CERTIFICATION TEST REPORT

Report Number. : 4790841155-E5V2

Applicant	:	SAMSUNG ELECTRONICS CO., LTD. 129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI, GYEONGGI-DO, 16677, KOREA
Model	:	SM-X516B
FCC ID	:	A3LSMX516B
EUT Description	:	GSM/WCDMA/LTE 5G NR Tablet + BT/BLE, DTS/UNII a/b/g/n/ac/ax and Digitizer
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
2023-07-24

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

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

IAS ACCREDITED Testing Laboratory TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2023-07-18	Initial issue	Dexter(Hyunsik) Yun
V2	2023-07-24	Updated to address TCB's question	Dexter(Hyunsik) Yun

UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

TABLE OF CONTENTS

UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION:	GSM/WCDMA/LTE 5G NR Tablet + BT/BLE, DTS/UNII a/b/g/n/ac/ax and Digitizer
MODEL NUMBER:	SM-X516B
SERIAL NUMBER:	R32W500GF0B, 74134cec50397ece (CONDUCTED); 74b2c4c8e3397ece, 74134cec51397ece (RADIATED);
DATE TESTED:	2023-06-07 ~ 2023-07-18;

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:

Seokhwan Hong
Suwon Lab Engineer
UL KOREA LTD.

Tested By:

Dexter(Hyunsik) Yun
Suwon Lab Engineer
UL KOREA LTD.

2. TEST METHODOLOGY

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 558074 D01 DTS Meas Guidance v05r02.
4. KDB 662911 D01 Multiple Transmitter Output 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.

UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

4. CALIBRATION AND UNCERTAINTY

4.1. 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.

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, 9 kHz to 30 MHz	1.69 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.92 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.06 dB
Radiated Disturbance, Above 18 GHz	6.02 dB

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

4.4. DECISION RULE

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

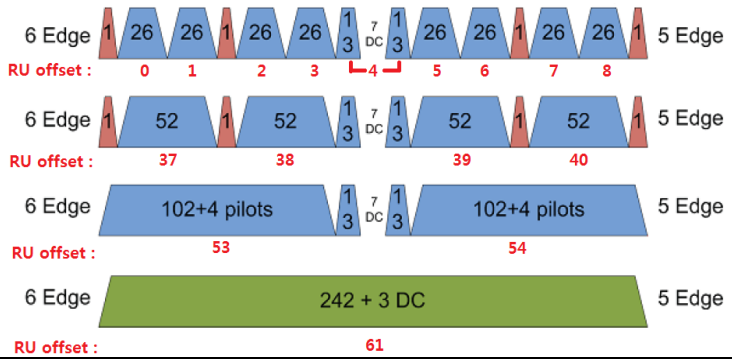
5.1. EUT DESCRIPTION

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

WiFi operating mode

Frequency rage	Mode	ANT 1	ANT 2
2.4GHz (2412 MHz ~ 2472 MHz)	802.11b MIMO	TX/RX	
	802.11g MIMO	TX/RX	
	802.11n(HT20) MIMO	TX/RX	
	802.11ax(HE20) MIMO	TX/RX	

802.11ax RU allocations



HE20

Test RU offset for tones

Mode	Tones number in RU	RU offset
HE20	26T	0
		4
		8
	52T	37
		38
		40
	106T	53
		54
	242T / SU Note 1	61 / -

Note. Full RU(Resource Unit) 242T mode and SU(Single Unit) mode have no difference in physical waveform. This report has been reported the SU mode with highest output power in MIMO.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range [MHz]	Mode	Output Power [dBm]		Output Power [mW]	
		ANT1	ANT2	ANT1	ANT2
2412 - 2472	802.11b MIMO	22.01		158.85	
	802.11g MIMO	20.43		110.41	
	802.11n(HT20) MIMO	18.78		75.51	
	802.11ax(HE20) MIMO	17.87		61.24	

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.

Bands [MHz]	ANT 1 [dBi]	ANT 2 [dBi]	Correlated Directional Gain [dBi]
2 412 ~ 2 472	-4.80	-5.20	-1.99

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[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}$] dBi.

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

Directional gain = 10 log[$(10^{0.40/20} + 10^{0.30/20})^2 / 2$] = 3.36 dBi

“Wifi1” and “Wifi2” as indicated in antenna specification are written as ANT1 and ANT2 in this report.

UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

5.4. TESTED CHANNELS LIST

Ch.	Frequency [MHz]	11b		11g		11n(HT20)		11ax(HE20)	
		SISO	MIMO	SISO	MIMO	SISO	MIMO	SISO	MIMO
1	2 412		O		O		O		O
6	2 437		O		O		O		O
11	2 462		O		O		O		O
12	2 467		O		O		O		O
13	2 472		O		O		O		O

*Note. SISO only operates Ant1 and performed Power verication.

5.5. 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.

Worst case of antenna axis: Y

Based on the baseline scan, the worst-case data rates were:
802.11b mode: 1 Mbps 2TX
802.11g mode: 6 Mbps 2TX
802.11n HT20 mode: MCS0 2TX
802.11ax HE20 mode: MCS0 2TX

Worst-case selection criteria for 802.11ax test items:
For the 6dB Bandwidth, it was tested at the RU allocation with lowest tones number for each bandwidth.

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

UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

Test case configuration for 802.11b, g, n HT20, ax HE20(SU) modes:

SISO ANT1 Target[dBm]						MIMO Target[dBm]					
Ch.	Freq.	802.11b	802.11g	802.11n HT20	802.11ax HE20	Ch.	Freq.	802.11b	802.11g	802.11n HT20	802.11ax HE20
1	2412	19	17	16	15	1	2412	22	20	19	18
6	2437	19	17	16	15	6	2437	22	20	19	18
11	2462	19	17	16	15	11	2462	22	20	19	18
12	2467	5	5	5	4	12	2467	8	8	8	7
13	2472	1	1	1	0	13	2472	4	4	4	3

Radiated Band-Edge, Conducted Band-Edge
Radiated Spurious Emission, Conducted Spurious Emission, PSD

Note1. In 802.11ax (RU mode), conducted & radiated spurious test was performed on the lower tone(26T) with high density.

Test case configuration for 802.11ax HE20(RU) modes :

MIMO Worst RU offset[dBm]					
Mode	Ch.	Freq.	Tone	RU offset	Test Case
802.11ax RU mode	1	2412	26 T	0	-
				4	**O**
				8	-
	6	2437		0	-
				4	**O**
				8	-
	11	2462		0	-
				4	**O**
				8	-

Note1. In 802.11ax HE20(RU) mode, the test case according to RU offset was selected from the offset with worst average power.
Note2. Radiated Band-Edge: investigated additional test with other lower RU tones. SU Mode (Worst case) is reported.

UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Charger	SAMSUNG	EP-TA800	R37M9KN2LV2DK3	N/A
Data Cable	SAMSUNG	EP-DN980	GH39-02115A	N/A

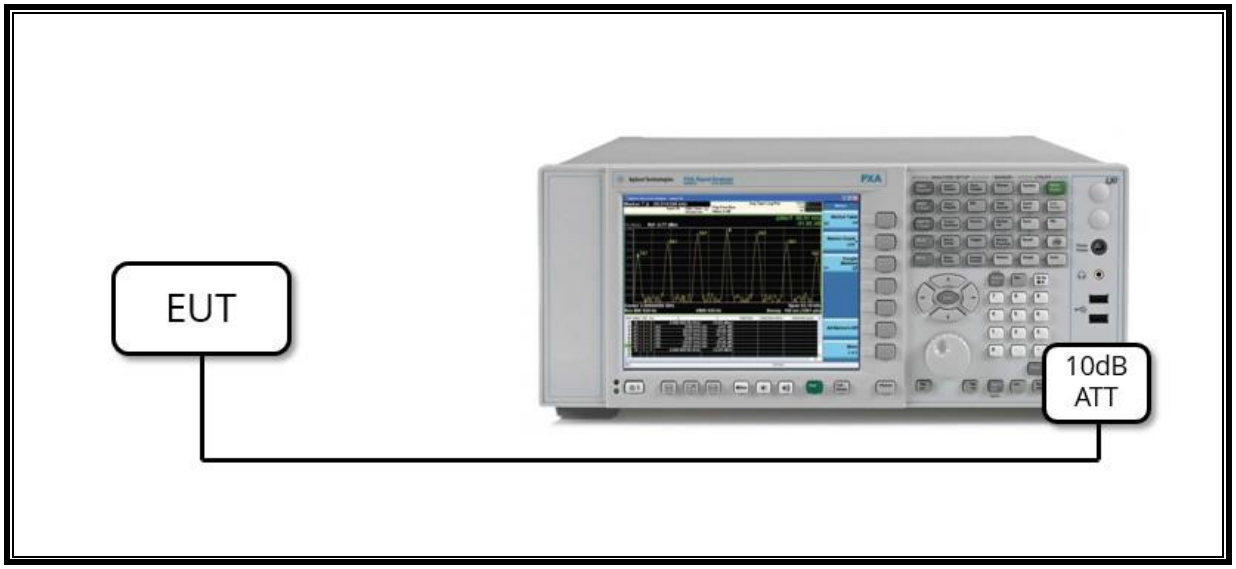
I/O CABLE

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

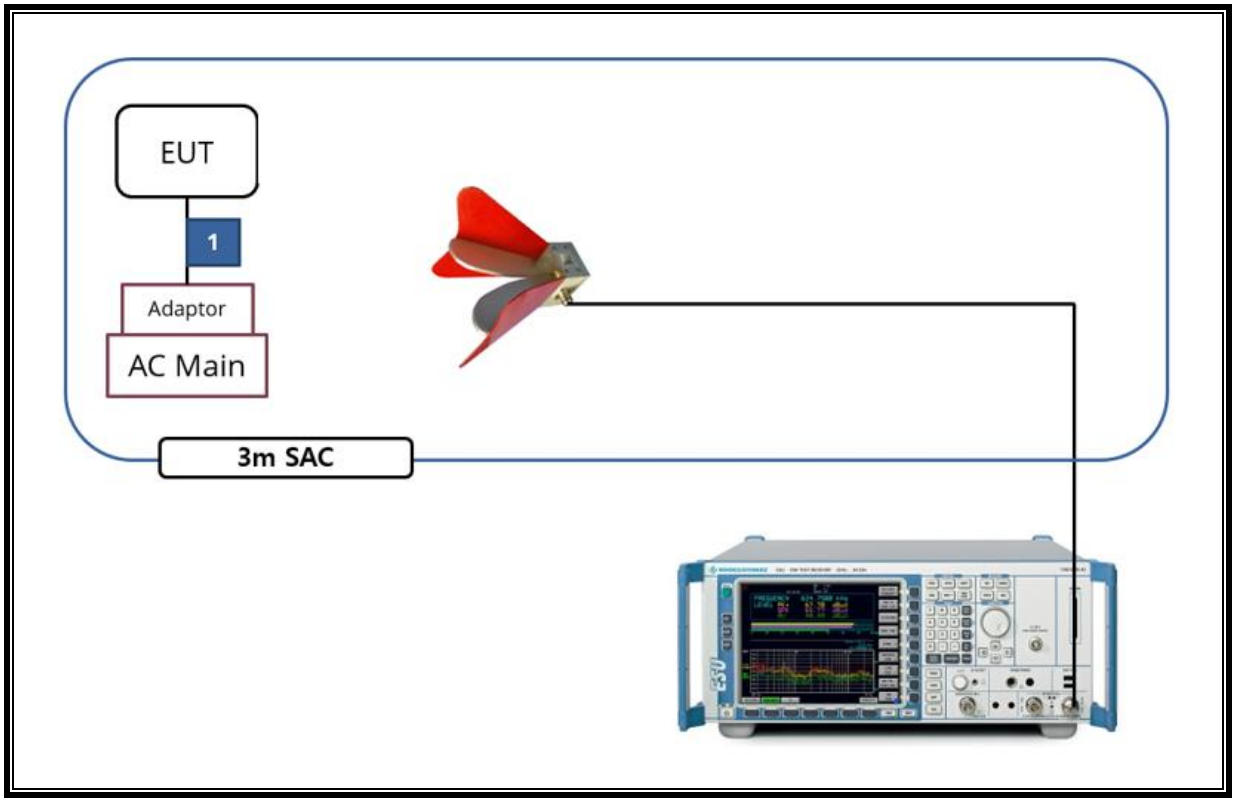
TEST SETUP

The EUT is a stand-alone unit during the tests.
Test software in hidden menu exercised the EUT to enable DTS 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 11.9.2.3.1 Method AVGPM

POWER SPECTRAL DENSITY : ANSI C63.10-2013, Section 11.10.3 & 11.10.5 Method AVGPSD-1 and Method AVGPSD-2

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

UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

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, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2024-08-15
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	2024-08-15
Antenna, Horn, 18 GHz	ETS	3115	00167211	2024-08-04
Antenna, Horn, 18 GHz	ETS	3115	00161451	2024-08-21
Antenna, Horn, 18 GHz	ETS	3117	00168724	2024-08-04
Antenna, Horn, 18 GHz	ETS	3117	00168717	2024-08-21
Antenna, Horn, 40 GHz	ETS	3116C	00166155	2024-08-02
Preamplifier	ETS	3115-PA	00167475	2023-08-04
Preamplifier	ETS	3116C-PA	00168841	2023-08-04
Preamplifier, 1000 MHz	Sonoma	310N	341282	2023-08-02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2023-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	2023-08-01
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	2023-08-01
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	2023-08-03
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	2023-08-01
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	2023-08-03
Average Power Sensor	Agilent / HP	U2000A	MY54260010	2023-08-03
Attenuator	PASTERNACK	PE7087-10	A001	2023-08-03
Attenuator	PASTERNACK	PE7087-10	A008	2023-08-03
Attenuator	PASTERNACK	PE7004-10	2	2023-08-01
Attenuator	PASTERNACK	PE7087-10	A009	2023-08-03
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2023-08-02
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2023-07-29
EMI Test Receive, 3 GHz	R&S	ESR3	101832	2023-08-01
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	2023-08-02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	2023-08-01
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	2023-08-01
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	2023-08-02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	2023-08-01
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	2023-08-02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	2023-08-01
LISN	R&S	ENV-216	101837	2023-08-04
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2023-10-06
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. SUMMARY TABLE

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	-30 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

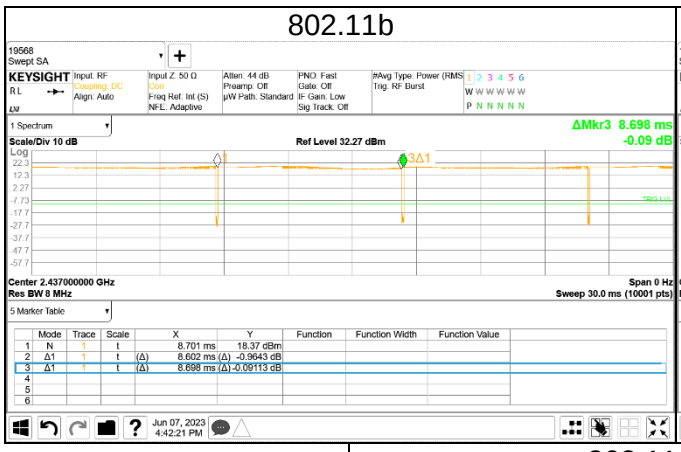
None; for reporting purposes only.

