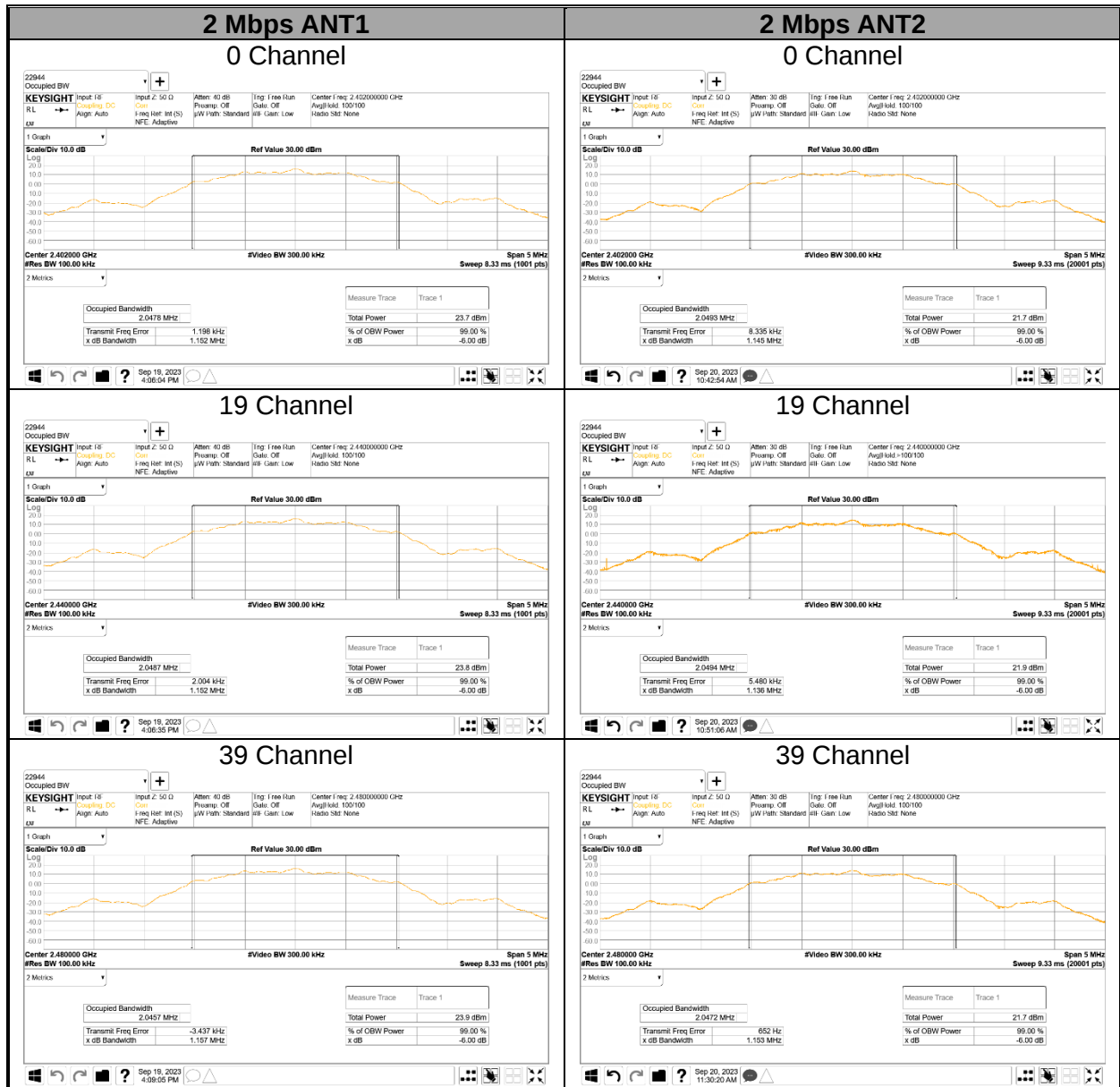
RESULTS

9.2.1. Test data

Mode	Antenna	Channel	Frequency [MHz]	6 dB Bandwidth [kHz]	Minimum Limit [kHz]
1 Mbps (37pkt)	ANT1	0	2 402	694.5	500.0
		19	2 440	698.0	
		39	2 480	701.5	
	ANT2	0	2 402	685.9	
		19	2 440	680.1	
		39	2 480	695.0	
2 Mbps (37pkt)	ANT1	0	2 402	1 152.0	
		19	2 440	1 152.0	
		39	2 480	1 157.0	
	ANT2	0	2 402	1 145.0	
		19	2 440	1 136.0	
		39	2 480	1 153.0	
Worst				680.1	500.0

9.2.2. 6 dB BANDWIDTH PLOTS





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(RBW $\geq$ DTS bandwidth).

RESULTS

9.3.1. DIVERSITY MODE TEST DATA

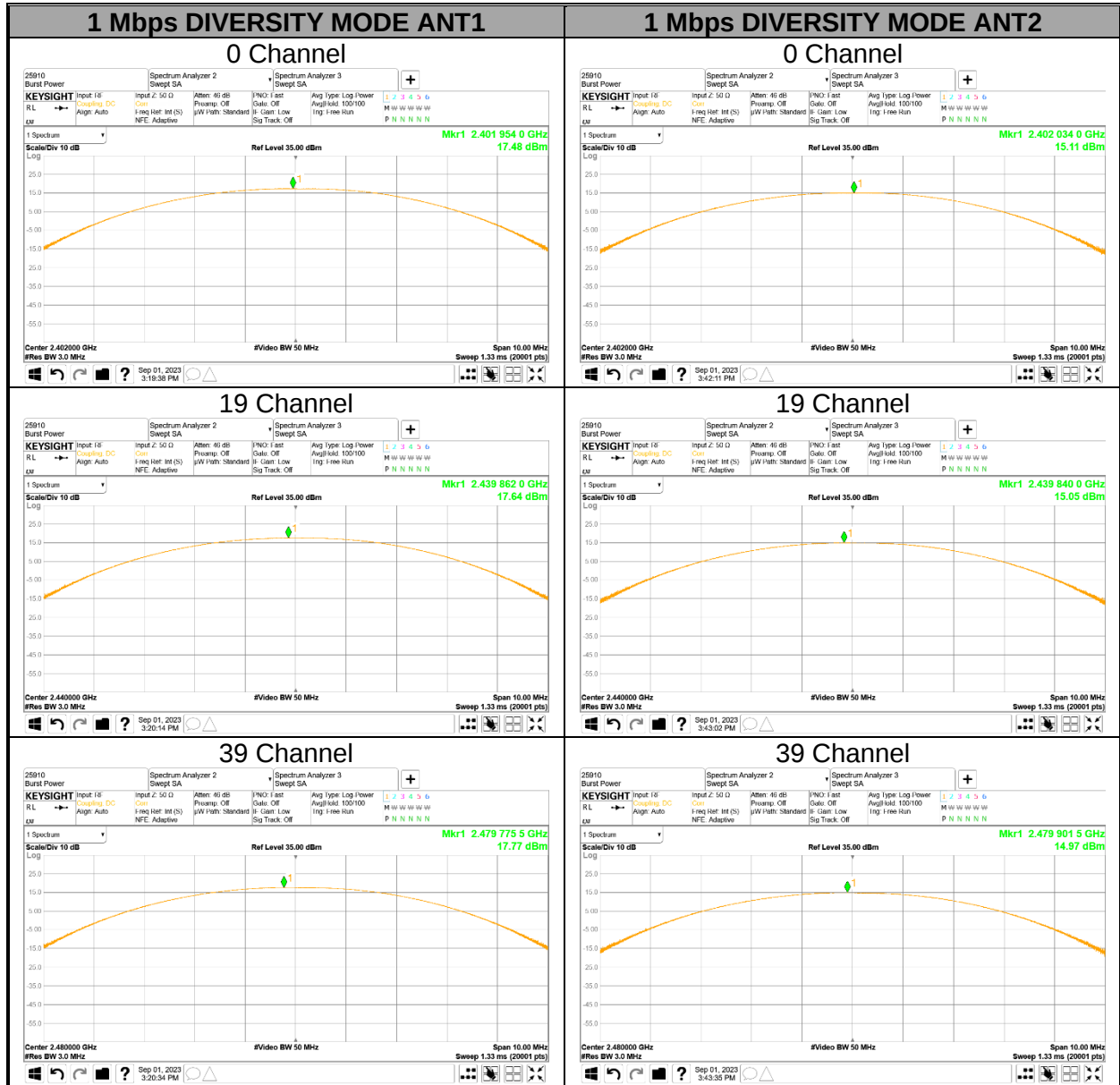
Mode	Antenna	Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
1 Mbps (37 pkt)	ANT1	0	2 402	17.480	30.000	-12.52
		19	2 440	17.640		-12.36
		39	2 480	17.770		-12.23
	ANT2	0	2 402	15.110		-14.67
		19	2 440	15.050		-14.69
		39	2 480	14.970		-14.86
2 Mbps (37 pkt)	ANT1	0	2 402	17.460		-12.59
		19	2 440	17.630		-12.41
		39	2 480	17.860		-12.17
	ANT2	0	2 402	15.490		-14.51
		19	2 440	15.440		-14.56
		39	2 480	15.310		-14.69
Worst				17.860	-12.17	