Mode	On Time [ms]	Period [ms]	Duty Cycle X [Linear]	Duty Cycle X [%]	Duty Cycle Correction Factor[dB]	1/T Minimum VBW[kHz]
802.11b MIMO	8.602	8.698	0.9890	98.896	-	0.12
802.11g MIMO	3.116	3.236	0.9629	96.292	0.16	0.32
802.11n(HT20) MIMO	6.224	6.344	0.9811	98.108	-	0.16
802.11ax(HE20) MIMO SU	2.554	2.664	0.9587	95.871	0.18	0.39
802.11ax(HE20) MIMO 26T	5.136	5.236	0.9809	98.090	-	0.19
802.11ax(HE20) MIMO 52T	5.545	5.656	0.9804	98.037	-	0.18
802.11ax(HE20) MIMO 106T	5.545	5.659	0.9799	97.986	0.09	0.18

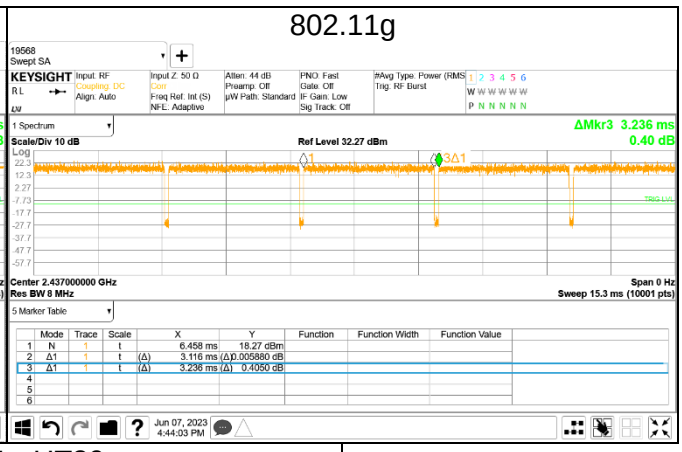
Note. According to ANSI C63.10 Section 11.6, do not apply the Duty Cycle Correction Factor judging that a duty cycle of greater than or equal to 98% is continuous signal.

UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

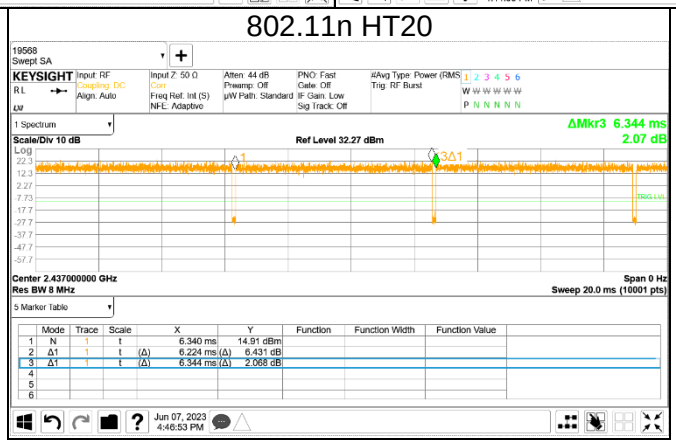
802.11b



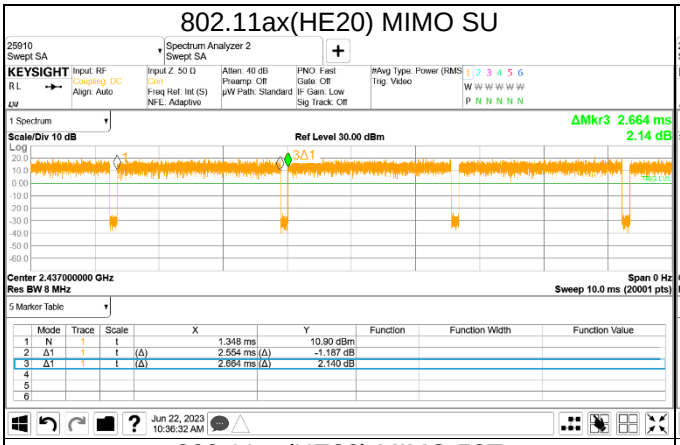
802.11g



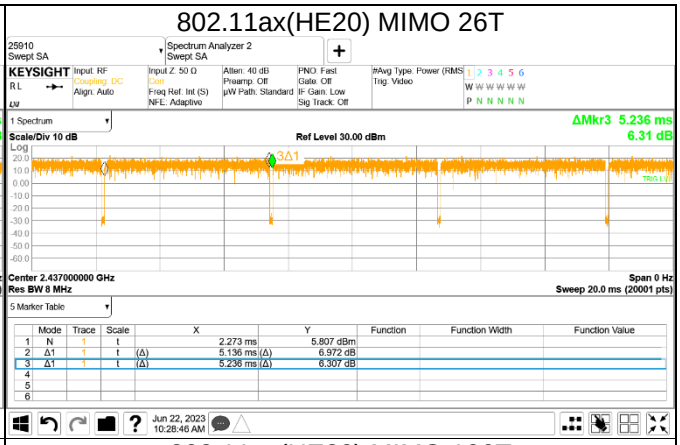
802.11n HT20



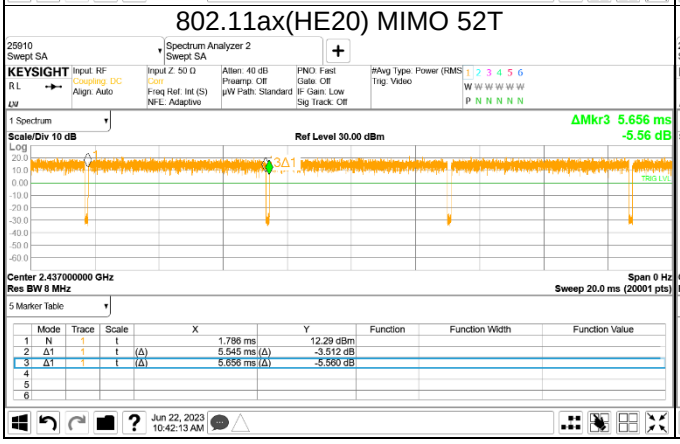
802.11ax(HE20) MIMO SU



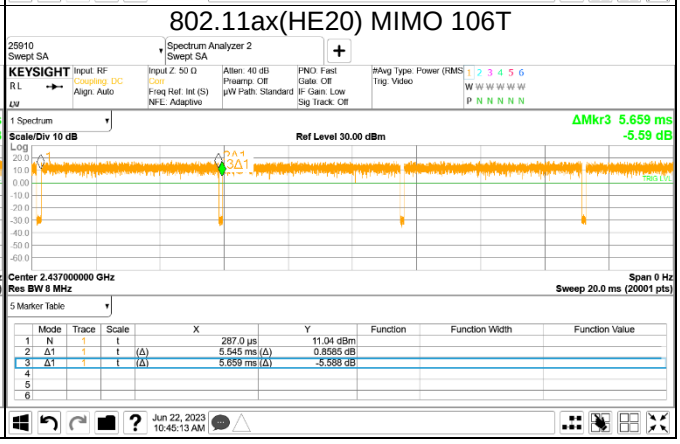
802.11ax(HE20) MIMO 26T



802.11ax(HE20) MIMO 52T



802.11ax(HE20) MIMO 106T



UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

9.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)
The minimum 6 dB bandwidth shall be at least 500 kHz.

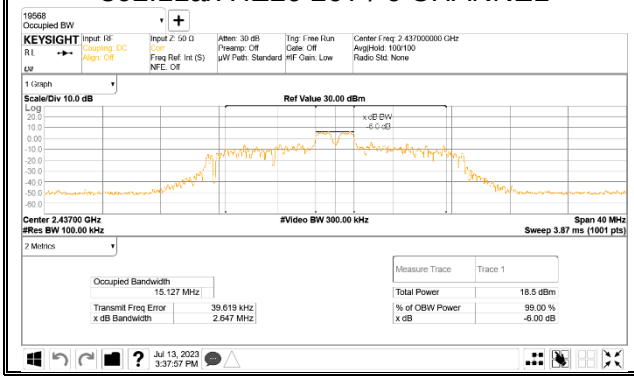
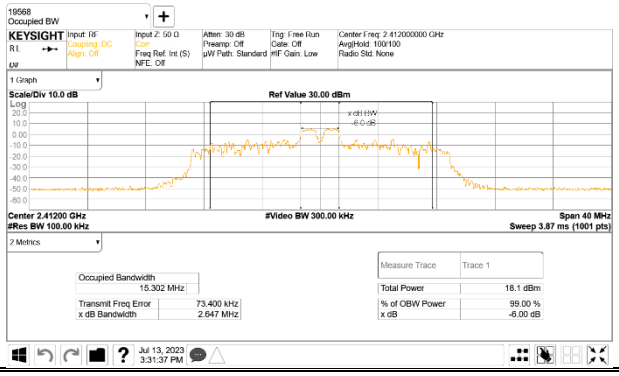
TEST PROCEDURE

Reference to KDB 558074 D01 15.247 Meas Guidance: The transmitter output is connected to a spectrum analyzer with the RBW set to100 kHz, the VBW >= 3 x RBW, peak detector and max hold.

RESULTS

- Please refer to the next page

WORST CASE TEST PLOTS

ANT1	ANT2
802.11ax HE20 26T / 6 CHANNEL	802.11ax HE20 26T / 1 CHANNEL
	

9.2.1. 802.11b MIMO MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		ANT 1	ANT 2	
1	2 412	8.091	8.589	0.5
6	2 437	9.018	**8.032**	
11	2 462	9.493	8.571	
12	2 467	8.110	8.591	
13	2 472	8.131	8.582	
Worst		**8.032**		

9.2.2. 802.11g MIMO MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		ANT 1	ANT 2	
1	2 412	15.340	14.820	0.5
6	2 437	**14.320**	15.670	
11	2 462	15.420	15.290	
12	2 467	15.320	15.940	
13	2 472	16.330	15.550	
Worst		**14.320**		

9.2.3. 802.11n HT20 MIMO MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		ANT 1	ANT 2	
1	2 412	16.300	**15.110**	0.5
6	2 437	16.070	16.270	
11	2 462	15.960	15.710	
12	2 467	16.110	15.690	
13	2 472	16.280	16.310	
Worst		**15.110**		

9.2.4. 802.11ax HE20(26T) MIMO MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		ANT 1	ANT 2	
1	2 412	2.688	**2.647**	0.5
6	2 437	**2.647**	2.653	
11	2 462	2.670	2.675	
Worst		**2.647**		

9.3. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband RF frame average power sensor.
The cable assembly insertion loss and duty cycle correction factor was entered as an offset in the power sensor to allow for direct reading of power.
Output power measurement was performed utilizing the 8.3.2.3 under KDB558074 D01 15.247 Meas Guidance.

DIRECTIONAL ANTENNA GAIN

The TX chains are correlated and the antenna gain is unequal among the chains.
The directional gain is:

Bands [MHz]	ANT 1 [dBi]	ANT 2 [dBi]	Correlated Directional Gain [dBi]
2 412 - 2 472	-4.80	-5.20	-1.99

Note. Since the correlated directional gain does not exceed 6dBi, it is not mentioned further below.

9.3.1. TEST RESULTS

- 802.11b,g,n,ax(SU) mode

Mode	Channel	Frequency [MHz]	SISO Average Power [dBm]		MIMO Average Power [dBm]			Power Limit [dBm]
			ANT1	ANT2	ANT1	ANT2	Total Corr'd Power [dBm]	
802.11b	1	2 412	19.38		19.03	18.96	22.01	30.00
	6	2 437	19.17		19.08	18.88	21.99	
	11	2 462	19.08		18.91	18.65	21.79	
	12	2 467	5.23		5.07	5.24	8.17	
	13	2 472	1.15		1.11	1.39	4.26	
Worst Case			19.38				**22.01**	
802.11g	1	2 412	16.62		16.54	16.63	19.60	
	6	2 437	16.88		16.99	16.83	19.92	
	11	2 462	16.74		17.35	17.48	20.43	
	12	2 467	5.29		5.14	5.44	8.30	
	13	2 472	0.93		0.91	1.19	4.06	
Worst Case			16.88				**20.43**	
802.11n HT20	1	2 412	15.84		15.45	15.62	18.55	
	6	2 437	15.87		15.60	15.94	18.78	
	11	2 462	15.45		15.31	15.40	18.37	
	12	2 467	4.76		4.48	4.91	7.71	
	13	2 472	0.38		0.60	0.29	3.46	
Worst Case			15.87				**18.78**	
802.11ax HE20(SU)	1	2 412	15.19		14.83	14.89	17.87	
	6	2 437	15.05		14.32	14.54	17.44	
	11	2 462	15.16		14.85	14.62	17.75	
	12	2 467	4.01		3.46	3.45	6.47	
	13	2 472	0.34		-1.05	-0.36	2.32	
Worst Case			15.19				**17.87**	

- Calculation of Output Power result

Average Power = Meas. Power + Duty Cycle CF / Total Corr'd Power = ANT1's Avearage Power + ANT2's Average Power