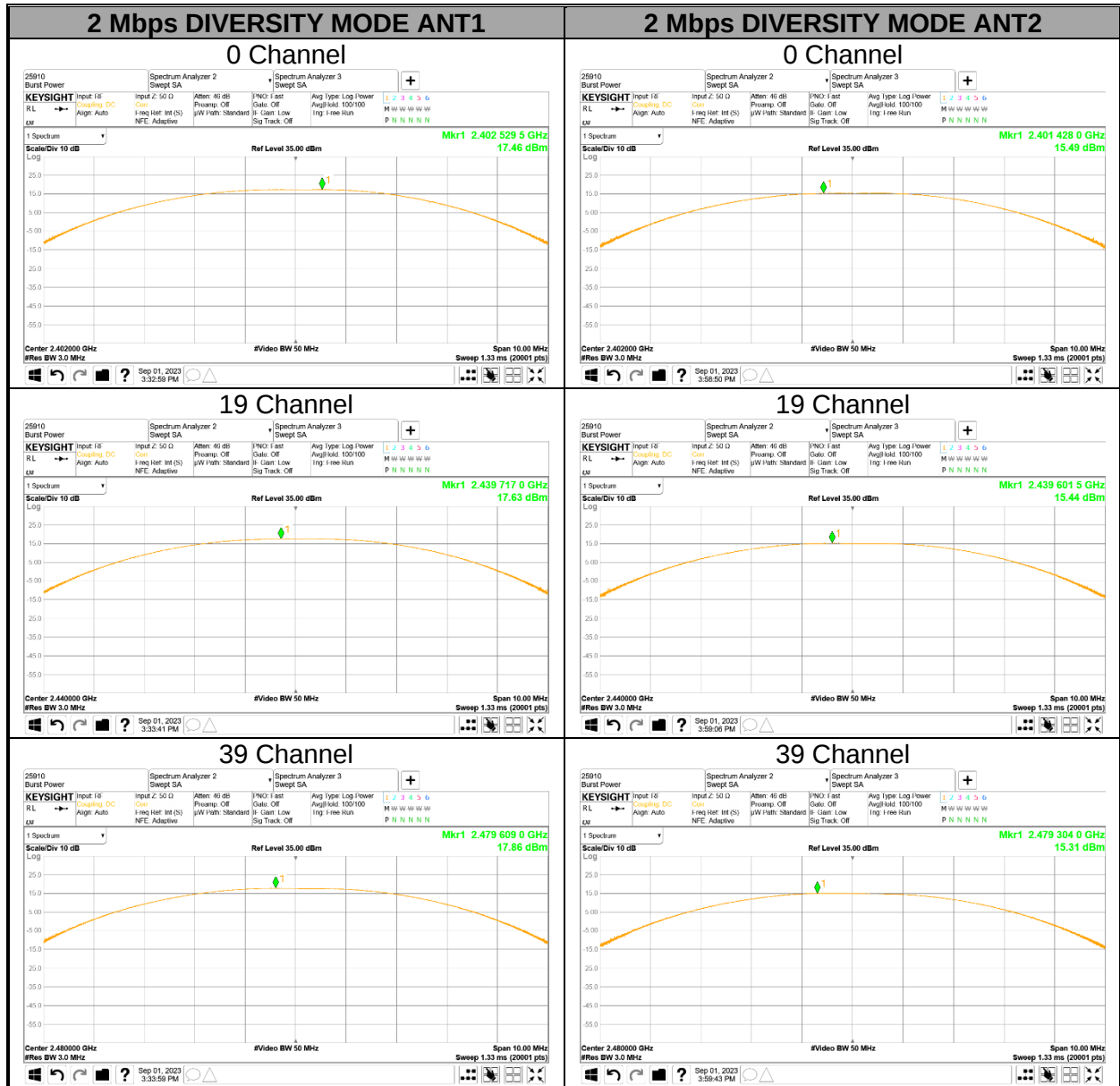
9.3.2. DUAL MODE TEST DATA

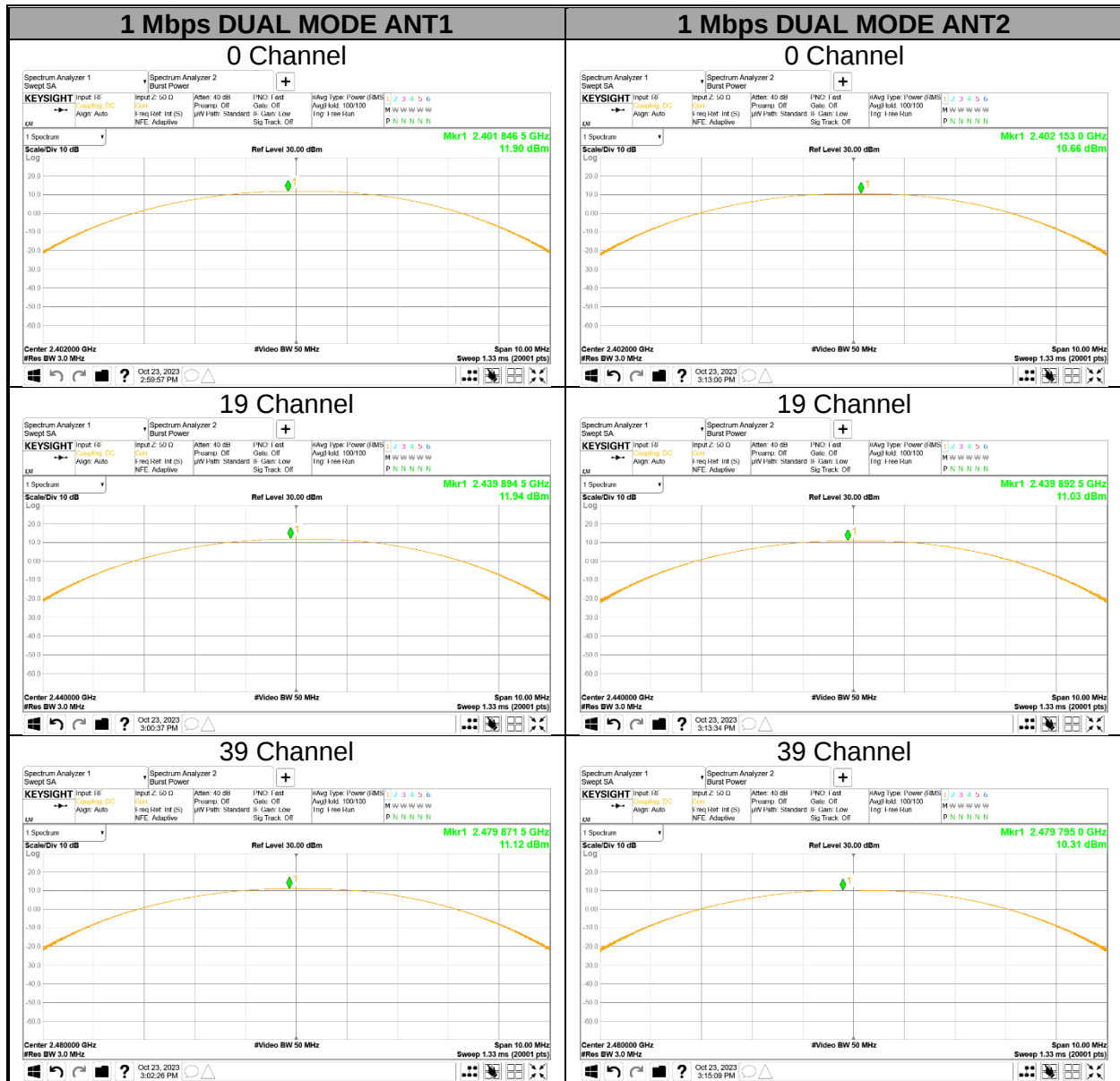
Mode	Antenna	Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
1 Mbps (37 pkt)	DUAL ANT1	0	2 402	11.90	30.000	
		19	2 440	11.94		
		39	2 480	11.12		
	DUAL ANT2	0	2 402	10.66		
		19	2 440	11.03		
		39	2 480	10.31		
	DUAL ANT1+2	0	2 402	14.33		-15.67
		19	2 440	14.52		-15.48
		39	2 480	13.74		-16.26
2 Mbps (37 pkt)	DUAL ANT1	0	2 402	11.95	30.000	
		19	2 440	12.19		
		39	2 480	11.22		
	DUAL ANT2	0	2 402	10.68		
		19	2 440	10.76		
		39	2 480	10.97		
	DUAL ANT1+2	0	2 402	14.37		-15.63
		19	2 440	14.54		-15.46
		39	2 480	14.11		-15.89
Worst				14.54	-15.46	

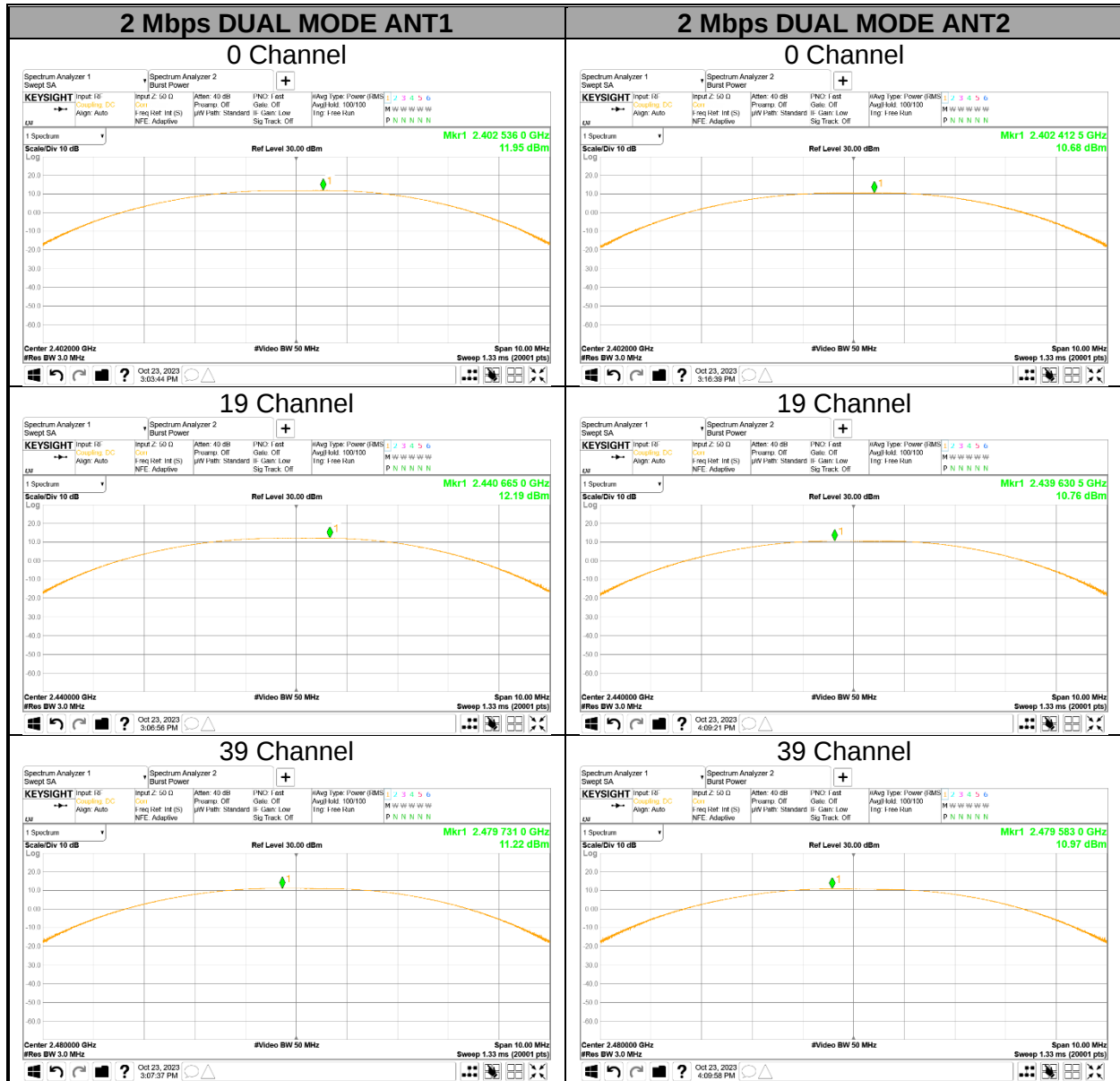
Note. Since sum of correlated antenna gain(-0.12 dBi) does not exceed 6dBi, the test limit was set to 30 dBm.

9.3.3. PEAK POWER PLOTS









9.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband RF frame average power sensor.
The cable assembly insertion loss and duty cycle correction factor were entered as an offset in the power meter to allow for direct reading of power.

RESULTS

9.4.1. DIVERSITY MODE TEST DATA

Mode	Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
1 Mbps (37pkt)	ANT1	0	2 402	17.064	50.863
		19	2 440	17.250	53.088
		39	2 480	17.345	54.263
	ANT2	0	2 402	14.793	30.151
		19	2 440	14.684	29.404
		39	2 480	14.737	29.765
2 Mbps (37 pkt)	ANT1	0	2 402	16.882	48.775
		19	2 440	17.326	54.026
		39	2 480	17.222	52.747
	ANT2	0	2 402	14.931	31.124
		19	2 440	14.726	29.689
		39	2 480	14.540	28.445

9.4.2. DUAL MODE TEST DATA

Mode	Antenna	Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
1 Mbps (37pkt)	DUAL ANT1	0	2 402	11.68	
		19	2 440	11.90	
		39	2 480	10.86	
	DUAL ANT2	0	2 402	10.44	
		19	2 440	10.50	
		39	2 480	10.02	
	DUAL ANT1+2	0	2 402	14.12	25.794
		19	2 440	14.27	26.713
		39	2 480	13.47	22.240
2 Mbps (37 pkt)	DUAL ANT1	0	2 402	11.56	
		19	2 440	11.54	
		39	2 480	10.74	
	DUAL ANT2	0	2 402	10.27	
		19	2 440	10.58	
		39	2 480	10.20	
	DUAL ANT1+2	0	2 402	13.97	24.950
		19	2 440	14.09	25.659
		39	2 480	13.49	22.334

9.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

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.

TEST PROCEDURE

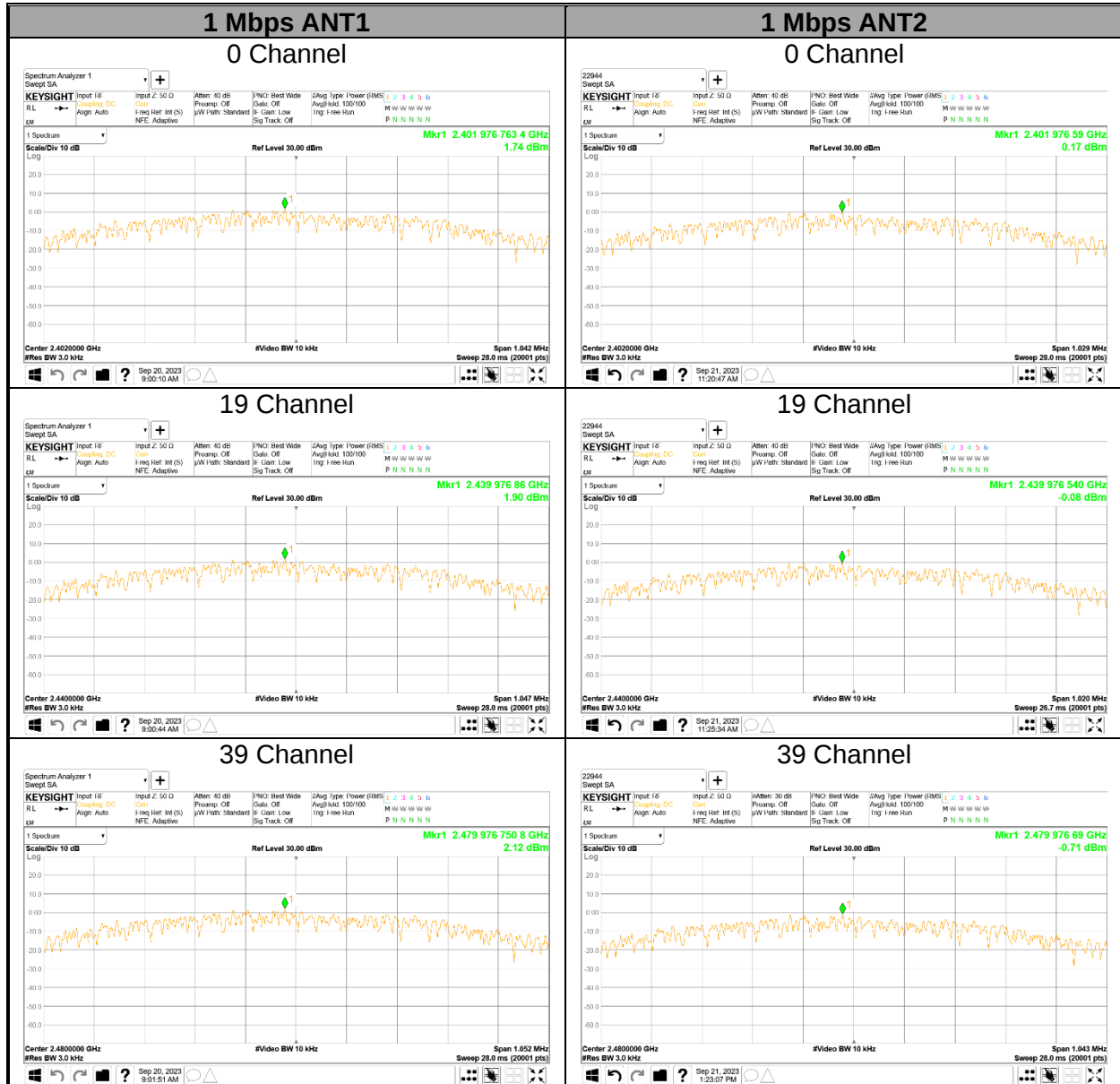
ANSI C63.10-2013, Section 11.10.2 Method PKPSD (peak PSD)

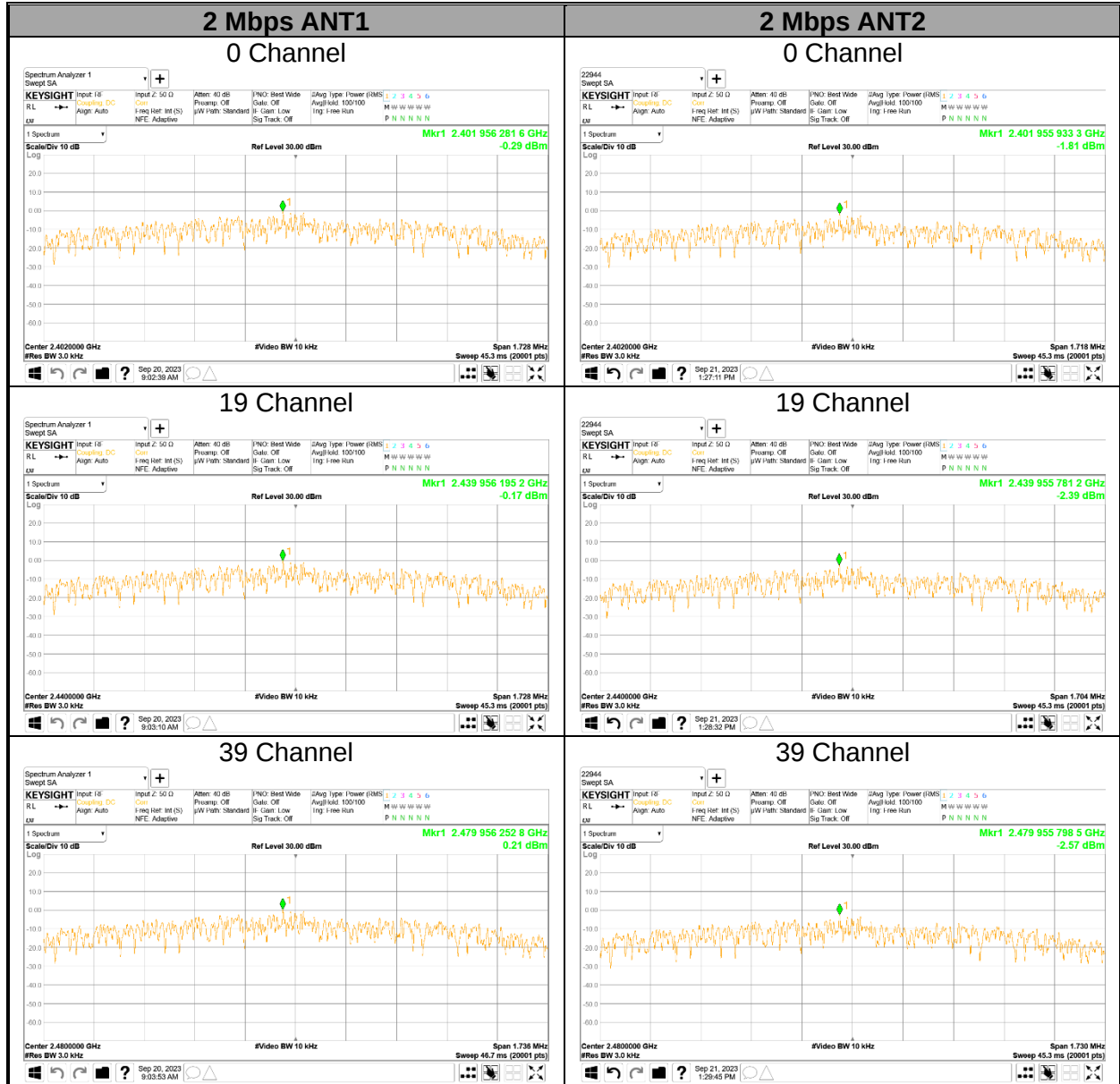
RESULTS

9.5.1. Test data

Mode	Antenna	Channel	Frequency [MHz]	PSD [dBm/3kHz]	Limit [dBm/3kHz]	Margin [dB]
1 Mbps (37pkt)	ANT1	0	2 402	1.74	8.00	-6.26
		19	2 440	1.90		-6.10
		39	2 480	2.12		-5.88
	ANT2	0	2 402	0.17		-7.83
		19	2 440	-0.08		-8.08
		39	2 480	-0.71		-8.71
2 Mbps (37 pkt)	ANT1	0	2 402	-0.29		-8.29
		19	2 440	-0.17		-8.17
		39	2 480	0.21		-7.79
	ANT2	0	2 402	-1.81		-9.81
		19	2 440	-2.39		-10.39
		39	2 480	-2.57		-10.57
Worst				2.12	-5.88	

9.5.2. PSD TEST PLOTS





9.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

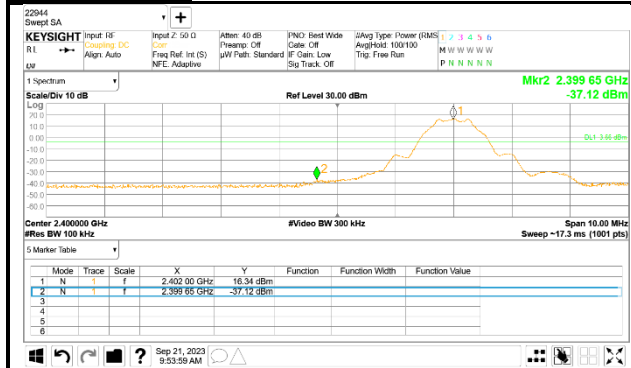
FCC §15.247 (d)

Output power was measured based on the use of a peak measurement.
Therefore, spurious emissions are required to be 20 dBc.