- 802.11ax (RU) mode

Channel	Frequency [MHz]	Tones	RU Offset	SISO Average Power [dBm]		MIMO Average Power [dBm]			Power Limit [dBm]
				ANT1	ANT2	ANT1	ANT2	Total Corr'd Power [dBm]	
1	2 412	26T	0	4.77		4.65	4.17	7.43	30.00
			4	10.17		10.30	9.87	13.10	
			8	5.04		4.99	4.50	7.76	
		52T	37	6.71		7.30	6.53	9.94	
			38	9.98		10.28	9.96	13.13	
			40	6.75		7.35	6.83	10.11	
		106T	53	9.18		9.51	9.08	12.31	
			54	9.15		9.23	9.11	12.18	
6	2 437	26T	0	4.68		4.01	4.13	7.08	
			4	10.06		9.77	10.13	12.96	
			8	5.17		4.69	4.82	7.77	
		52T	37	6.70		6.18	6.23	9.22	
			38	9.95		9.51	9.61	12.57	
			40	6.72		6.89	6.96	9.94	
		106T	53	8.88		8.31	8.46	11.40	
			54	9.28		8.75	8.84	11.81	
11	2 462	26T	0	5.19		5.47	5.38	8.44	
			4	9.92		10.20	10.14	13.18	
			8	4.03		4.62	4.55	7.60	
		52T	37	7.04		7.44	7.24	10.35	
			38	9.88		10.12	10.18	13.16	
			40	5.91		6.38	6.35	9.38	
		106T	53	9.31		9.09	8.86	11.99	
			54	8.99		8.40	8.38	11.40	
12	2 467	26T	0	-0.56		-0.03	-0.16	2.92	
			4	4.02		4.28	4.32	7.31	
			8	-1.46		-1.03	-0.75	2.12	
		52T	37	1.34		1.57	1.69	4.64	
			38	4.02		4.22	4.59	7.42	
			40	0.51		0.63	1.15	3.91	
		106T	53	3.36		3.34	3.21	6.29	
			54	3.33		2.68	3.00	5.85	
13	2 472	26T	0	-4.33		-4.79	-4.20	-1.47	
			4	0.52		0.13	0.56	3.36	
			8	-4.98		-5.59	-4.63	-2.07	
		52T	37	-2.44		-2.99	-2.49	0.28	
			38	0.39		0.02	0.55	3.30	
			40	-2.90		-3.58	-2.60	-0.05	
		106T	53	-0.83		-1.34	-0.80	1.95	
			54	-1.14		-1.57	-0.54	1.99	
Worst Case				10.17				13.18	

9.4. 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.

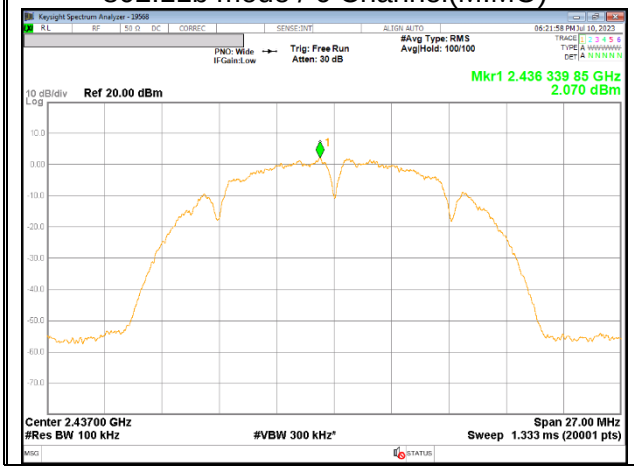
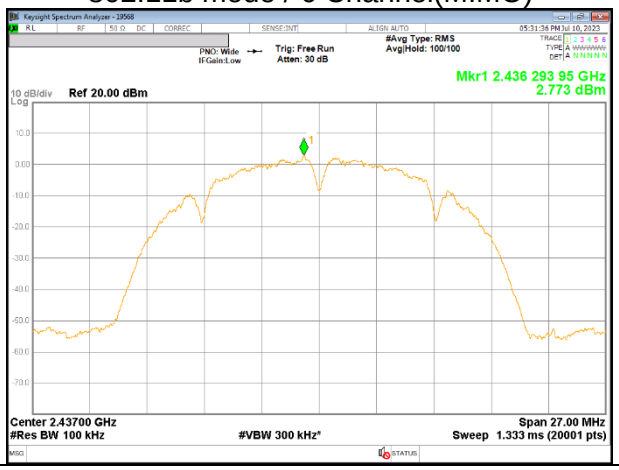
TEST PROCEDURE

Power Spectral Density was performed utilizing the section8.4 under KDB558074 D01 15.247 Meas Guidance.

RESULTS

- Please refer to the next page

WORST CASE TEST PLOTS

ANT 1	ANT 2
802.11b mode / 6 Channel(MIMO)	802.11b mode / 6 Channel(MIMO)
	

9.4.1. 802.11b/g/n HT20/ax HE20 MODE TEST RESULTS

- MIMO Mode

Mode	Channel	Frequency [MHz]	Meas PSD [dBm/100kHz]		DCCF	Total Corr'd PSD [dBm/100kHz]	PSD Limit [dBm/3kHz]
			ANT1	ANT2			
802.11b	1	2 412	2.66	1.94	0.00	5.33	8.00 Note
	6	2 437	**2.07**	**2.77**	**0.00**	**5.45**	
	11	2 462	2.51	2.38	0.00	5.45	
	12	2 467	-10.64	-10.61	0.00	-7.61	
	13	2 472	-15.43	-14.71	0.00	-12.04	
802.11g	1	2 412	-2.04	-2.06	0.16	1.12	
	6	2 437	-1.77	-2.42	0.16	1.08	
	11	2 462	-2.03	-1.77	0.16	1.27	
	12	2 467	-14.30	-14.16	0.16	-11.05	
	13	2 472	-18.43	-17.83	0.16	-14.95	
802.11n HT20	1	2 412	-3.20	-3.43	0.00	-0.30	
	6	2 437	-3.89	-3.07	0.00	-0.45	
	11	2 462	-3.74	-3.07	0.00	-0.38	
	12	2 467	-14.22	-14.34	0.00	-11.27	
	13	2 472	-21.06	-18.06	0.00	-16.30	
802.11ax HE20	1	2 412	-5.29	-5.41	0.18	-2.16	
	6	2 437	-5.98	-5.92	0.18	-2.76	
	11	2 462	-5.40	-5.68	0.18	-2.35	
	12	2 467	-17.49	-17.23	0.18	-14.17	
	13	2 472	-21.82	-21.04	0.18	-18.22	

- MIMO Mode(802.11ax HE20)

Channel	Frequency [MHz]	Tones	RU Offset	Meas PPSD [dBm/100kHz]		DCCF	Total Corr'd PPSD [dBm/100kHz]	PSD Limit [dBm/3kHz]
				ANT1	ANT2			
1	2 412	26T	0	-6.62	-7.57	0.00	-4.06	8.00 Note
			4	-2.29	-2.57	0.00	0.58	
			8	-7.18	-7.16	0.00	-4.16	
6	2 437	26T	0	-7.71	-7.12	0.00	-4.40	
			4	-2.40	-2.36	0.00	0.63	
			8	-6.76	-6.65	0.00	-3.69	
11	2 462	26T	0	-6.08	-6.30	0.00	-3.18	
			4	-1.89	-1.89	0.00	1.12	
			8	-7.33	-6.71	0.00	-4.00	

Calculation of Output PSD result
- 1TX : Corr'd PSD = Meas PSD + Duty Cycle CF
- 2TX : Total PSD = ANT1 Meas PSD + ANT2 Meas PSD + Duty Cycle CF

Note. RBW 100kHz measurement data is lower than 3kHz limit.

UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

9.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

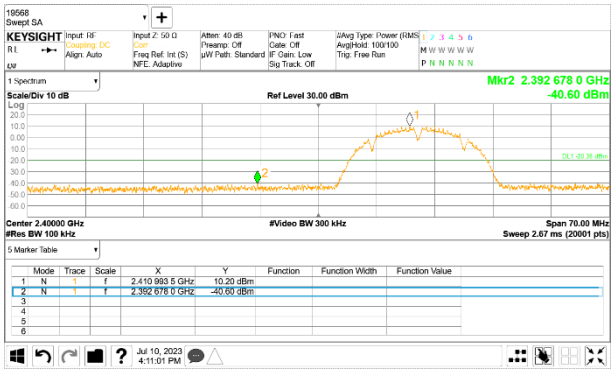
FCC §15.247 (d)

Output power was measured based on the use of average measurement, therefore the required attenuation is 30 dB.

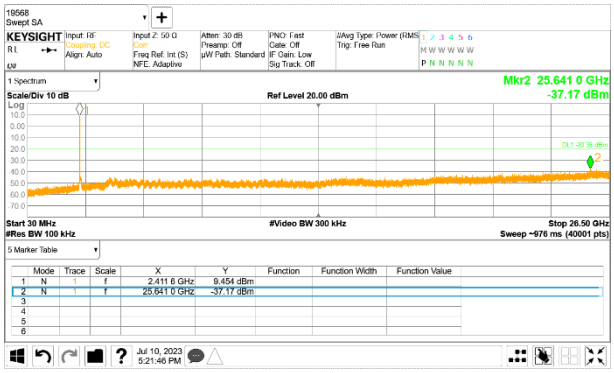
RESULTS

9.5.1. 802.11b MODE

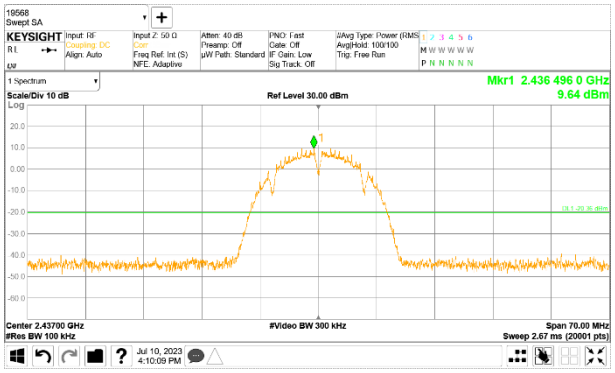
2TX Antenna 1



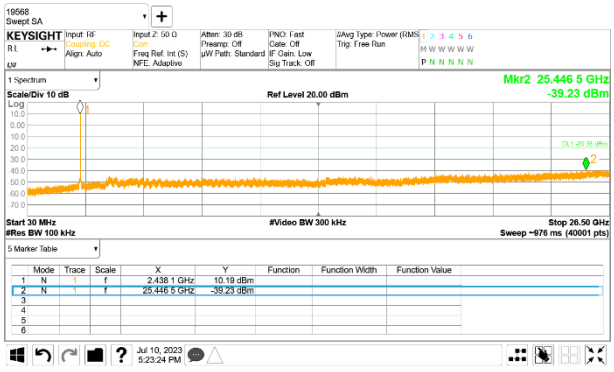
1 Channel Band-edge



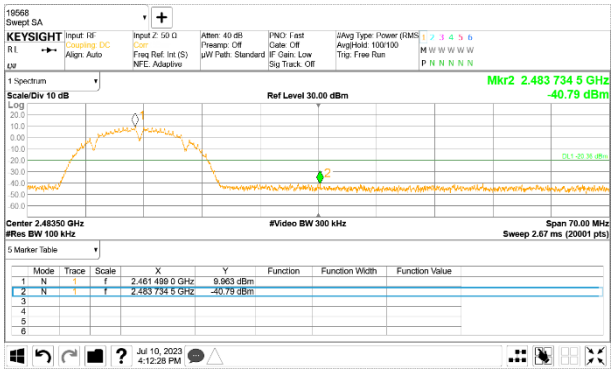
Out-Of-Band 1 Channel



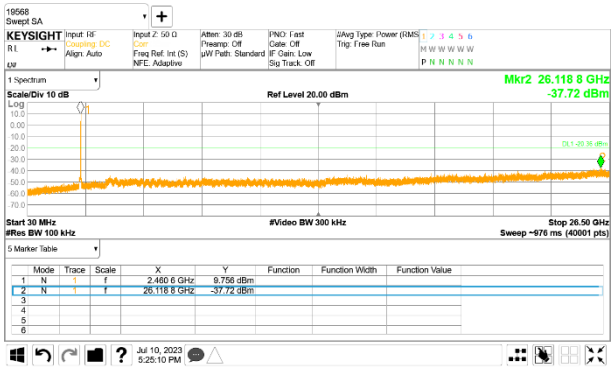
6 Channel Band-edge



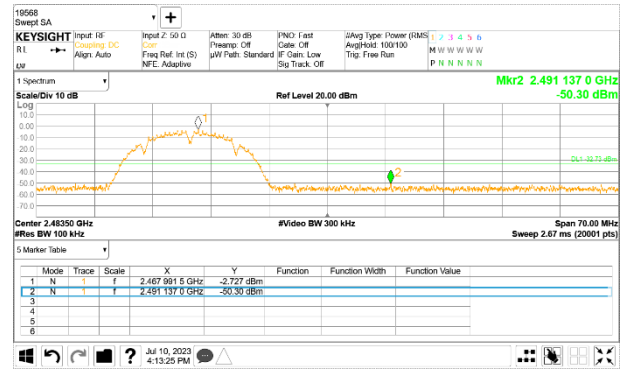
Out-Of-Band 6 Channel



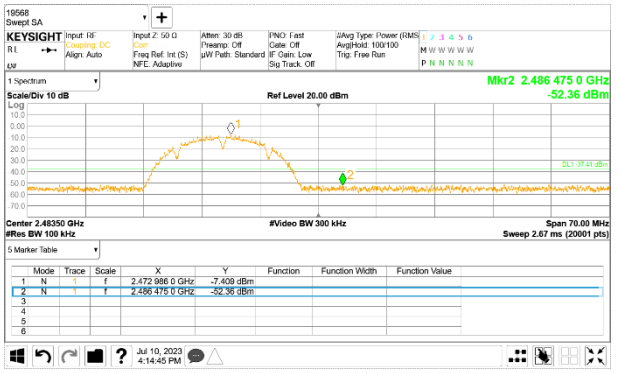
11 Channel Band-edge



Out-Of-Band 11 Channel

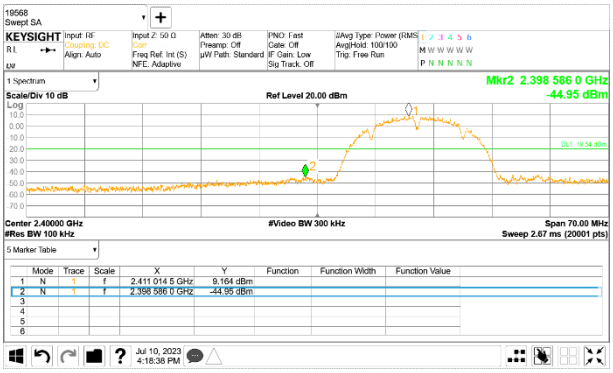


12 Channel Band-edge

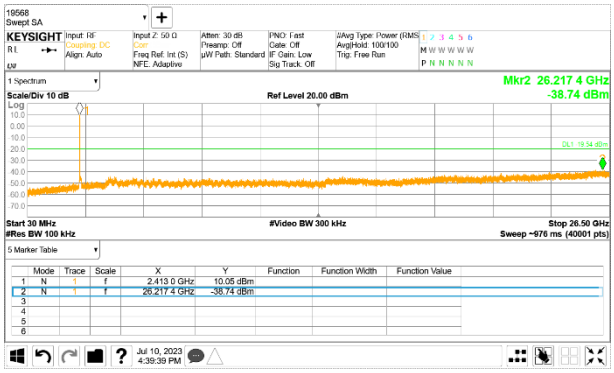


13 Channel Band-edge

2TX Antenna 2

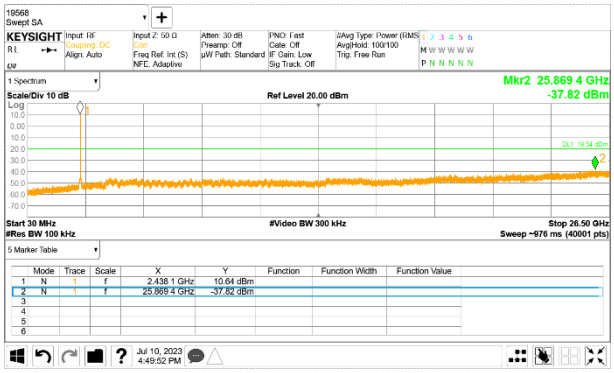


1 Channel Band-edge

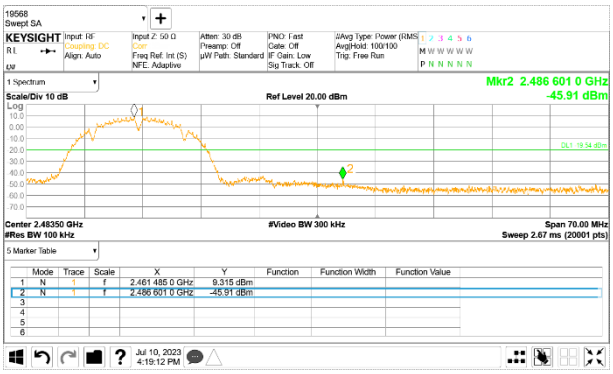


Out-Of-Band 1 Channel

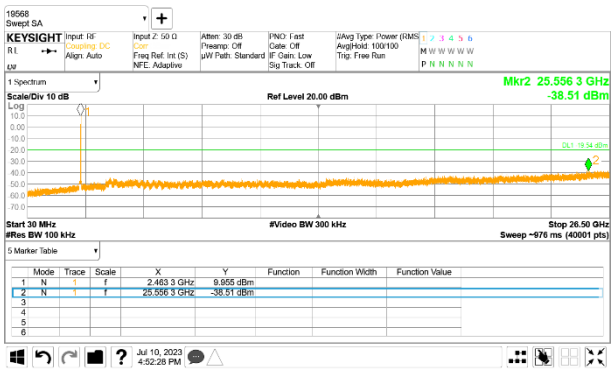
6 Channel Band-edge



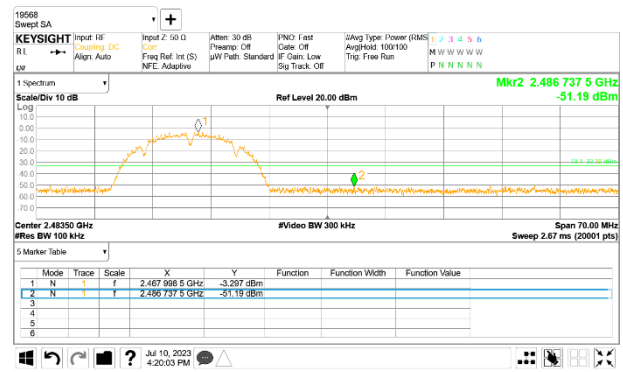
Out-Of-Band 6 Channel



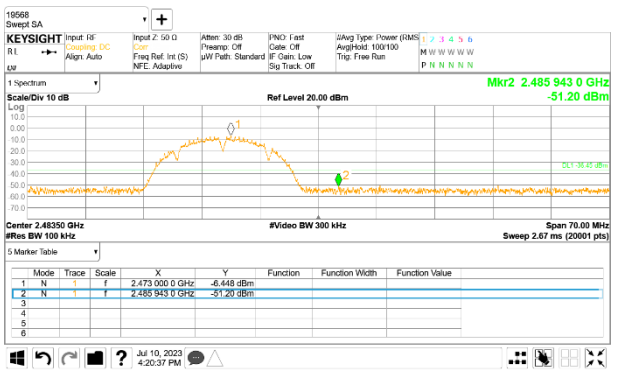
11 Channel Band-edge



Out-Of-Band 11 Channel



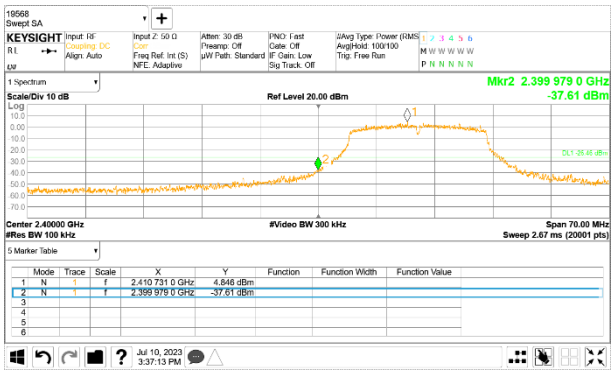
12 Channel Band-edge



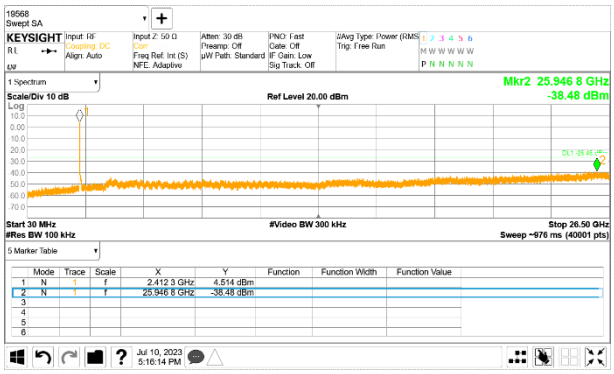
13 Channel Band-edge

9.5.2. 802.11g MODE

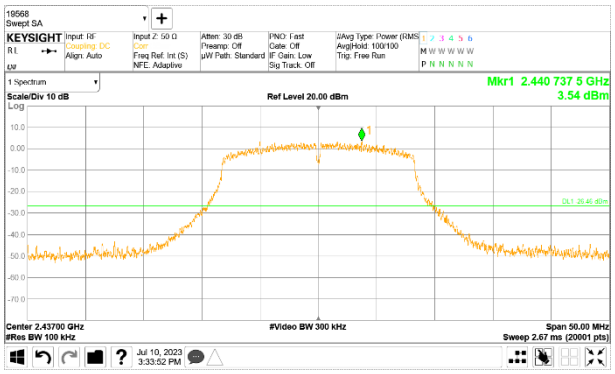
2TX Antenna 1



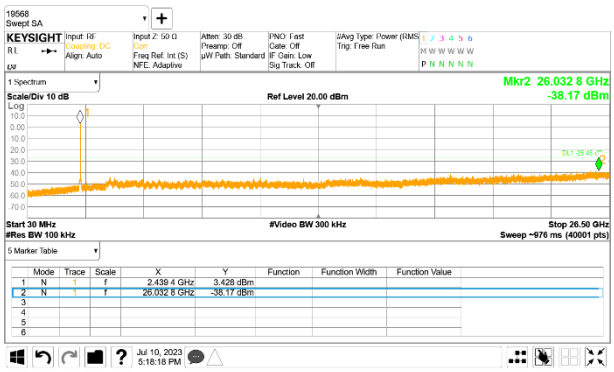
1 Channel Band-edge



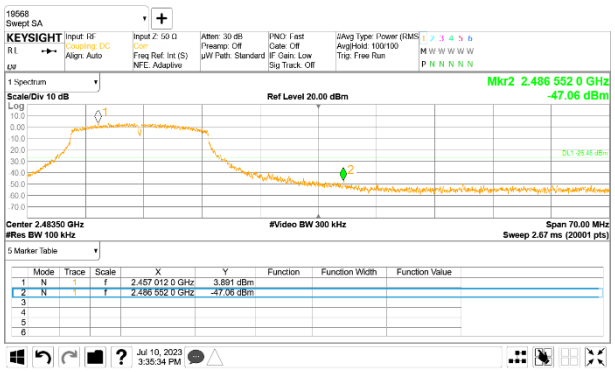
Out-Of-Band 1 Channel



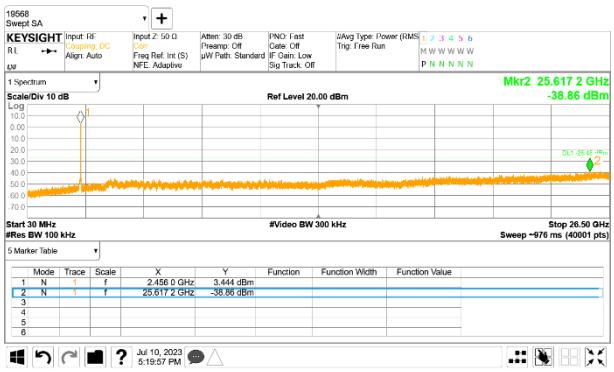
6 Channel Band-edge



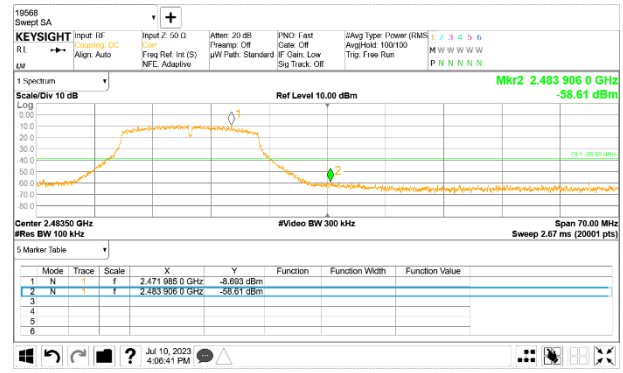
Out-Of-Band 6 Channel



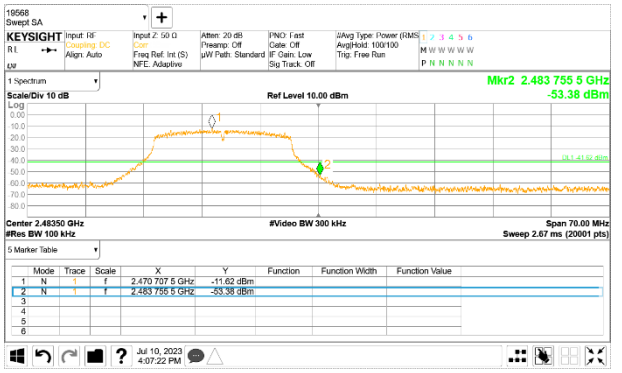
11 Channel Band-edge



Out-Of-Band 11 Channel

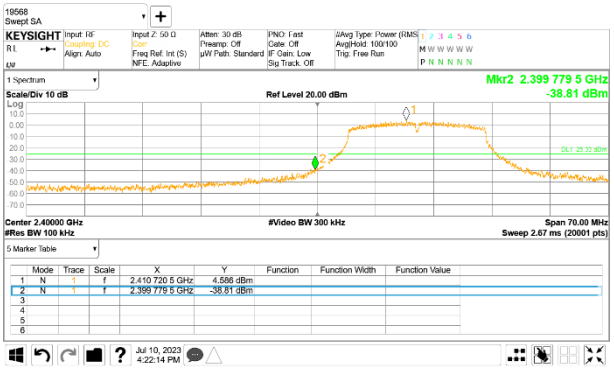


12 Channel Band-edge

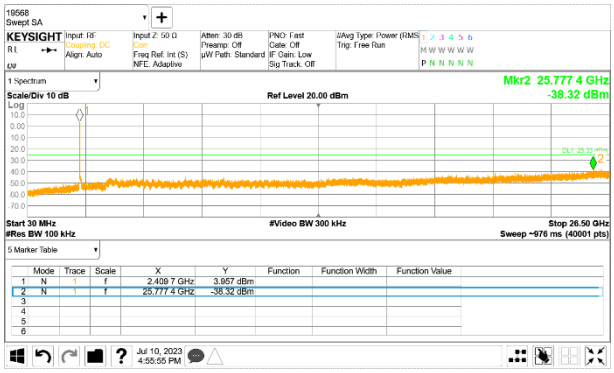


13 Channel Band-edge

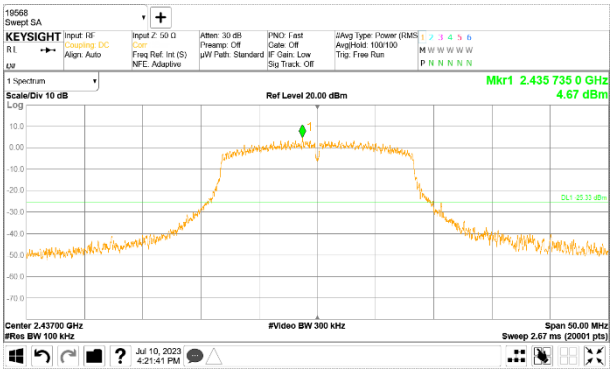