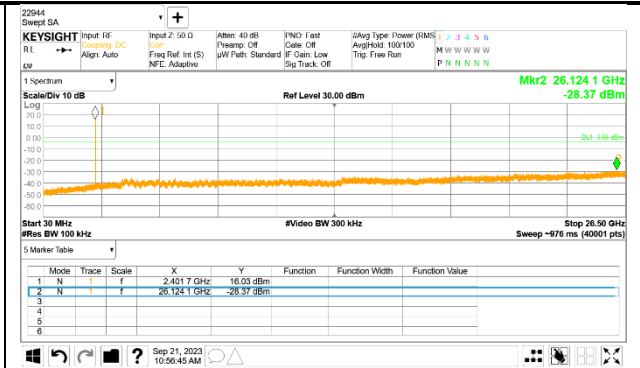
RESULTS

9.6.1. Test plot

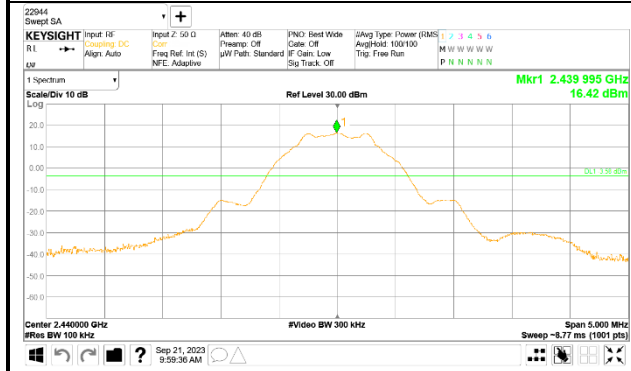
1 Mbps ANT1



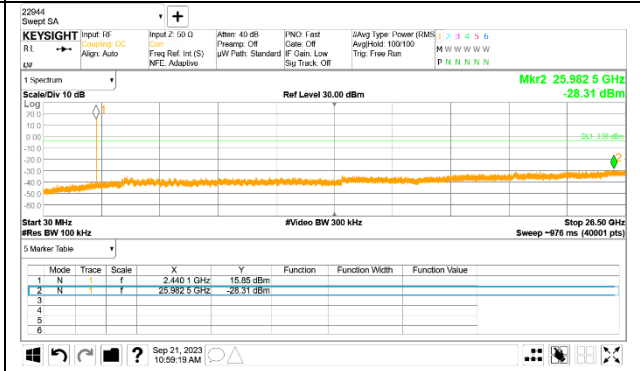
0 CHANNEL BANDEDGE



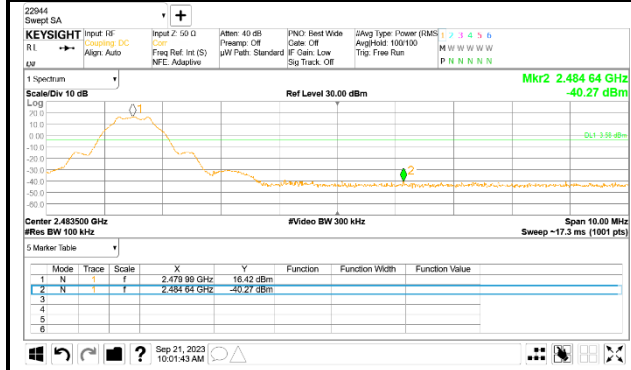
OUT-OF-BAND 0 CHANNEL



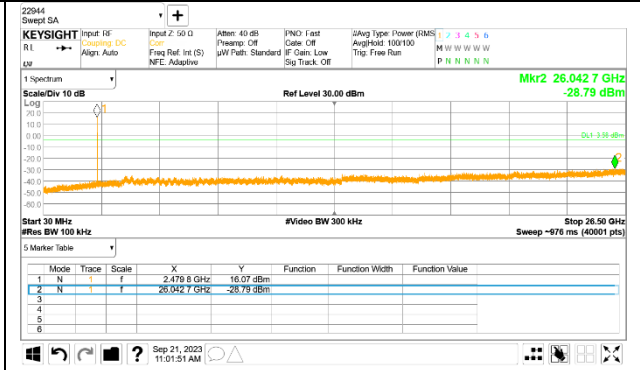
IN-BAND REFERENCE LEVEL



OUT-OF-BAND 19 CHANNEL

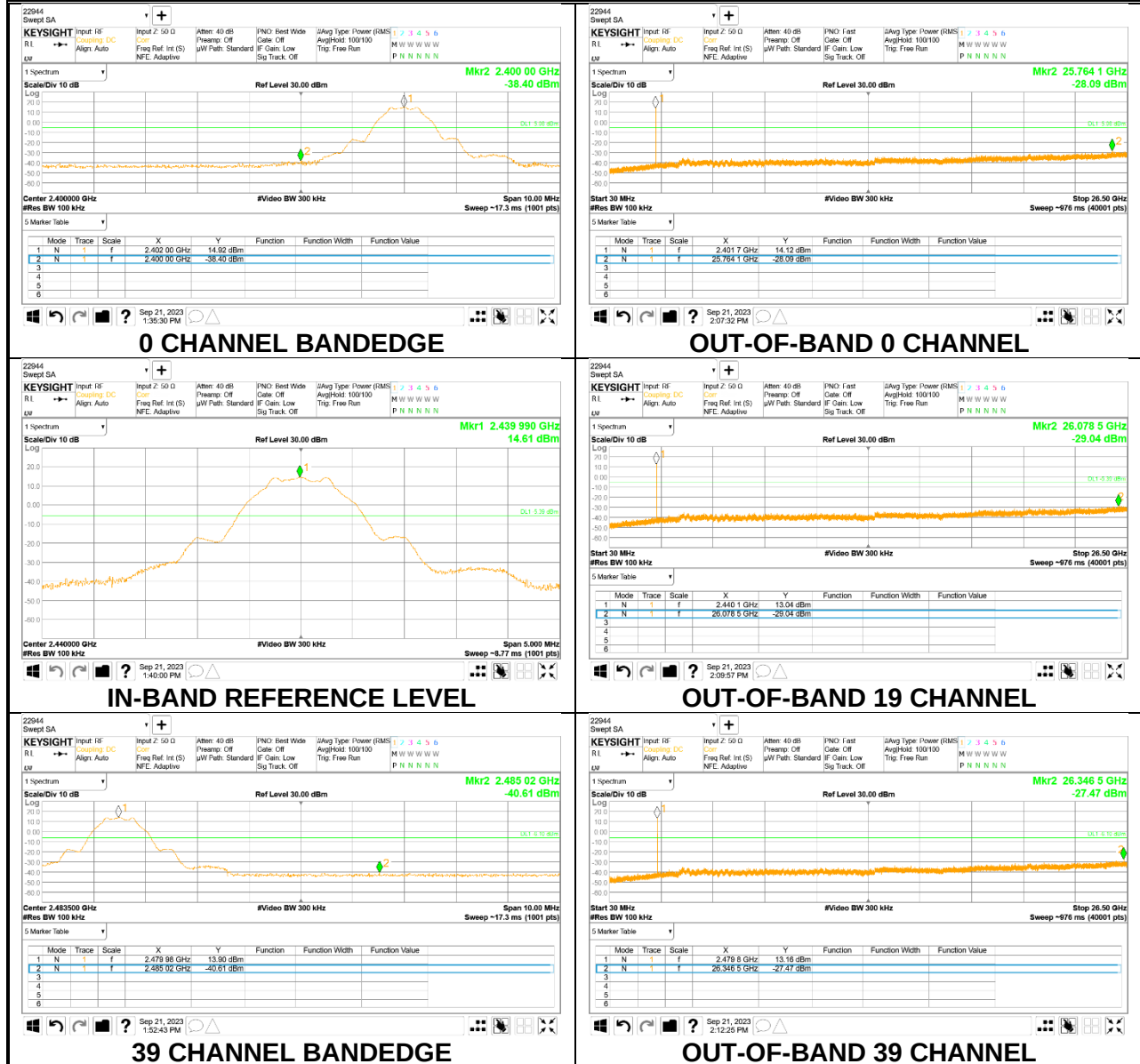


39 CHANNEL BANDEDGE

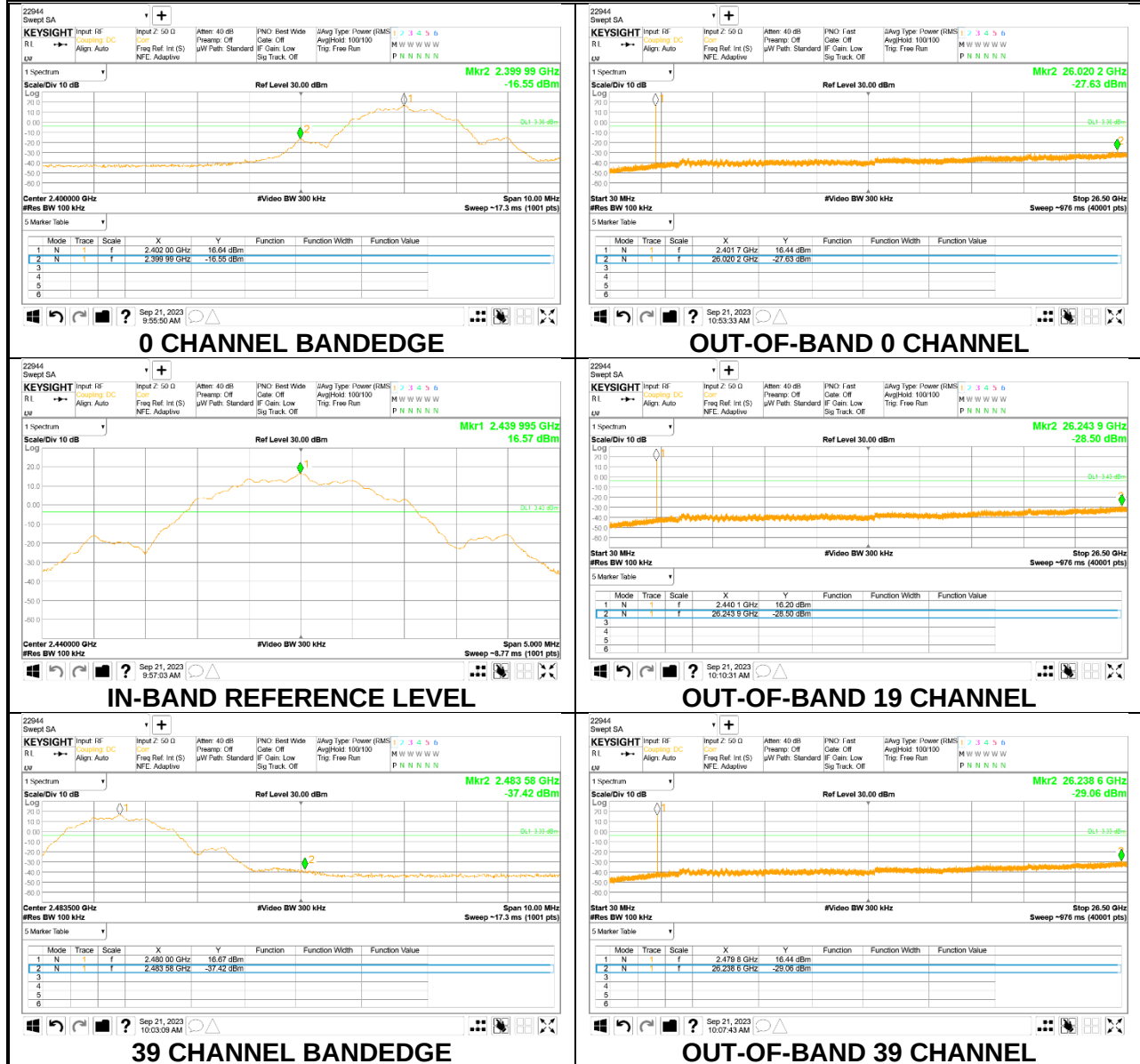


OUT-OF-BAND 39 CHANNEL

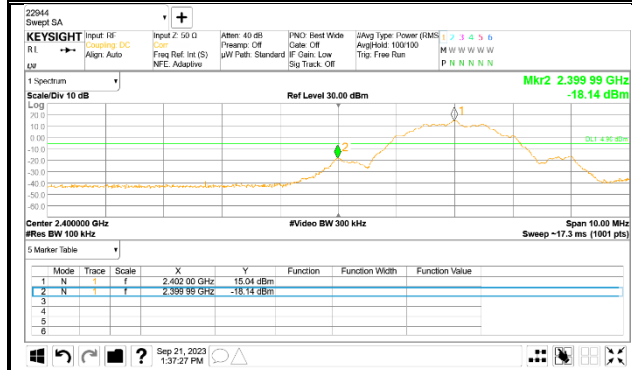
1 Mbps ANT2



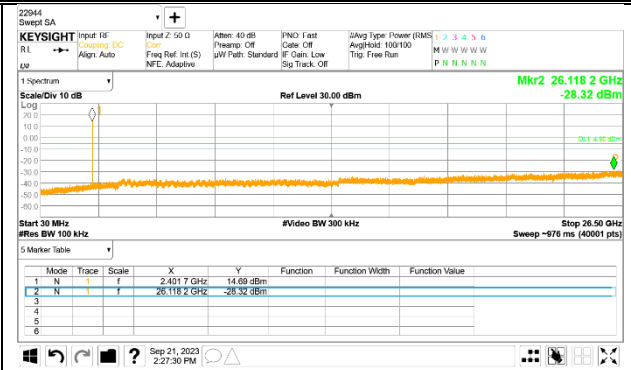
2 Mbps ANT1



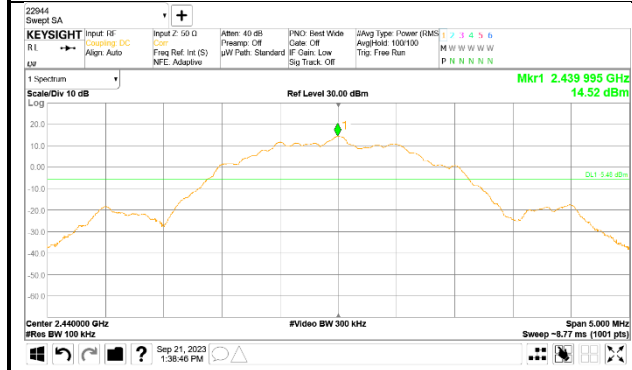
2 Mbps ANT2



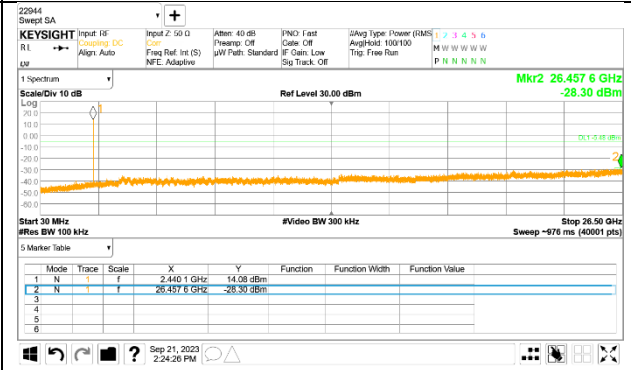
0 CHANNEL BANDEGE



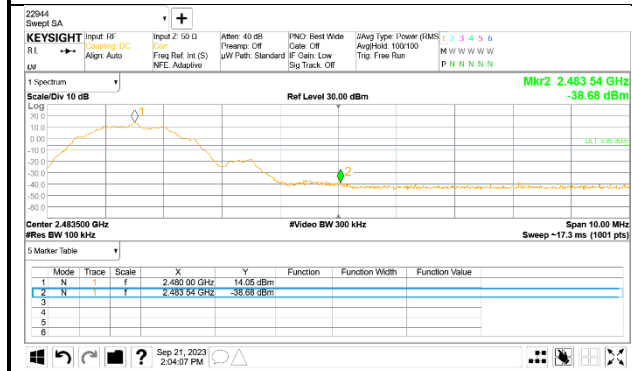
OUT-OF-BAND 0 CHANNEL



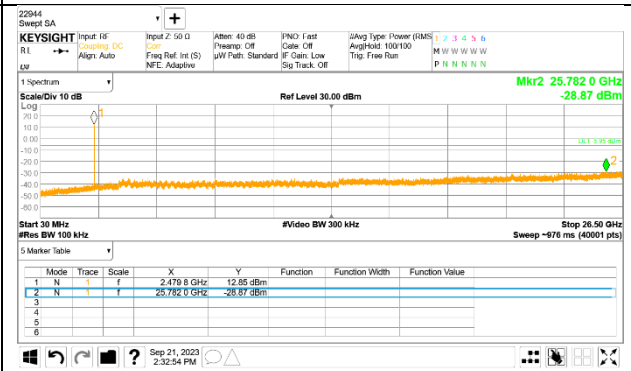
IN-BAND REFERENCE LEVEL



OUT-OF-BAND 19 CHANNEL



39 CHANNEL BANDEGE



OUT-OF-BAND 39 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 band-edge, Final detection of spurious harmonic emissions)
Duty cycle factor = $10 \log(1/x)$. For this sample: For 1 Mbps, DCF = $10\log(1/0.513)=2.898$ dB (Spectrum Analyzer round it up to 2.90 dB) and for 2 Mbps, DCF = $10\log(1/0.382)=4.175$ dB (Spectrum Analyzer round it up to 4.18 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.

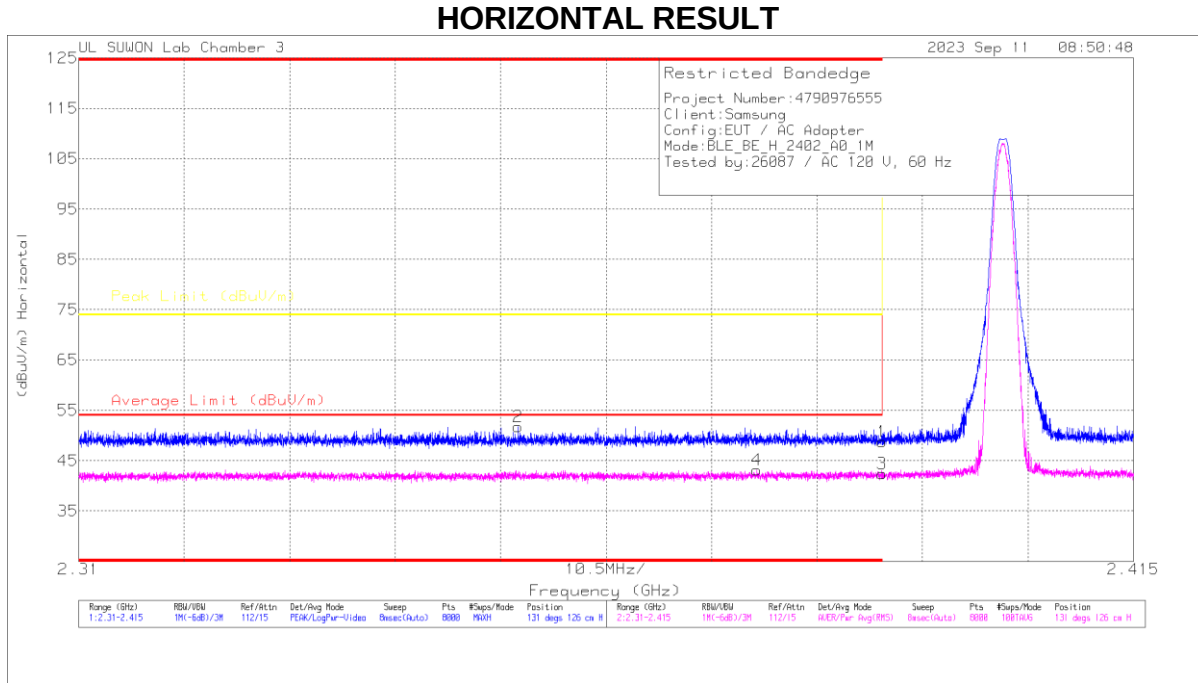
Note : Emission was pre-scanned from 9kHz to 30MHz; No emissions were detected which was at least 20dB below the specification limit (consider distance correction factor).
Per FCC part 15.31(o), test results were not reported.