2TX Antenna 2



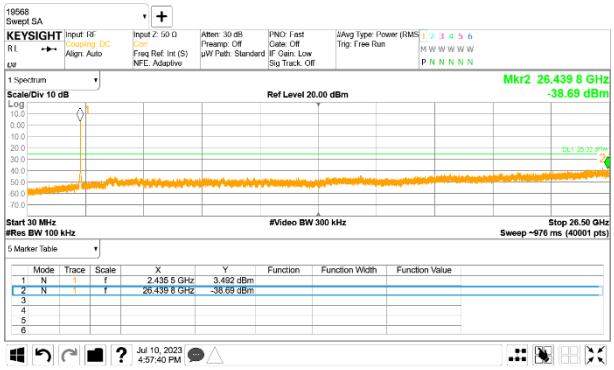
1 Channel Band-edge



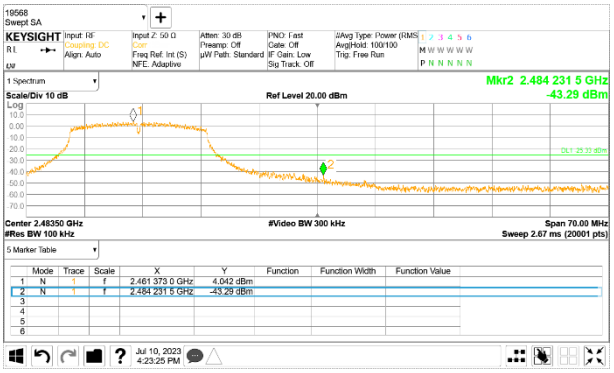
Out-Of-Band 1 Channel



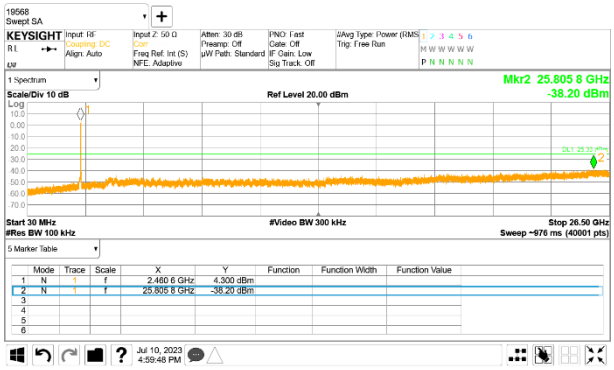
6 Channel Band-edge



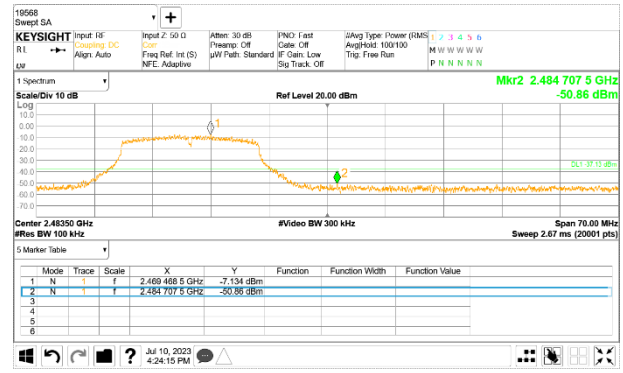
Out-Of-Band 6 Channel



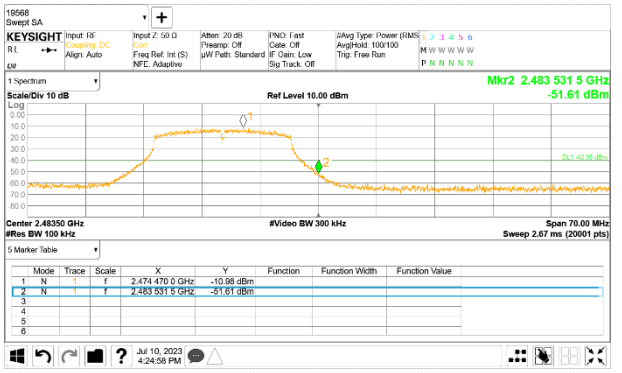
11 Channel Band-edge



Out-Of-Band 11 Channel



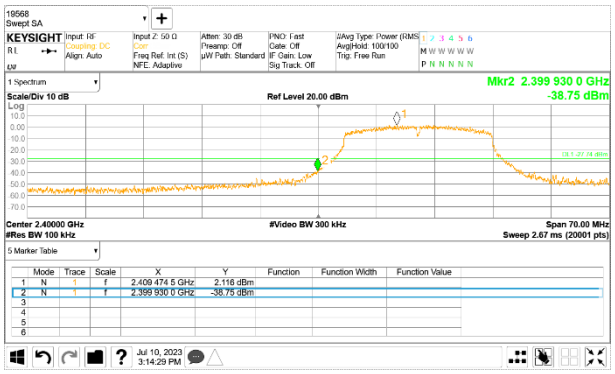
12 Channel Band-edge



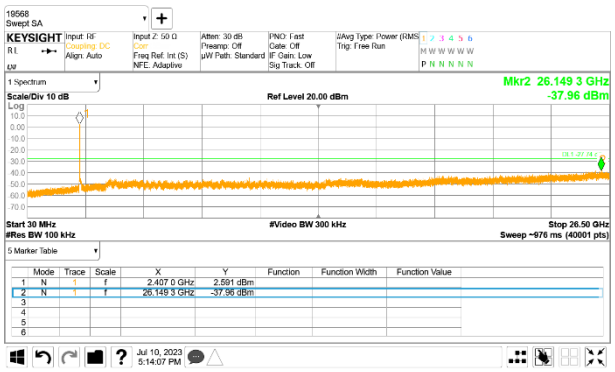
13 Channel Band-edge

9.5.3. 802.11n HT20 MODE

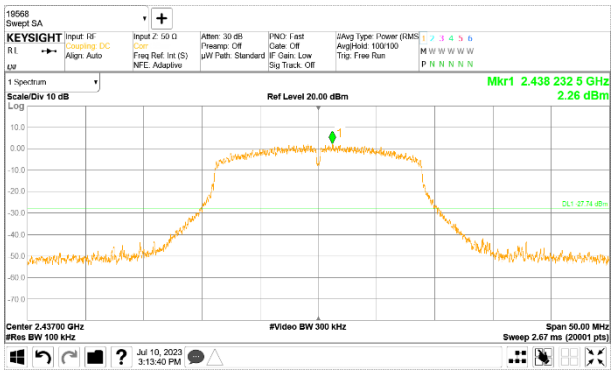
2TX Antenna 1



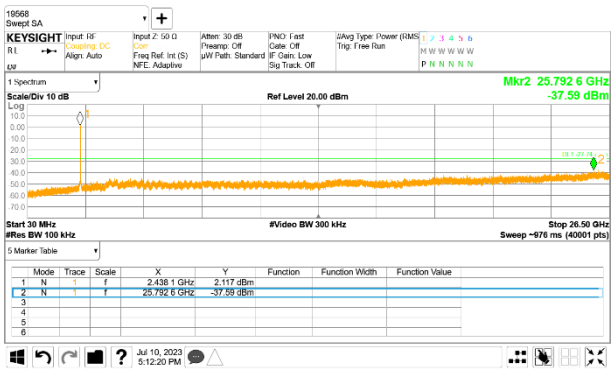
1 Channel Band-edge



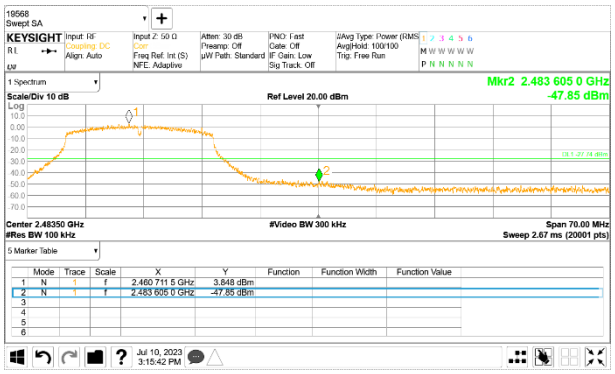
Out-Of-Band 1 Channel



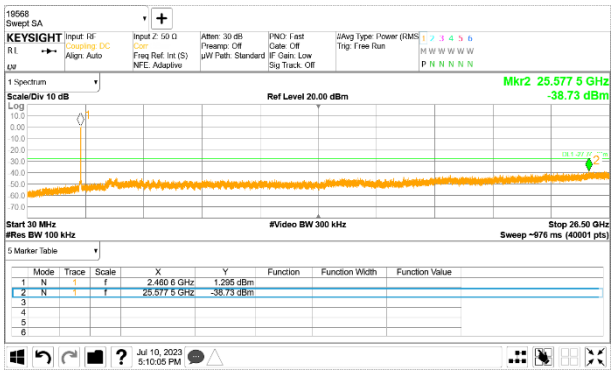
6 Channel Band-edge



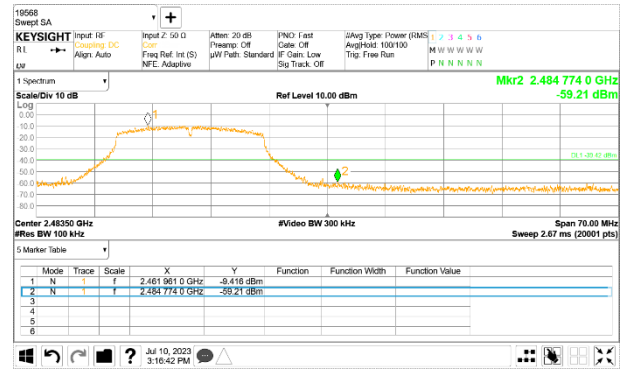
Out-Of-Band 6 Channel



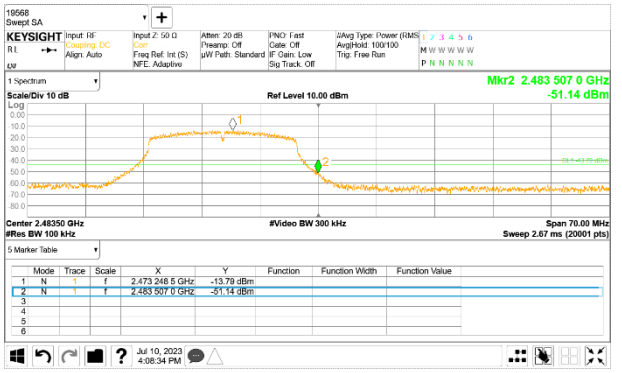
11 Channel Band-edge



Out-Of-Band 11 Channel

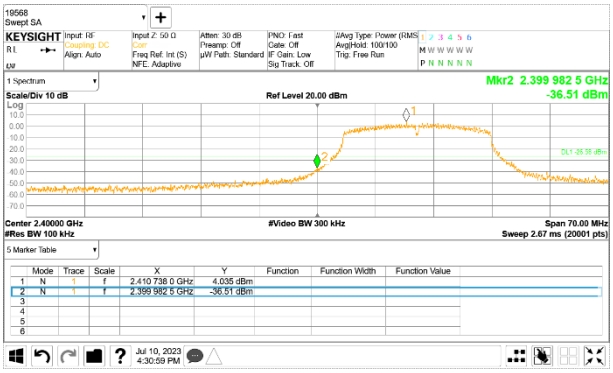


12 Channel Band-edge

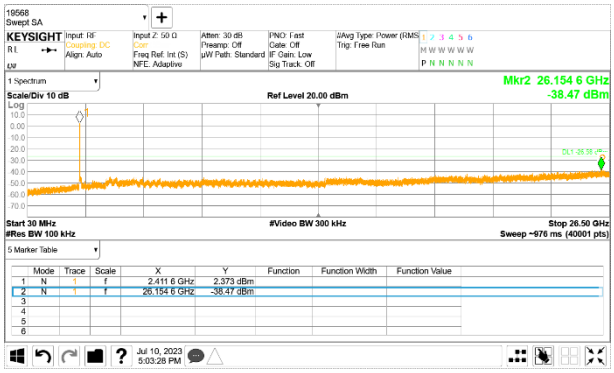


13 Channel Band-edge

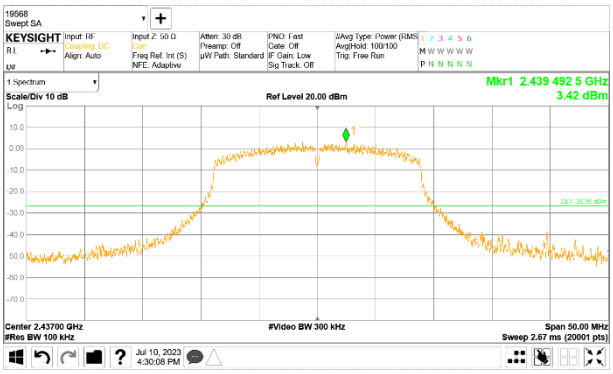
2TX Antenna 2



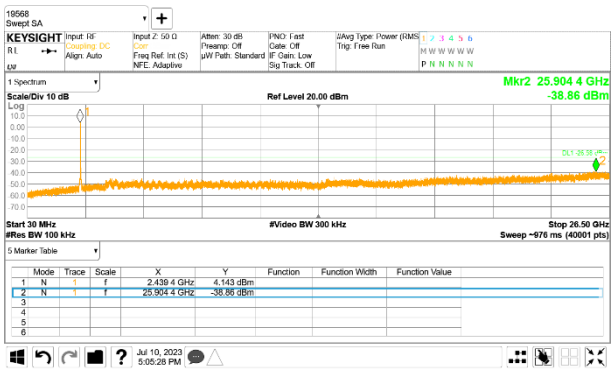
1 Channel Band-edge



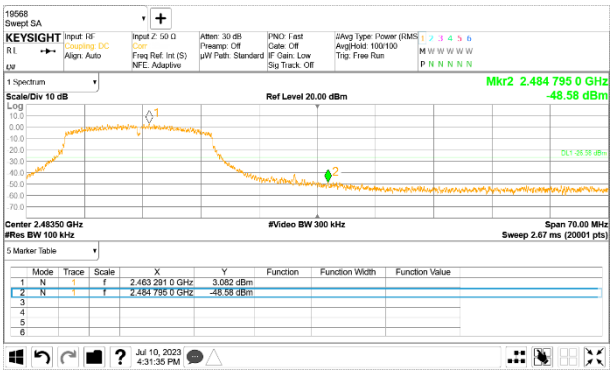
Out-Of-Band 1 Channel



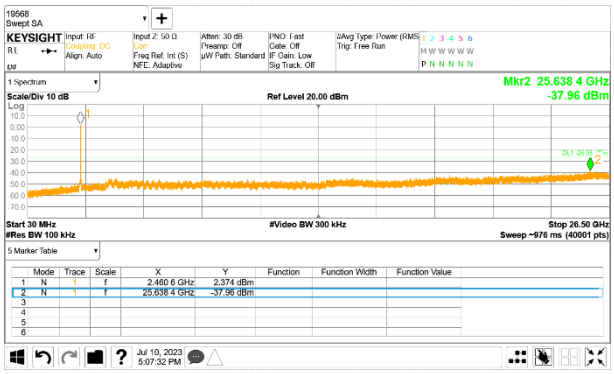
6 Channel Band-edge



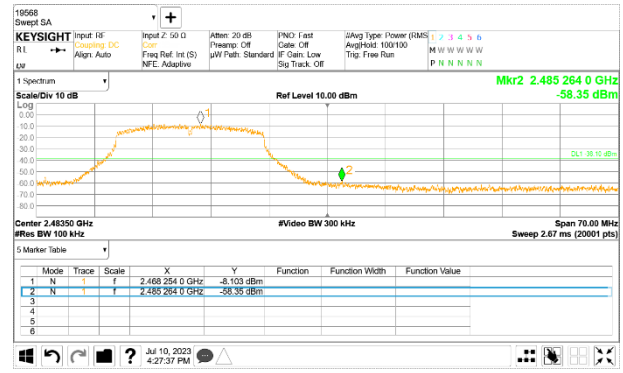
Out-Of-Band 6 Channel



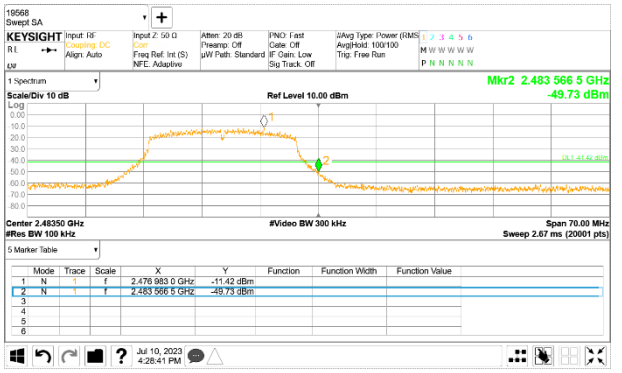
11 Channel Band-edge



Out-Of-Band 11 Channel



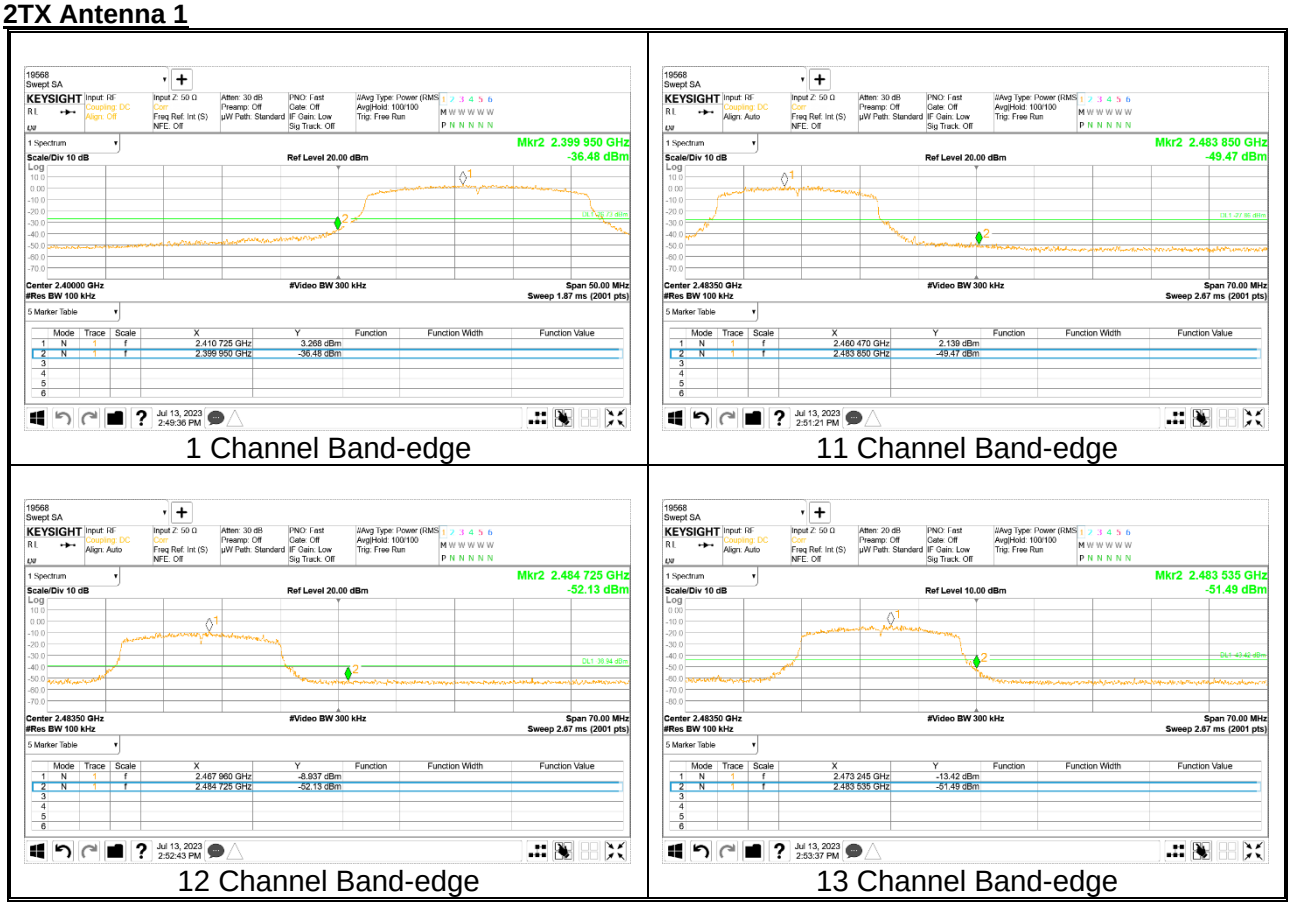
12 Channel Band-edge



13 Channel Band-edge

9.5.4. 802.11ax HE20(SU) MODE

2TX Antenna 1



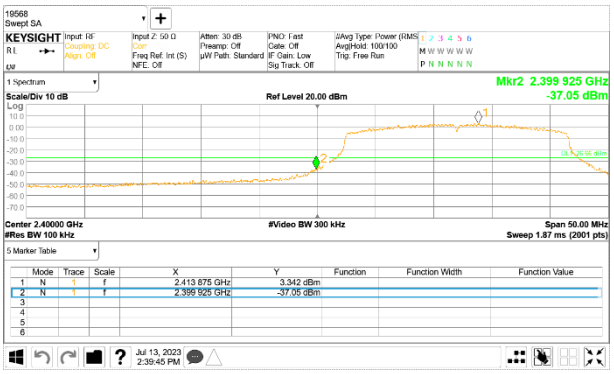
1 Channel Band-edge

11 Channel Band-edge