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. 1 Mbps ANT1

BANDEDGE (0 CHANNEL)



Trace Markers

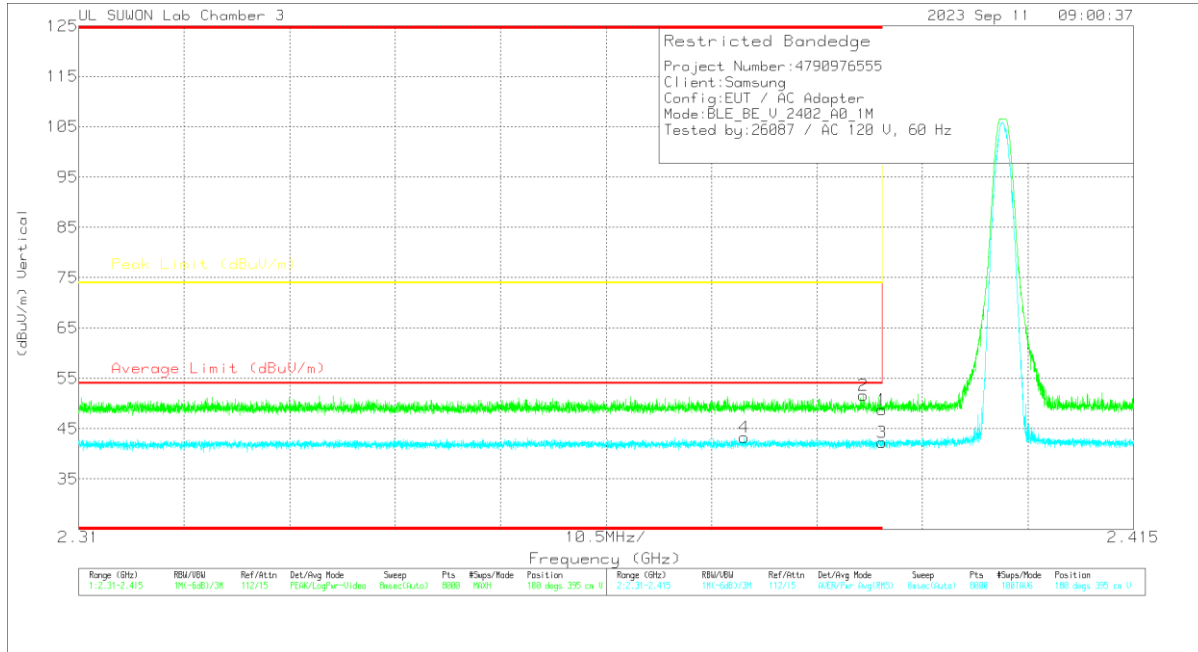
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor (dB(dBm))	Path Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (m)	Height (m)	Polarity
1	* 2.39	41.41	PK	32.1	-24.8	0	48.71	-	-	74	-25.29	131	126	H
2	* 2.35373	44.56	PK	32	-24.8	0	51.76	-	-	74	-22.24	131	126	H
3	* 2.39	32.24	RMS	32.1	-24.8	2.9	42.44	54	-11.56	-	-	131	126	H
4	* 2.37749	32.98	RMS	32.1	-24.8	2.9	43.18	54	-10.82	-	-	131	126	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	Antenna Correction Factor(dB(dBm))	Path Loss(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	41.5	PK	32.1	-24.8	0	48.8	-	-	74	-25.2	180	395	V
2	* 2.38812	44.32	PK	32.1	-24.8	0	51.62	-	-	74	-22.38	180	395	V
3	* 2.39	32.12	RMS	32.1	-24.8	2.9	42.32	54	-11.68	-	-	180	395	V
4	* 2.37628	33.06	RMS	32.1	-24.8	2.9	43.26	54	-10.74	-	-	180	395	V

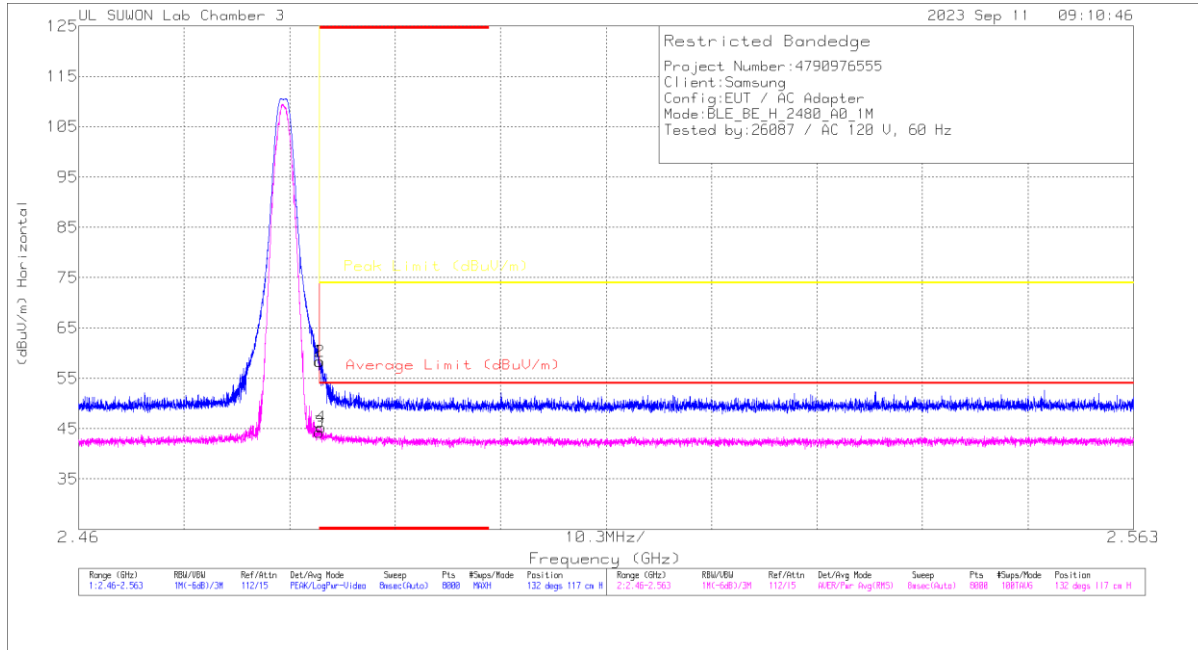
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

RMS - RMS detection

BANDEDGE (39 CHANNEL)

HORIZONTAL RESULT



Trace Markers

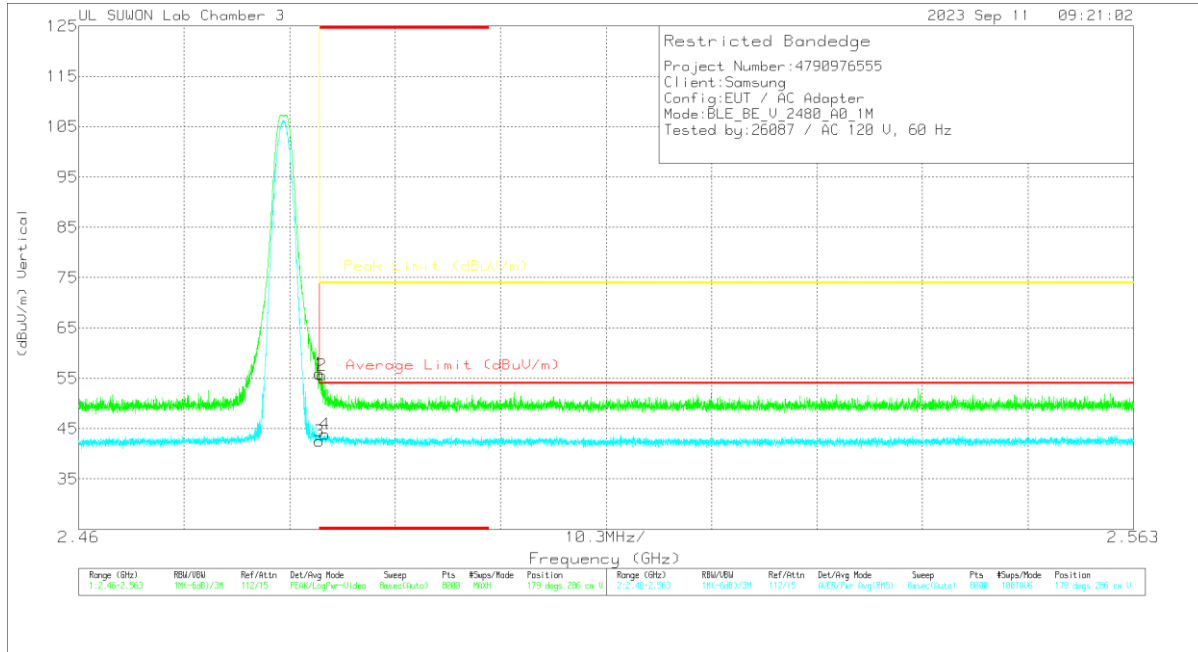
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor(dB(Lim))	Path Loss(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Pk Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.4835	50.76	Pk	32.4	-24.8	0	58.36	-	-	74	-15.64	132	117	H
2	* 2.48356	50.78	Pk	32.4	-24.8	0	58.38	-	-	74	-15.62	132	117	H
3	* 2.4835	33.74	RMS	32.4	-24.8	2.9	44.24	54	-9.76	-	-	132	117	H
4	* 2.48368	34.76	RMS	32.4	-24.8	2.9	45.26	54	-8.74	-	-	132	117	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	Antenna Correction Factor(dB(dsm))	Path Loss(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (m)	Height (m)	Polarity
1	* 2.4835	48.33	PK	32.4	-24.8	0	55.93	-	-	74	-18.07	179	286	V
2	* 2.48373	47.98	PK	32.4	-24.8	0	55.58	-	-	74	-18.42	179	286	V
3	* 2.4835	32.08	RMS	32.4	-24.8	2.9	42.58	54	-11.42	-	-	179	286	V
4	* 2.48405	33.44	RMS	32.4	-24.8	2.9	43.94	54	-10.06	-	-	179	286	V

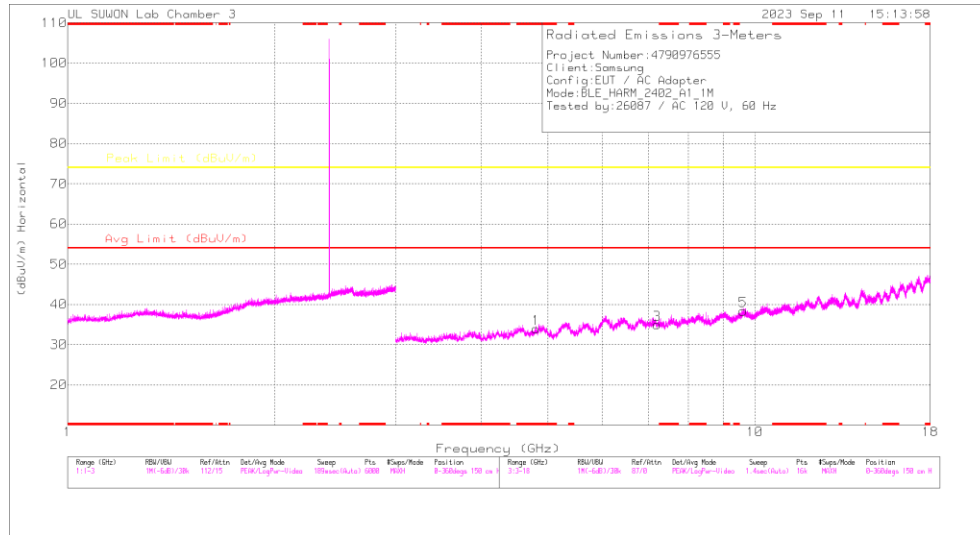
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

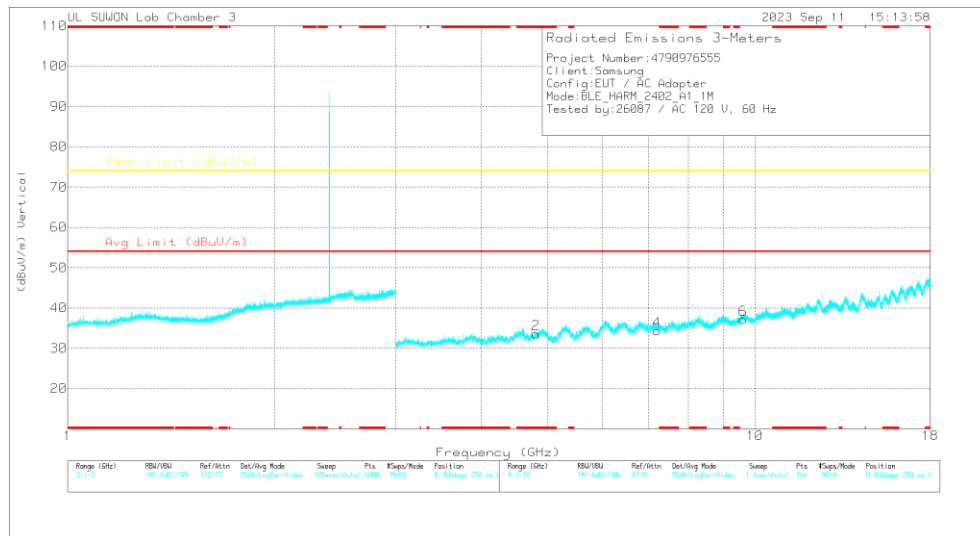
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

0 CHANNEL RESULTS



HORIZONTAL



VERTICAL

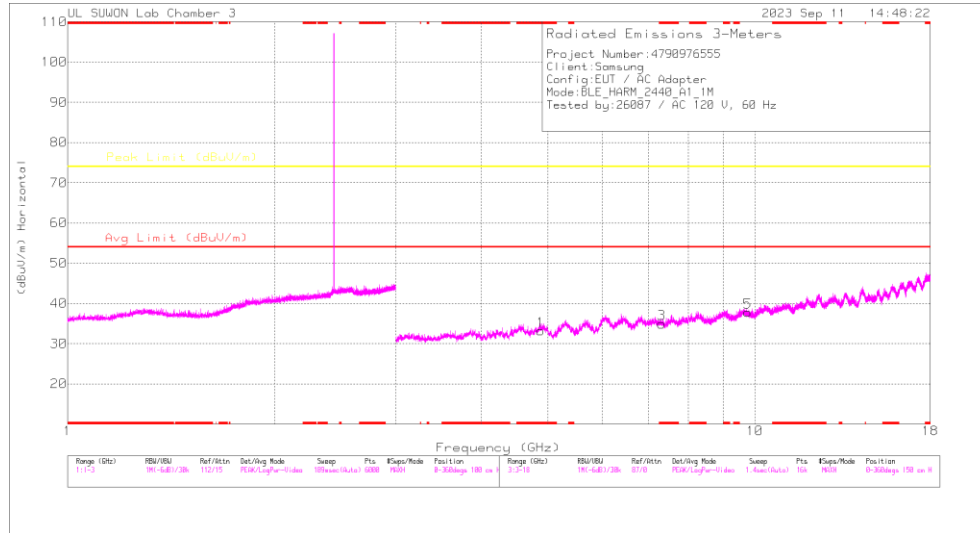
Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Radiated Emissions

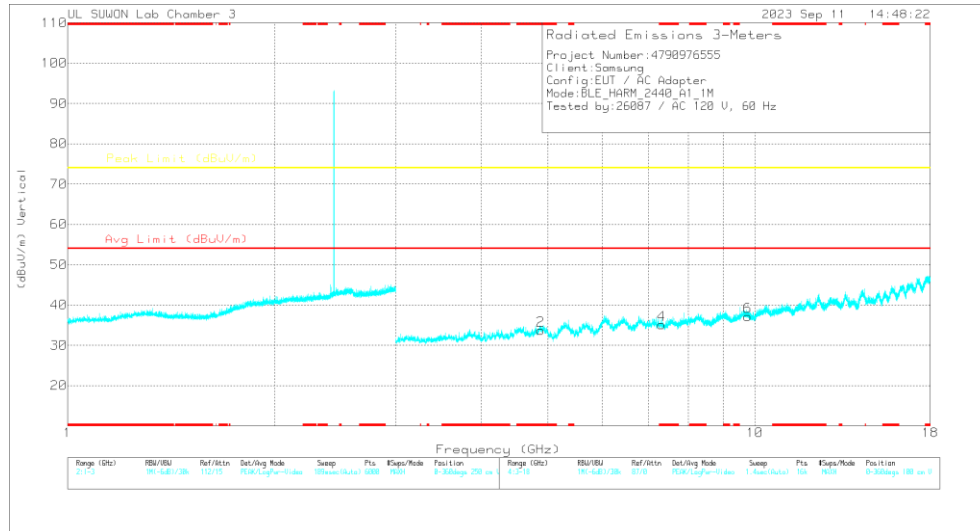
Frequency (GHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor(dB(1/m))	Path Loss(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.80466	39.82	PK2	34.3	-30.1	0	44.02	-	-	74	-29.98	0	100	H
* 4.80465	40.43	PK2	34.3	-30.1	0	44.63	-	-	74	-29.37	0	100	V
7.20664	36.24	PK2	35.8	-25.9	0	46.14	-	-	74	-27.86	0	100	H
7.2067	35.16	PK2	35.8	-25.9	0	45.06	-	-	74	-28.94	0	100	V
9.60907	32.97	PK2	36.7	-21.7	0	47.97	-	-	74	-26.03	0	100	H
9.60898	33.09	PK2	36.7	-21.7	0	48.09	-	-	74	-25.91	0	100	V

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

19 CHANNEL RESULTS



HORIZONTAL



VERTICAL

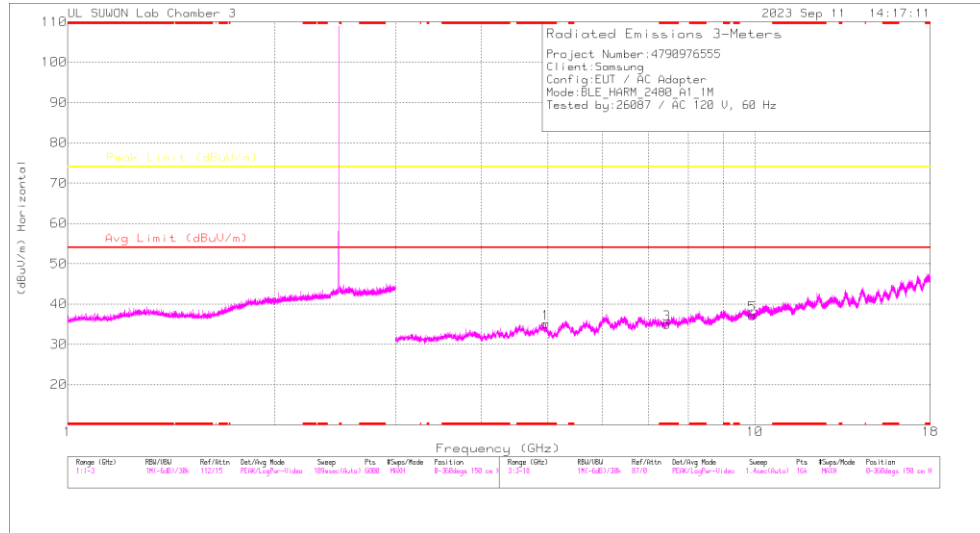
Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Radiated Emissions

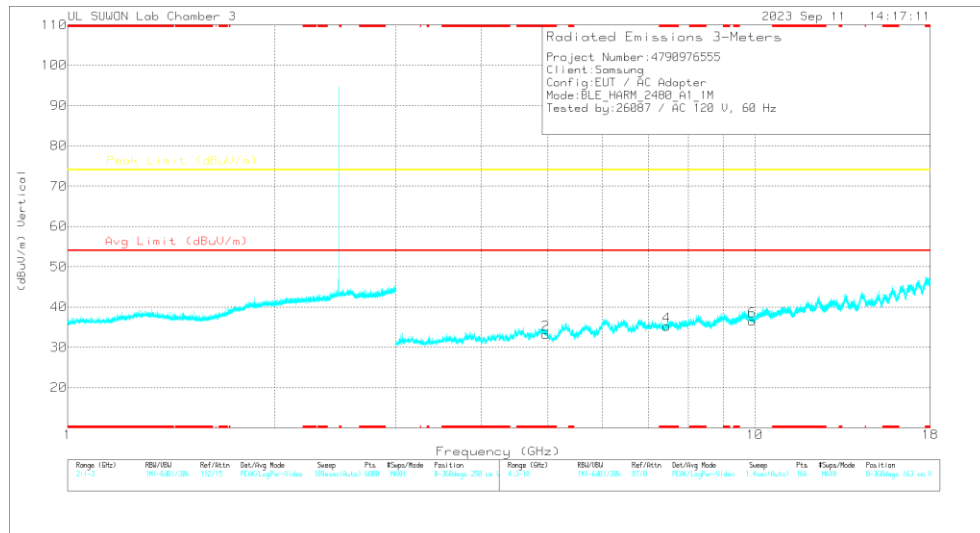
Frequency (GHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor (dB [1m])	Path Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.8807	40.05	PK2	34.2	-29.9	0	44.35	-	-	74	-29.65	0	100	H
* 4.88066	40.5	PK2	34.2	-29.9	0	44.8	-	-	74	-29.2	0	100	V
* 7.32016	34.64	PK2	35.8	-25.5	0	44.94	-	-	74	-29.06	0	100	H
* 7.32029	34.9	PK2	35.8	-25.5	0	45.2	-	-	74	-28.8	0	100	V
9.76074	32.62	PK2	36.9	-21.5	0	48.02	-	-	74	-25.98	0	100	H
9.76083	32.36	PK2	36.9	-21.5	0	47.76	-	-	74	-26.24	0	100	V

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

39 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.

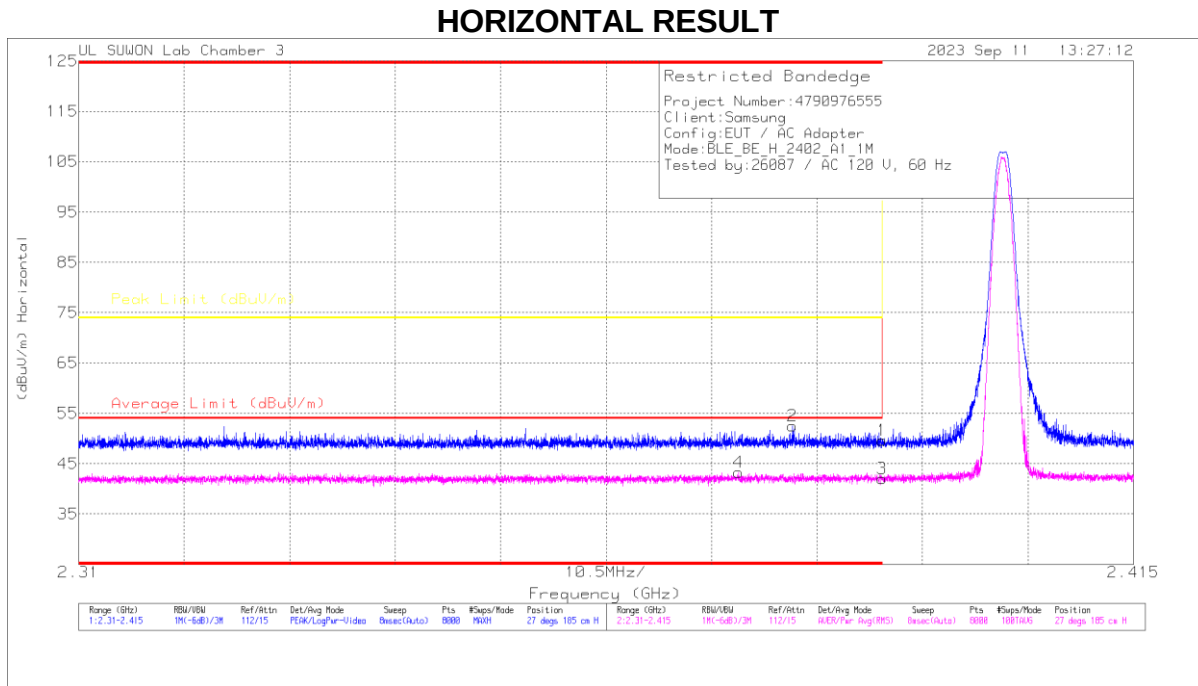
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor (dB [m])	Path Loss (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
* 4.96042	40.48	PK2	34.3	-30	0	44.78	-	-	74	-29.22	0	100	H
* 4.96034	39.44	PK2	34.3	-30	0	43.74	-	-	74	-30.26	0	100	V
* 7.44006	34.92	PK2	35.7	-25.2	0	45.42	-	-	74	-28.58	0	100	H
* 7.44032	34.72	PK2	35.7	-25.2	0	45.22	-	-	74	-28.78	0	100	V
9.92027	32.33	PK2	37.1	-21.4	0	48.03	-	-	74	-25.97	0	100	H
9.92026	31.68	PK2	37.1	-21.4	0	47.38	-	-	74	-26.62	0	100	V

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

10.2.2. 1 Mbps ANT2

BANDEDGE (0 CHANNEL)



Trace Markers

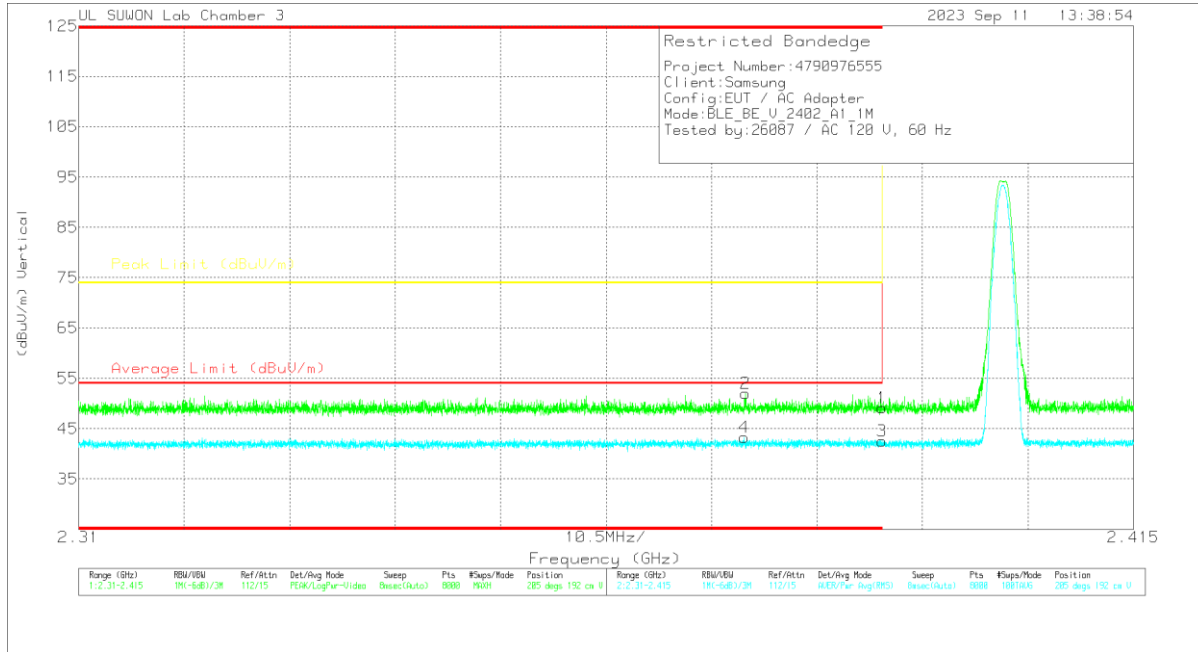
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor(dB[2m])	Path Loss(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	42.29	Pk	32.1	-24.8	0	49.59	-	-	74	-24.41	27	185	H
2	* 2.38108	45.31	Pk	32.1	-24.9	0	52.51	-	-	74	-21.49	27	185	H
3	* 2.39	31.78	RMS	32.1	-24.8	2.9	41.98	54	-12.02	-	-	27	185	H
4	* 2.37567	33.19	RMS	32.1	-24.9	2.9	43.29	54	-10.71	-	-	27	185	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	Antenna Correction Factor(dB(dsm))	Path Loss(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (m)	Height (m)	Polarity
1	* 2.39	41.82	PK	32.1	-24.8	0	49.12	-	-	74	-24.88	205	192	V
2	* 2.37638	44.68	PK	32.1	-24.8	0	51.98	-	-	74	-22.02	205	192	V
3	* 2.39	32.37	RMS	32.1	-24.8	2.9	42.57	54	-11.43	-	-	205	192	V
4	* 2.37626	33.06	RMS	32.1	-24.8	2.9	43.26	54	-10.74	-	-	205	192	V