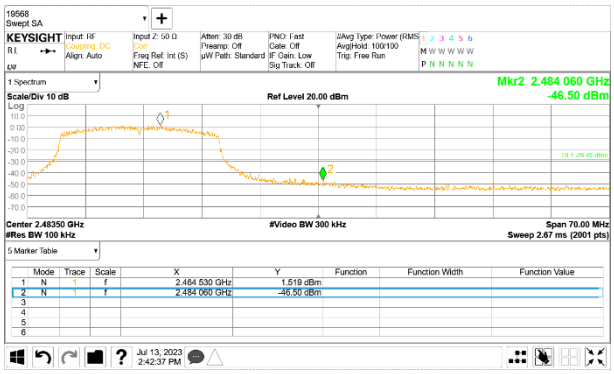
12 Channel Band-edge

13 Channel Band-edge

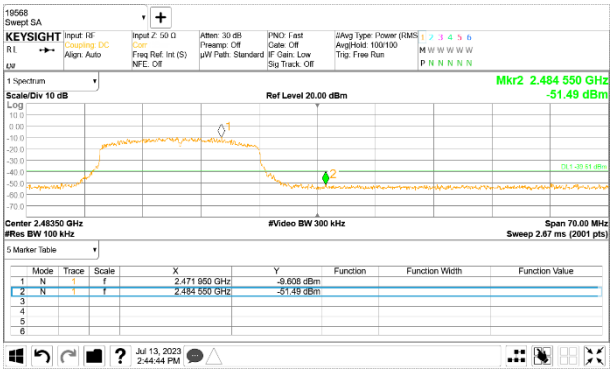
2TX Antenna 2



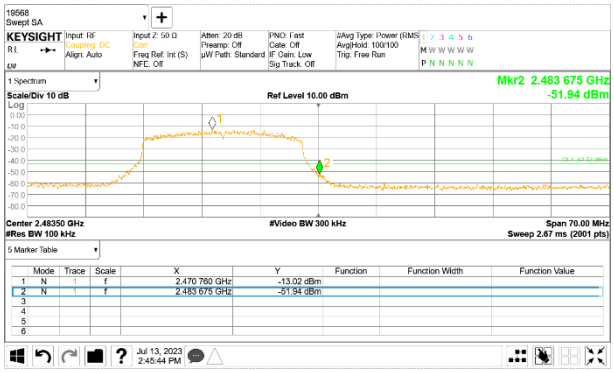
1 Channel Band-edge



11 Channel Band-edge



12 Channel Band-edge

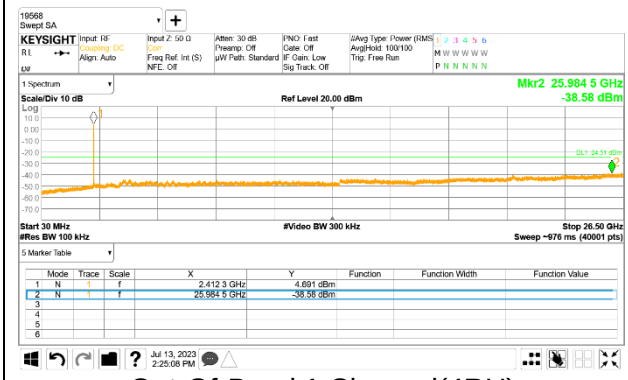


13 Channel Band-edge

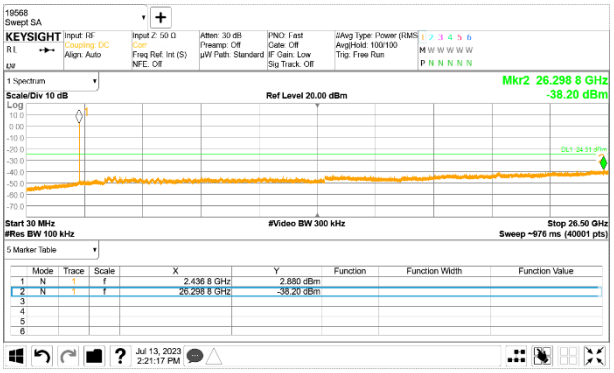
9.5.5. 802.11ax HE20(RU) MODE

2TX Antenna 1 MODE

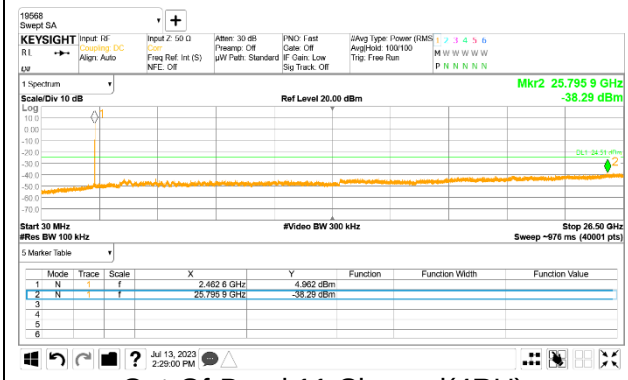
In-Band Reference Level



Out-Of-Band 1 Channel(4RU)



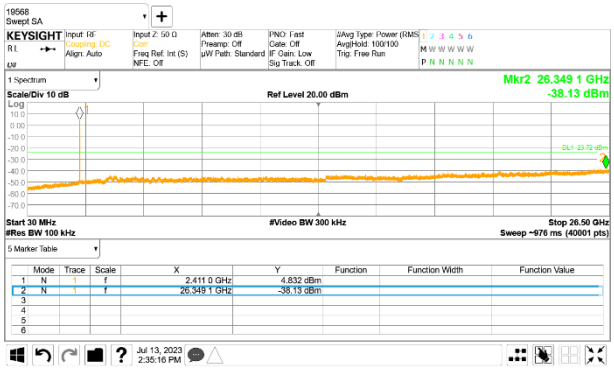
Out-Of-Band 6 Channel(4RU)



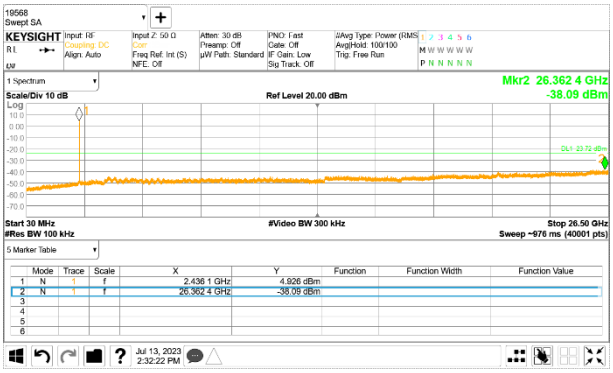
Out-Of-Band 11 Channel(4RU)

2TX Antenna 2 MODE

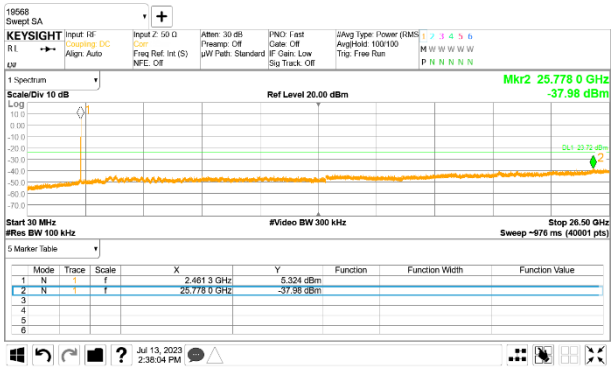
In-Band Reference Level



Out-Of-Band 1 Channel(4RU)



Out-Of-Band 6 Channel(4RU)



Out-Of-Band 11 Channel(4RU)

10. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (μV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

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

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

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

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1 GHz and 150 cm for above 1 GHz. 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; the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor for average measurements.
(Restriced bandedge, Final detection of spurious harmonic emissions)

Duty cycle factor = 10log (1/x) For this sample:

802.11b MIMO mode = 0 dB (duty cycle > 98%);
802.11g MIMO mode = 0.16 dB (96.29%);
802.11n(HT20) MIMO mode = 0 dB (duty cycle > 98%);
802.11ax(HE20) MIMO SU mode = 0.18 dB (95.87%);
802.11ax(HE20) MIMO 26 Tone mode = 0 dB (duty cycle > 98%).

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 each applicable band.
(From 30MHz to 1GHz, test was performed with the EUT set to transmit at the channel with highest output power)

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

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

Although these tests were performed other than open area 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.

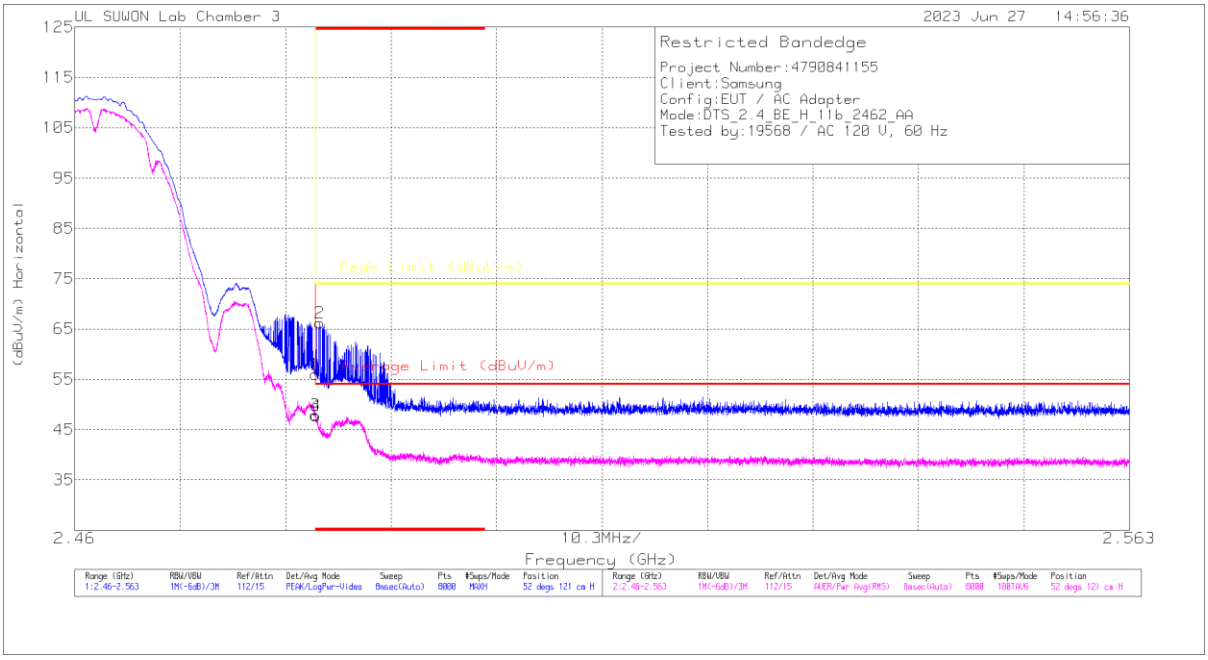
10.1. TRANSMITTER ABOVE 1 GHz

10.1.1. TX ABOVE 1 GHz 802.11b MODE IN THE 2.4 GHz BAND

2TX Antenna 1 + Antenna 2

BANDEDGE(WORST CASE: 11 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)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	48.63	Pk	32.4	-25	0	56.03	-	-	74	-17.97	52	121	H
2	* 2.48394	58.8	Pk	32.4	-25	0	66.2	-	-	74	-7.8	52	121	H
3	* 2.4835	40.48	RMS	32.4	-25	0	47.88	54	-6.12	-	-	52	121	H
4	* 2.48355	40.4	RMS	32.4	-25	0	47.8	54	-6.2	-	-	52	121	H

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

BANDEDGE TEST DATA

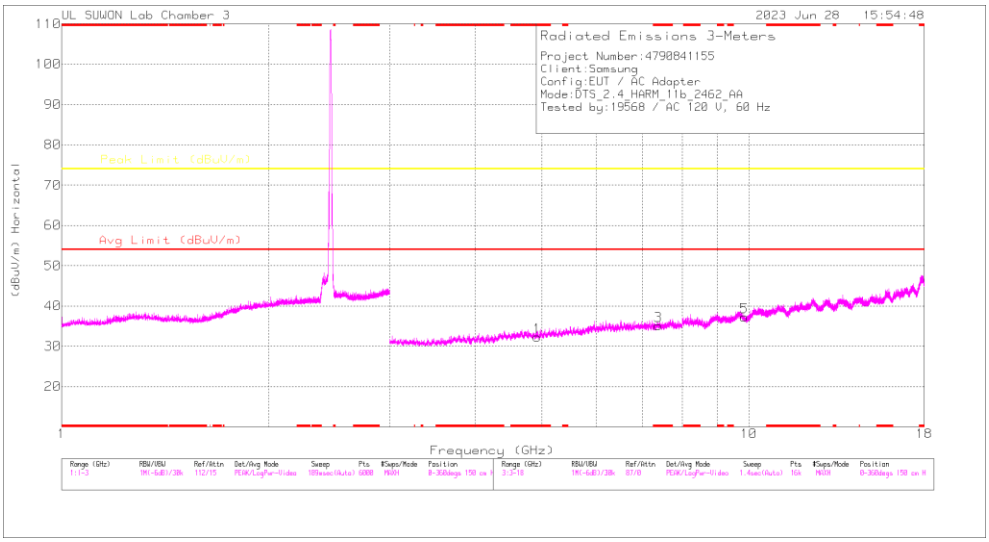
Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBuV]	Detector Mode	ANT Factor	Loss [dB]	DC Corr [dB]	Result [dBuV/m]	AV Limit [dBuV/m]	AV Margin [dB]	PK Limit [dBuV/m]	PK Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity
2412	MIMO	* 2.39	49.02	Pk	32.10	-25.10	0.00	56.02	-	-	74.00	-17.98	58	105	H
		* 2.38993	58.24	Pk	32.10	-25.10	0.00	65.24	-	-	74.00	-8.76	58	105	H
		* 2.39	38.23	RMS	32.10	-25.10	0.00	45.23	54.00	-8.77	-	-	58	105	H
		* 2.38632	40.60	RMS	32.10	-25.10	0.00	47.60	54.00	-6.40	-	-	58	105	H
		* 2.39	45.21	Pk	32.10	-25.10	0.00	52.21	-	-	74.00	-21.79	71	210	V
		* 2.38994	54.18	Pk	32.10	-25.10	0.00	61.18	-	-	74.00	-12.82	71	210	V
		* 2.39	34.88	RMS	32.10	-25.10	0.00	41.88	54.00	-12.12	-	-	71	210	V
		* 2.38942	35.51	RMS	32.10	-25.10	0.00	42.51	54.00	-11.49	-	-	71	210	V
2462	MIMO	* 2.4835	48.63	Pk	32.40	-25.00	0.00	56.03	-	-	74.00	-17.97	52	121	H
		* 2.48394	58.80	Pk	32.40	-25.00	0.00	66.20	-	-	74.00	**-7.80**	52	121	H
		* 2.4835	40.48	RMS	32.40	-25.00	0.00	47.88	54.00	**-6.12**	-	-	52	121	H
		* 2.48355	40.40	RMS	32.40	-25.00	0.00	47.80	54.00	-6.20	-	-	52	121	H
		* 2.4835	43.71	Pk	32.40	-25.00	0.00	51.11	-	-	74.00	-22.89	69	226	V
		* 2.48358	54.74	Pk	32.40	-25.00	0.00	62.14	-	-	74.00	-11.86	69	226	V
		* 2.4835	35.46	RMS	32.40	-25.00	0.00	42.86	54.00	-11.14	-	-	69	226	V
		* 2.48363	35.63	RMS	32.40	-25.00	0.00	43.03	54.00	-10.97	-	-	69	226	V
2467	MIMO	* 2.4835	43.54	Pk	32.40	-25.00	0.00	50.94	-	-	74.00	-23.06	55	103	H
		* 2.48581	46.74	Pk	32.40	-25.00	0.00	54.14	-	-	74.00	-19.86	55	103	H
		* 2.4835	33.78	RMS	32.40	-25.00	0.00	41.18	54.00	-12.82	-	-	55	103	H
		* 2.48409	35.00	RMS	32.40	-25.00	0.00	42.40	54.00	-11.60	-	-	55	103	H
		* 2.4835	43.31	Pk	32.40	-25.00	0.00	50.71	-	-	74.00	-23.29	69	222	V
		* 2.48582	44.85	Pk	32.40	-25.00	0.00	52.25	-	-	74.00	-21.75	69	222	V
		* 2.4835	32.42	RMS	32.40	-25.00	0.00	39.82	54.00	-14.18	-	-	69	222	V
		* 2.48417	33.87	RMS	32.40	-25.00	0.00	41.27	54.00	-12.73	-	-	69	222	V
2472	MIMO	* 2.4835	42.67	Pk	32.40	-25.00	0.00	50.07	-	-	74.00	-23.93	52	101	H
		* 2.49271	45.51	Pk	32.40	-25.00	0.00	52.91	-	-	74.00	-21.09	52	101	H
		* 2.4835	32.75	RMS	32.40	-25.00	0.00	40.15	54.00	-13.85	-	-	52	100	H
		* 2.48534	33.96	RMS	32.40	-25.00	0.00	41.36	54.00	-12.64	-	-	52	100	H
		* 2.4835	42.15	Pk	32.40	-25.00	0.00	49.55	-	-	74.00	-24.45	96	222	V
		* 2.48545	44.71	Pk	32.40	-25.00	0.00	52.11	-	-	74.00	-21.89	96	222	V
		* 2.4835	32.49	RMS	32.40	-25.00	0.00	39.89	54.00	-14.11	-	-	96	222	V
		* 2.48574	33.18	RMS	32.40	-25.00	0.00	40.58	54.00	-13.42	-	-	96	222	V

Note1. Pk - Peak detector, RMS - RMS detectior
Note2. * - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

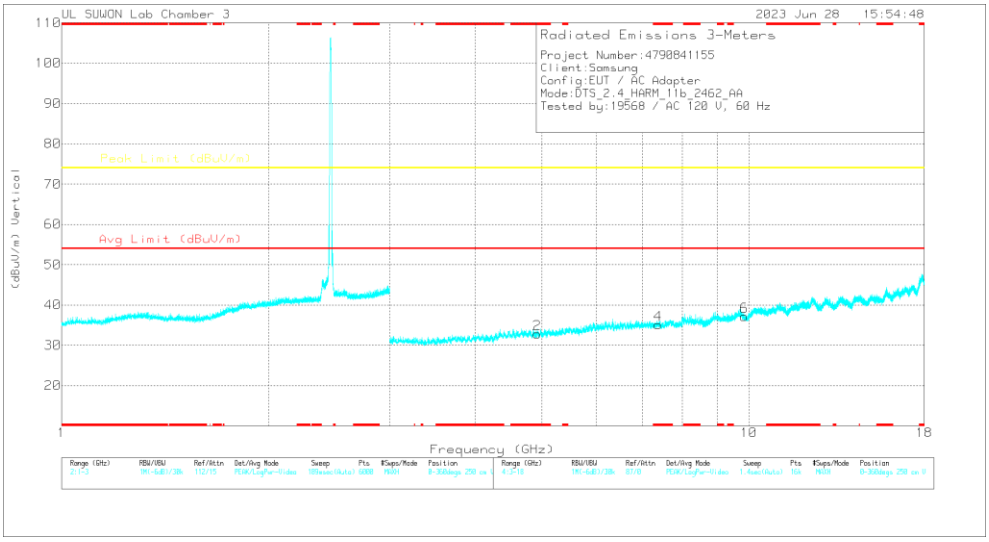
UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

HARMONICS AND SPURIOUS EMISSIONS(WORST CASE: 11 CHANNEL)

CH 11 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_0021895 7	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
* 4.9239	40.36	PK2	34.2	-30.9	0	43.66	-	-	74	-30.34	112	119	H
* 4.9239	29.88	MAv1	34.2	-30.9	0	33.18	54	-20.82	-	-	112	119	H
* 4.92284	40.17	PK2	34.2	-30.9	0	43.47	-	-	74	-30.53	87	285	V
* 4.92405	29.02	MAv1	34.2	-30.9	0	32.32	54	-21.68	-	-	87	285	V
* 7.38128	34.11	PK2	35.7	-24.9	0	44.91	-	-	74	-29.09	0	100	H
* 7.38631	34.35	PK2	35.7	-24.8	0	45.25	-	-	74	-28.75	0	100	V
9.85457	31.74	PK2	37.1	-21.4	0	47.44	-	-	74	-26.56	0	100	H
9.85002	31.6	PK2	37.1	-21.3	0	47.4	-	-	74	-26.6	0	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