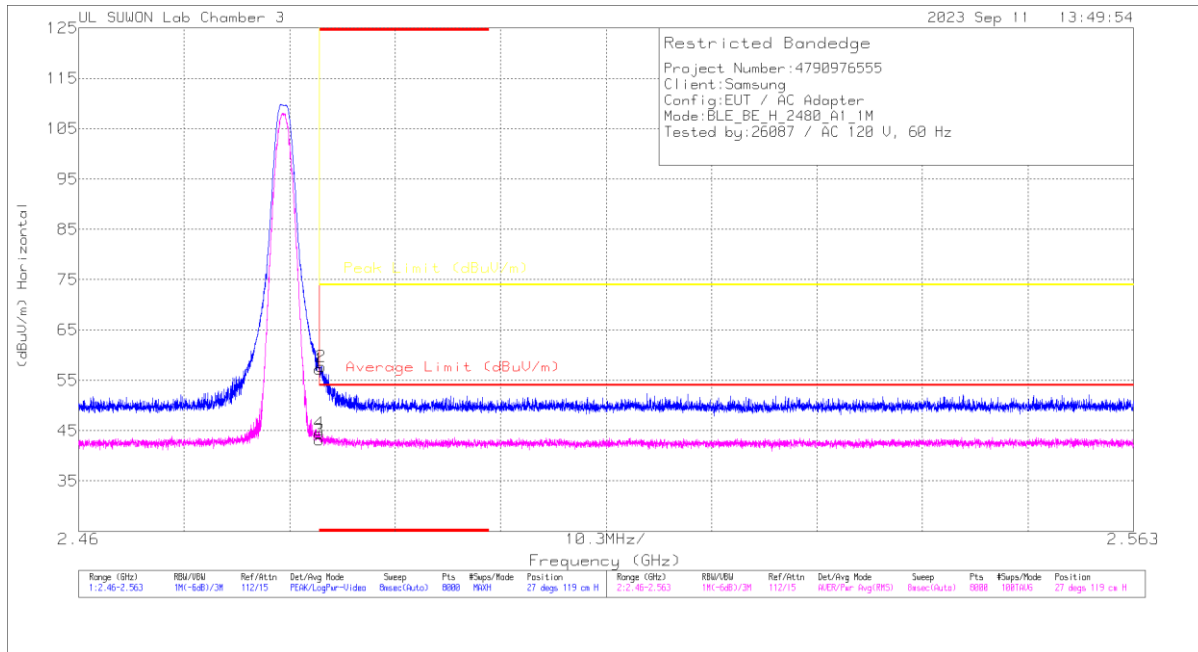
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

RMS - RMS detection

BANDEDGE (39 CHANNEL)

HORIZONTAL RESULT



Trace Markers

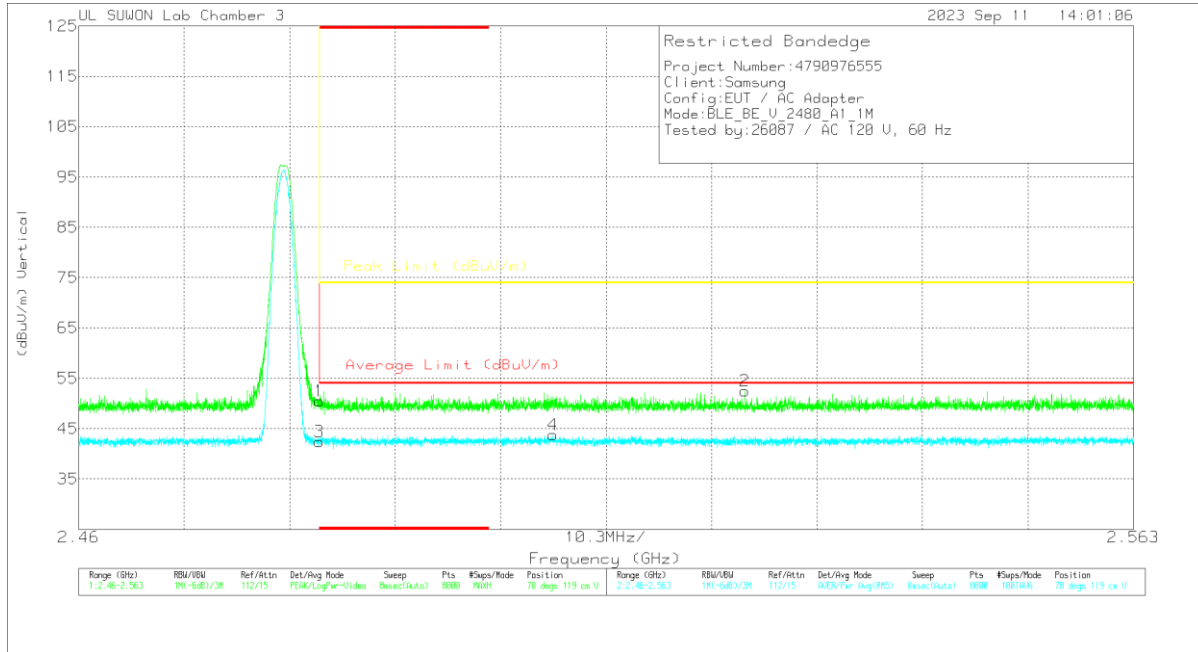
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor(dB(Lim))	Path Loss(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Pk Margin (dB)	Asimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	49.66	Pk	32.4	-24.8	0	57.26	-	-	74	-16.74	27	119	H
2	* 2.48371	50.12	Pk	32.4	-24.8	0	57.72	-	-	74	-16.28	27	119	H
3	* 2.4835	32.61	RMS	32.4	-24.8	2.9	43.11	54	-10.89	-	-	27	119	H
4	* 2.48351	33.97	RMS	32.4	-24.8	2.9	44.47	54	-9.53	-	-	27	119	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	Antenna Correction Factor(dB/Unit)	Path Loss(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	42.89	PK	32.4	-24.8	0	50.49	-	-	74	-23.51	78	119	V
2	2.52504	44.88	PK	32.4	-24.8	0	52.48	-	-	74	-21.52	78	119	V
3	* 2.4835	31.86	RMS	32.4	-24.8	2.9	42.36	54	-11.64	-	-	78	119	V
4	2.50633	33.09	RMS	32.4	-24.6	2.9	43.79	54	-10.21	-	-	78	119	V

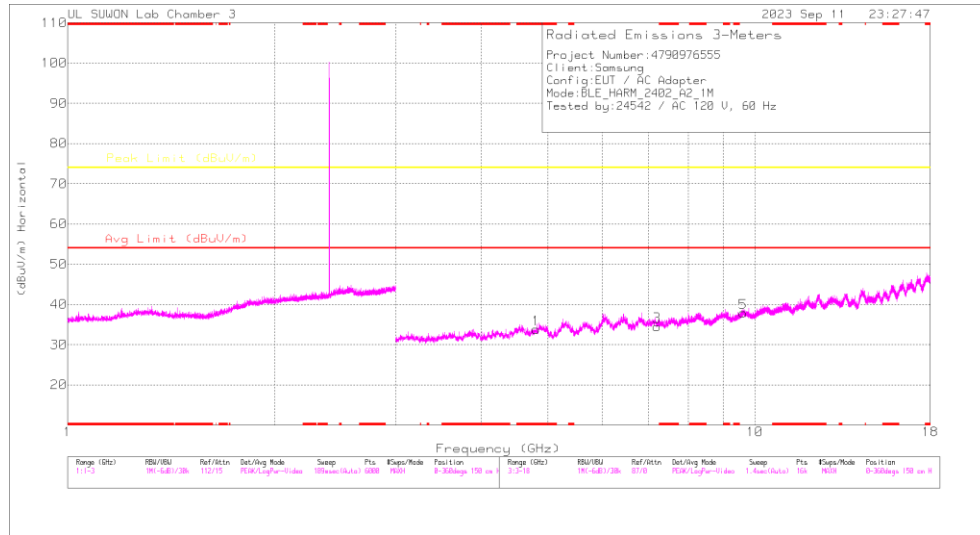
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

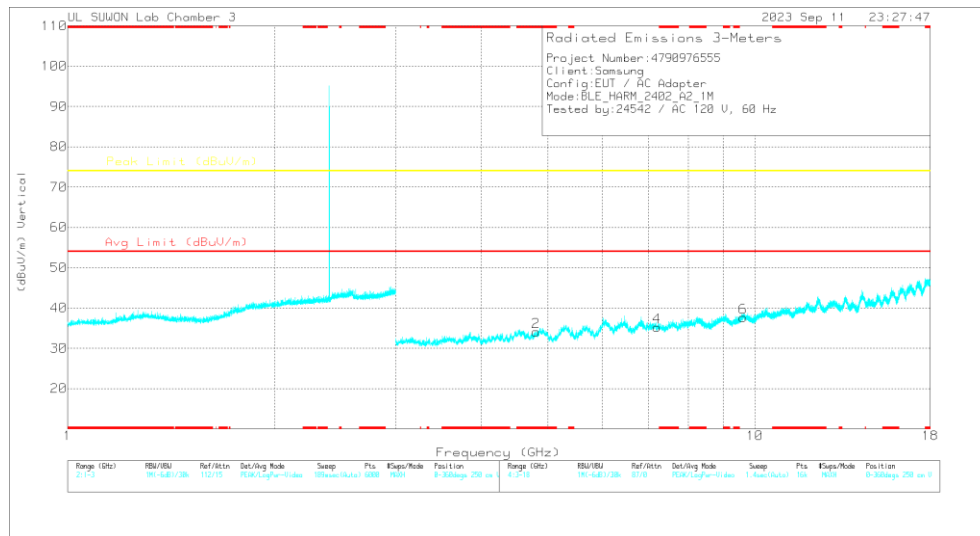
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

0 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.

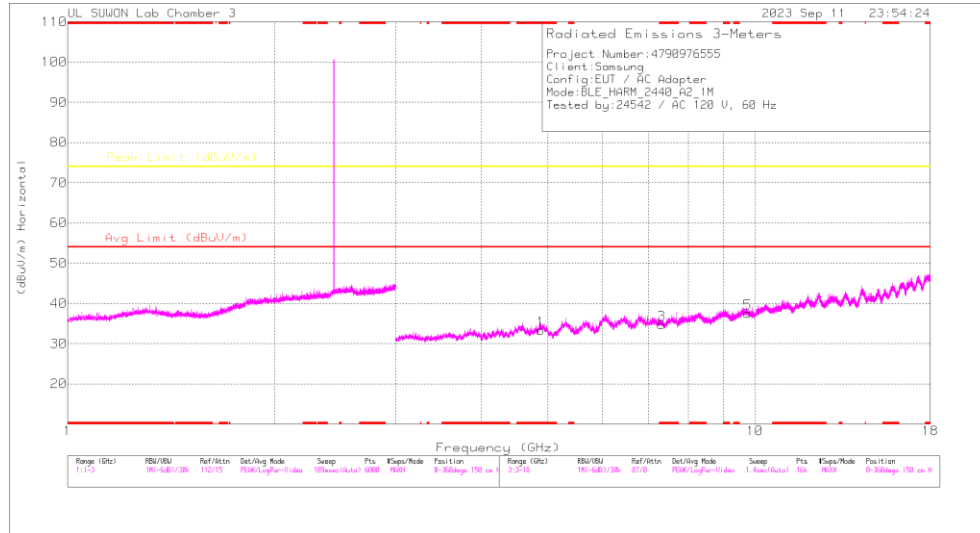
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor(dB(1/m))	Path Loss(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
* 4.80666	39.69	PK2	34.3	-30	0	43.99	-	-	74	-30.01	0	100	H
* 4.80216	39.53	PK2	34.3	-30.1	0	43.73	-	-	74	-30.27	0	100	V
7.20779	35.16	PK2	35.8	-25.9	0	45.06	-	-	74	-28.94	0	100	H
7.20536	35.22	PK2	35.8	-25.9	0	45.12	-	-	74	-28.88	0	100	V
9.60961	32.79	PK2	36.7	-21.7	0	47.79	-	-	74	-26.21	0	100	H
9.60545	32.68	PK2	36.7	-21.8	0	47.58	-	-	74	-26.42	0	100	V

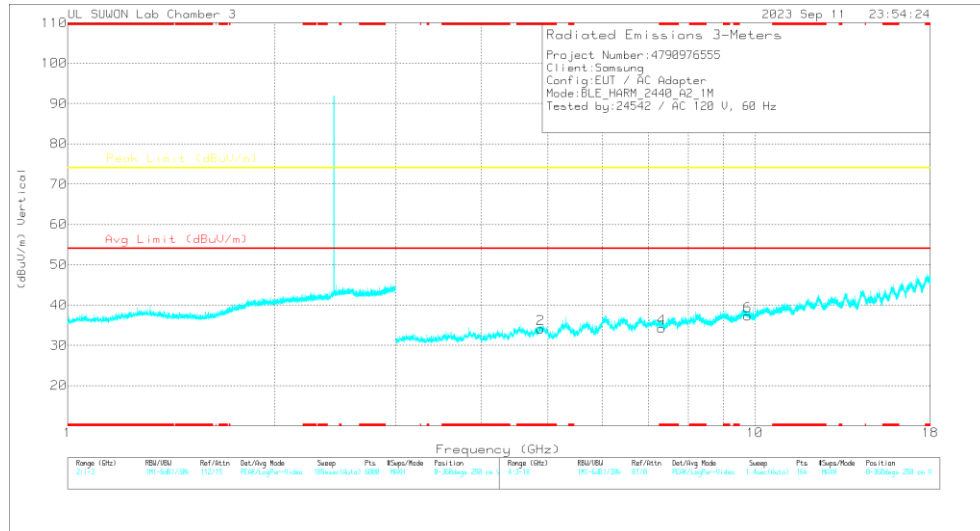
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

19 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.

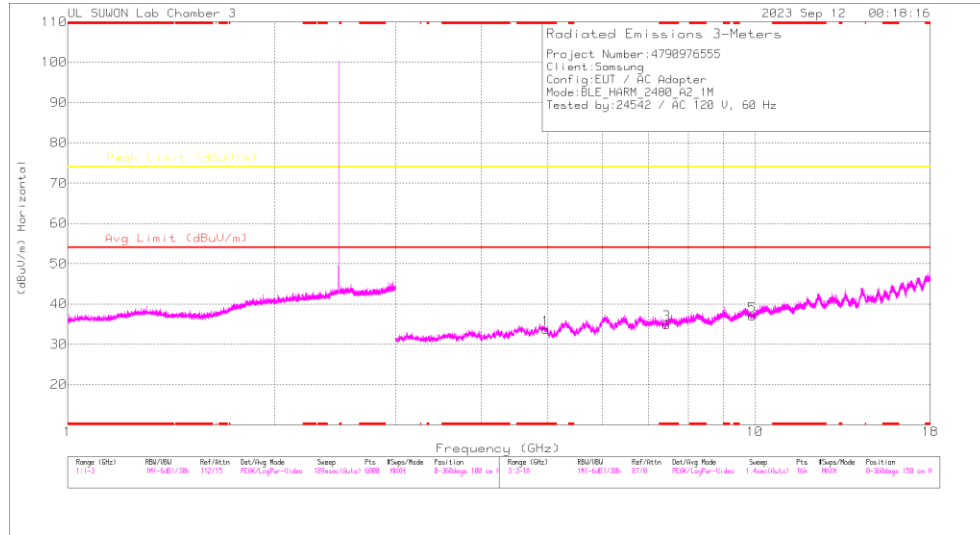
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor (dB [1m])	Path Loss (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
* 4.87622	39.94	PK2	34.2	-29.9	0	44.24	-	-	74	-29.76	0	100	H
* 4.87737	40.1	PK2	34.2	-29.9	0	44.4	-	-	74	-29.6	0	100	V
* 7.3184	35.04	PK2	35.8	-25.4	0	45.44	-	-	74	-28.56	0	100	H
* 7.32255	35.11	PK2	35.8	-25.5	0	45.41	-	-	74	-28.59	0	100	V
9.76109	32.36	PK2	36.9	-21.5	0	47.76	-	-	74	-26.24	0	100	H
9.75892	32.57	PK2	36.9	-21.5	0	47.97	-	-	74	-26.03	0	100	V

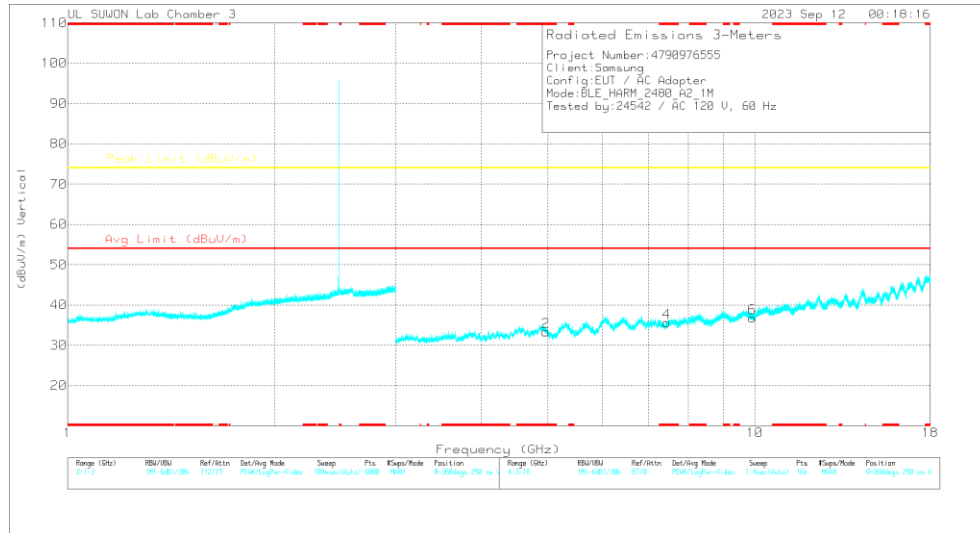
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

39 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

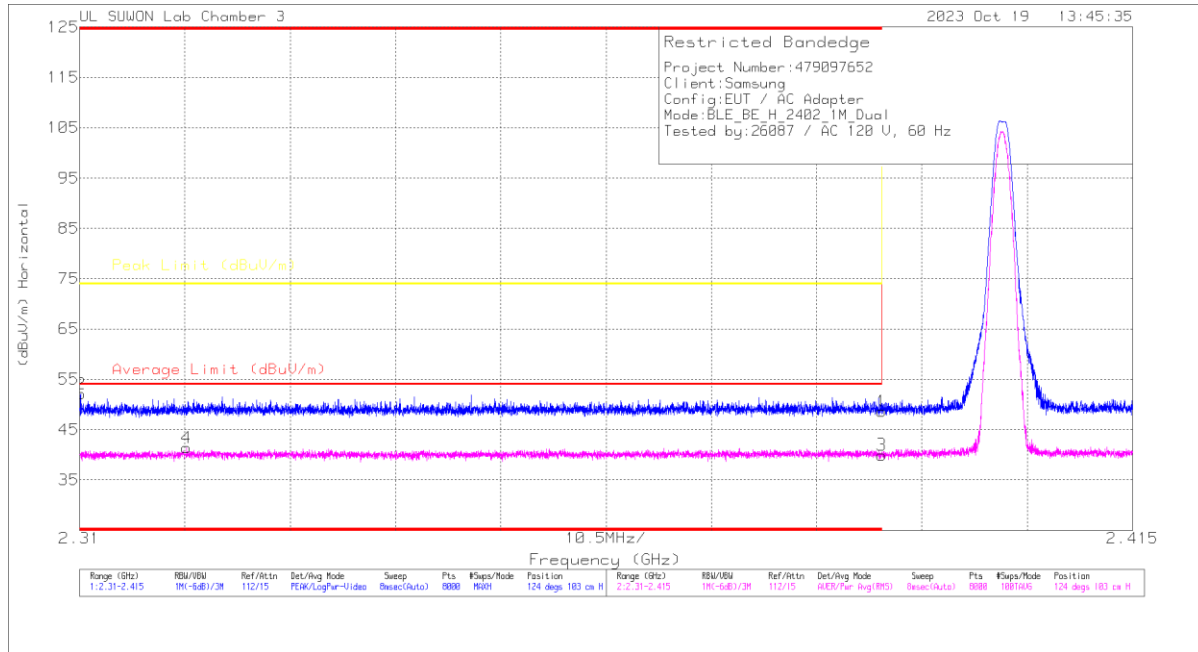
Frequency (GHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor (dB [m])	Path Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96389	39.41	PK2	34.3	-30.2	0	43.51	-	-	74	-30.49	0	100	H
* 4.96061	40.09	PK2	34.3	-30	0	44.39	-	-	74	-29.61	0	100	V
* 7.43839	34.94	PK2	35.7	-25.2	0	45.44	-	-	74	-28.56	0	100	H
* 7.43528	35.05	PK2	35.7	-25.2	0	45.55	-	-	74	-28.45	0	100	V
9.917	31.58	PK2	37.1	-21.3	0	47.38	-	-	74	-26.62	0	100	H
9.9192	31.19	PK2	37.1	-21.4	0	46.89	-	-	74	-27.11	0	100	V

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

10.2.3. 1 Mbps DUAL

BANDEDGE (0 CHANNEL)

HORIZONTAL RESULT



Trace Markers

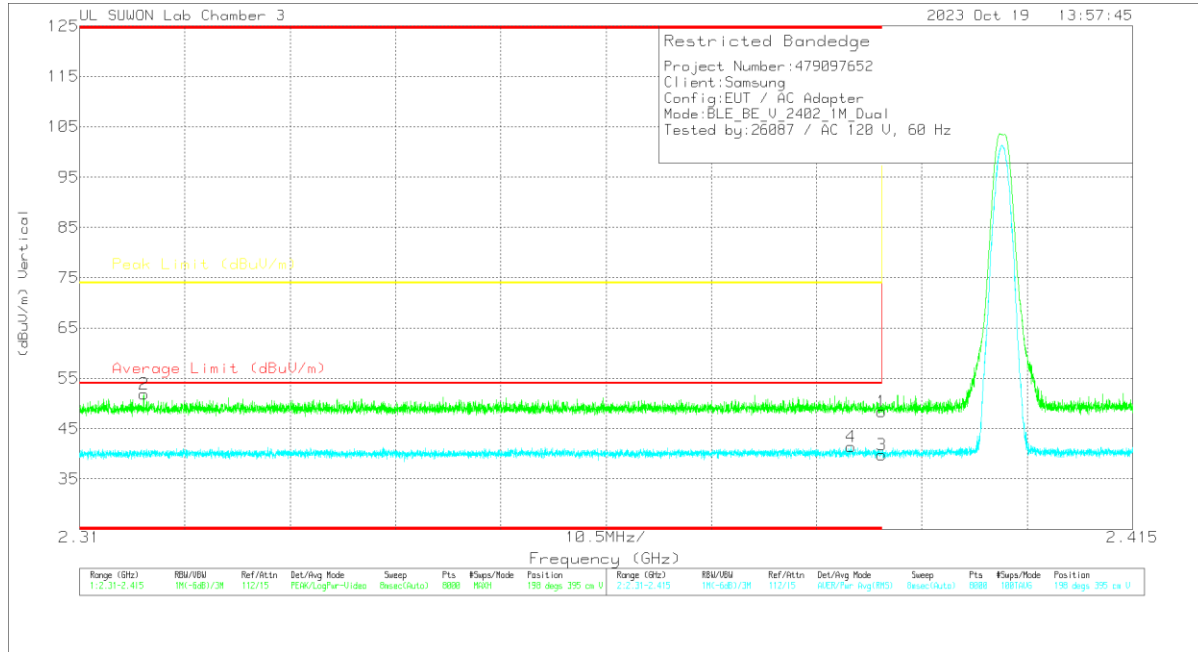
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Antenna Correction Factor (dB [1m])	Path Loss (dB)	DC Cor (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.35	Pk	32.1	-24.8	0	48.65	-	-	74	-25.35	124	103	H
2	* 2.31009	45.07	Pk	31.8	-24.8	0	52.07	-	-	74	-21.93	124	103	H
3	* 2.39	31.53	RMS	32.1	-24.8	2.9	41.73	54	-12.27	-	-	124	103	H
4	* 2.32065	33.11	RMS	31.9	-24.8	2.9	43.11	54	-10.89	-	-	124	103	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meas Reading (dBuV)	Det	Antenna Correction Factor (dB/20m)	Path Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (m)	Height (m)	Polarity
1	* 2.39	41.11	Pk	32.1	-24.8	0	48.11	-	-	74	-25.59	198	395	V
2	* 2.31643	44.81	Pk	31.9	-24.8	0	51.91	-	-	74	-22.09	198	395	V
3	* 2.39	31.39	RMS	32.1	-24.8	2.9	41.59	54	-12.41	-	-	198	395	V
4	* 2.3869	32.93	RMS	32.1	-24.8	2.9	43.13	54	-10.87	-	-	198	395	V

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

Pk - Peak detector

RMS - RMS detection