HARMONICS AND SPURIOUS EMISSIONS TEST DATA

Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBuV]	Detector Mode	ANT Factor	Loss [dB]	DC Corr [dB]	Result [dBuV/m]	AV Limit [dBuV/m]	AV Margin [dB]	PK Limit [dBuV/m]	PK Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity
2412	MIMO	* 4.82383	39.62	PK2	34.30	-30.20	0.00	43.72	-	-	74.00	-30.28	111	117	H
		* 4.82402	28.99	MAv1	34.30	-30.20	0.00	33.09	54.00	-20.91	-	-	111	117	H
		* 4.82454	39.03	PK2	34.30	-30.20	0.00	43.13	-	-	74.00	-30.87	85	267	V
		* 4.82408	28.04	MAv1	34.30	-30.20	0.00	32.14	54.00	-21.86	-	-	85	267	V
		7.241	35.61	PK2	35.80	-25.80	0.00	45.61	-	-	74.00	-28.39	0	100	H
		7.234	35.21	PK2	35.80	-25.80	0.00	45.21	-	-	74.00	-28.79	0	100	V
		9.648	32.65	PK2	36.80	-21.40	0.00	48.05	-	-	74.00	**-25.95**	74	334	H
		9.650	32.33	PK2	36.80	-21.30	0.00	47.83	-	-	74.00	-26.17	86	103	V
2437	MIMO	* 4.87383	39.71	PK2	34.20	-30.80	0.00	43.11	-	-	74.00	-30.89	114	120	H
		* 4.87388	29.13	MAv1	34.20	-30.80	0.00	32.53	54.00	-21.47	-	-	114	120	H
		* 4.87268	40.11	PK2	34.20	-30.80	0.00	43.51	-	-	74.00	-30.49	88	278	V
		* 4.87378	28.91	MAv1	34.20	-30.80	0.00	32.31	54.00	-21.69	-	-	88	278	V
		* 7.31128	34.91	PK2	35.80	-25.50	0.00	45.21	-	-	74.00	-28.79	0	100	H
		* 7.30966	35.35	PK2	35.80	-25.50	0.00	45.65	-	-	74.00	-28.35	0	100	V
		9.748	31.56	PK2	36.90	-21.20	0.00	47.26	-	-	74.00	-26.74	57	241	H
		9.748	32.34	PK2	36.90	-21.20	0.00	48.04	-	-	74.00	-25.96	350	296	V
2462	MIMO	* 4.9239	40.36	PK2	34.20	-30.90	0.00	43.66	-	-	74.00	-30.34	112	119	H
		* 4.9239	29.88	MAv1	34.20	-30.90	0.00	33.18	54.00	**-20.82**	-	-	112	119	H
		* 4.92284	40.17	PK2	34.20	-30.90	0.00	43.47	-	-	74.00	-30.53	87	285	V
		* 4.92405	29.02	MAv1	34.20	-30.90	0.00	32.32	54.00	-21.68	-	-	87	285	V
		* 7.38128	34.11	PK2	35.70	-24.90	0.00	44.91	-	-	74.00	-29.09	0	100	H
		* 7.38631	34.35	PK2	35.70	-24.80	0.00	45.25	-	-	74.00	-28.75	0	100	V
		9.855	31.74	PK2	37.10	-21.40	0.00	47.44	-	-	74.00	-26.56	0	100	H
		9.850	31.60	PK2	37.10	-21.30	0.00	47.40	-	-	74.00	-26.60	0	100	V

Note1. PK2 - KDB558074 Method: Maximum Peak / MAv1 - KDB558074 Option 1 Maximum RMS Average
Note2. * - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

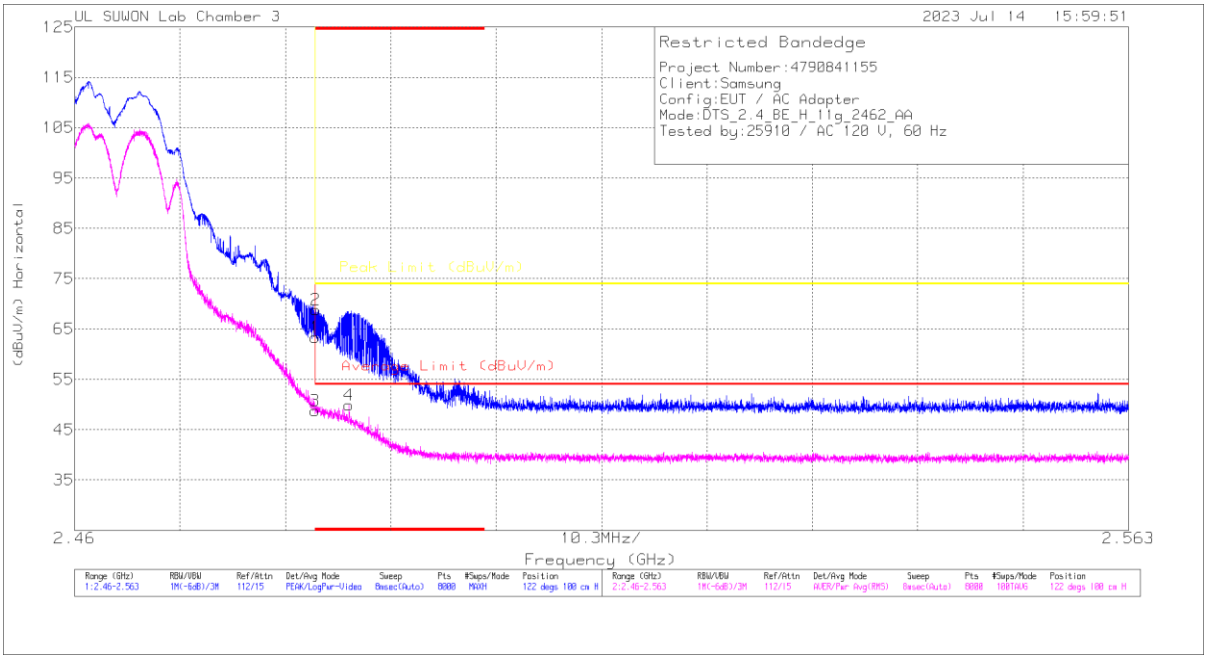
UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

10.1.2. TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND

2TX Antenna 1 + Antenna 2

BANDEDGE (WORST CASE: 11 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)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	55.94	Pk	32.4	-25	0	63.34	-	-	74	-10.66	122	100	H
2	* 2.48354	61.45	Pk	32.4	-25	0	68.85	-	-	74	-5.15	122	100	H
3	* 2.4835	41.19	RMS	32.4	-25	.16	48.75	54	-5.25	-	-	122	100	H
4	* 2.48682	42.34	RMS	32.4	-25	.16	49.9	54	-4.1	-	-	122	100	H

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

BANDEDGE TEST DATA

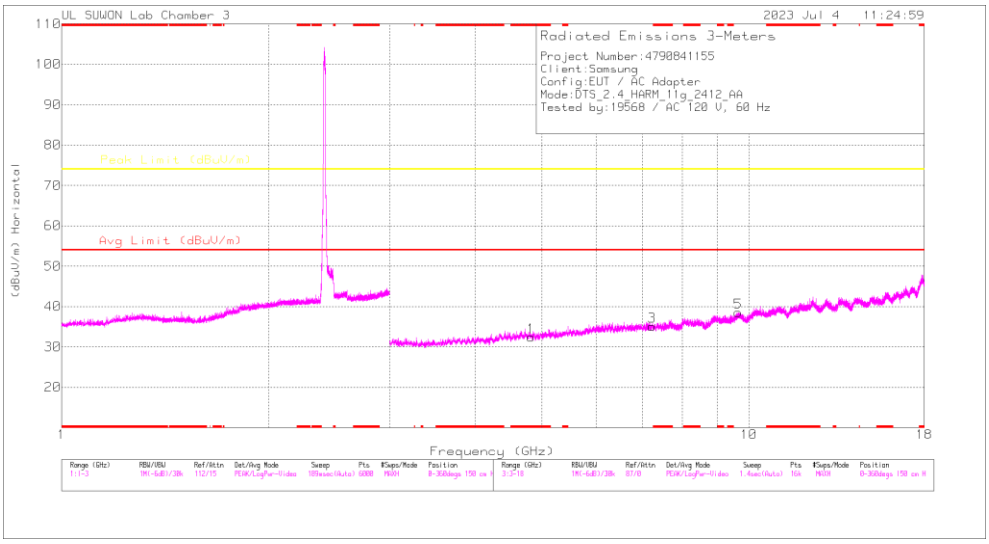
Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBuV]	Detector Mode	ANT Factor	Loss [dB]	DC Corr [dB]	Result [dBuV/m]	AV Limit [dBuV/m]	AV Margin [dB]	PK Limit [dBuV/m]	PK Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity
2412	MIMO	* 2.39	55.61	Pk	32.10	-25.10	0.00	62.61	-	-	74.00	-11.39	122	217	H
		* 2.38706	57.83	Pk	32.10	-25.10	0.00	64.83	-	-	74.00	-9.17	122	217	H
		* 2.39	41.36	RMS	32.10	-25.10	0.16	48.52	54.00	-5.48	-	-	122	217	H
		* 2.38994	42.15	RMS	32.10	-25.10	0.16	49.31	54.00	-4.69	-	-	122	217	H
		* 2.39	56.00	Pk	32.10	-25.10	0.00	63.00	-	-	74.00	-11.00	99	114	V
		* 2.38891	57.03	Pk	32.10	-25.10	0.00	64.03	-	-	74.00	-9.97	99	114	V
		* 2.39	39.56	RMS	32.10	-25.10	0.16	46.72	54.00	-7.28	-	-	99	114	V
		* 2.3899	40.80	RMS	32.10	-25.10	0.16	47.96	54.00	-6.04	-	-	99	114	V
2462	MIMO	* 2.4835	55.94	Pk	32.40	-25.00	0.00	63.34	-	-	74.00	-10.66	122	100	H
		* 2.48354	61.45	Pk	32.40	-25.00	0.00	68.85	-	-	74.00	**-5.15**	122	100	H
		* 2.4835	41.19	RMS	32.40	-25.00	0.16	48.75	54.00	-5.25	-	-	122	100	H
		* 2.48682	42.34	RMS	32.40	-25.00	0.16	49.90	54.00	**-4.10**	-	-	122	100	H
		* 2.4835	52.99	Pk	32.40	-25.00	0.00	60.39	-	-	74.00	-13.61	89	156	V
		* 2.48534	59.01	Pk	32.40	-25.00	0.00	66.41	-	-	74.00	-7.59	89	156	V
		* 2.4835	38.64	RMS	32.40	-25.00	0.16	46.20	54.00	-7.80	-	-	89	156	V
		* 2.48497	39.44	RMS	32.40	-25.00	0.16	47.00	54.00	-7.00	-	-	89	156	V
2467	MIMO	* 2.4835	52.13	Pk	32.40	-25.00	0.00	59.53	-	-	74.00	-14.47	52	100	H
		* 2.48353	52.98	Pk	32.40	-25.00	0.00	60.38	-	-	74.00	-13.62	52	100	H
		* 2.4835	37.51	RMS	32.40	-25.00	0.16	45.07	54.00	-8.93	-	-	52	100	H
		* 2.48353	38.53	RMS	32.40	-25.00	0.16	46.09	54.00	-7.91	-	-	52	100	H
		* 2.4835	54.22	Pk	32.40	-25.00	0.00	61.62	-	-	74.00	-12.38	80	157	V
		* 2.48351	54.71	Pk	32.40	-25.00	0.00	62.11	-	-	74.00	-11.89	80	157	V
		* 2.4835	39.83	RMS	32.40	-25.00	0.16	47.39	54.00	-6.61	-	-	80	157	V
		* 2.48356	39.49	RMS	32.40	-25.00	0.16	47.05	54.00	-6.95	-	-	80	157	V
2472	MIMO	* 2.4835	54.48	Pk	32.40	-25.00	0.00	61.88	-	-	74.00	-12.12	123	232	H
		* 2.48359	55.79	Pk	32.40	-25.00	0.00	63.19	-	-	74.00	-10.81	123	232	H
		* 2.4835	38.96	RMS	32.40	-25.00	0.16	46.52	54.00	-7.48	-	-	123	232	H
		* 2.48372	40.29	RMS	32.40	-25.00	0.16	47.85	54.00	-6.15	-	-	123	232	H
		* 2.4835	53.95	Pk	32.40	-25.00	0.00	61.35	-	-	74.00	-12.65	88	135	V
		* 2.48372	54.07	Pk	32.40	-25.00	0.00	61.47	-	-	74.00	-12.53	88	135	V
		* 2.4835	38.65	RMS	32.40	-25.00	0.16	46.21	54.00	-7.79	-	-	88	135	V
		* 2.48363	38.88	RMS	32.40	-25.00	0.16	46.44	54.00	-7.56	-	-	88	135	V

Note1. Pk - Peak detector, RMS - RMS detectior
Note2. * - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

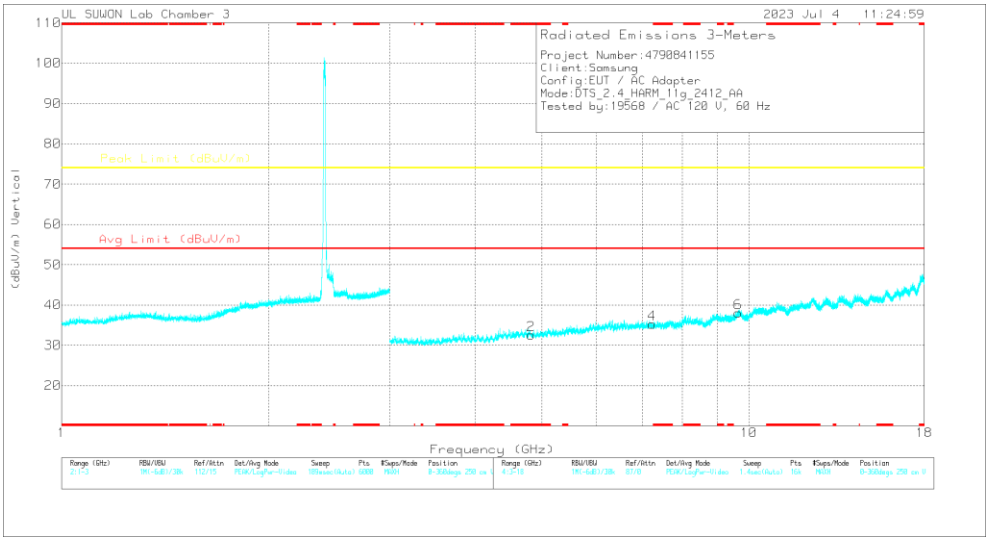
UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

HARMONICS AND SPURIOUS EMISSIONS (WORST CASE: 1 CHANNEL)

CH 1 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_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
* 4.82825	38.65	PK2	34.2	-30.3	0	42.55	-	-	74	-31.45	0	100	H
* 4.82244	39.04	PK2	34.3	-30.2	0	43.14	-	-	74	-30.86	0	100	V
7.23577	35.47	PK2	35.8	-25.8	0	45.47	-	-	74	-28.53	0	100	H
7.23486	35.05	PK2	35.8	-25.8	0	45.05	-	-	74	-28.95	0	100	V
9.64859	33.21	PK2	36.8	-21.4	0	48.61	-	-	74	-25.39	0	100	H
9.64618	32.34	PK2	36.8	-21.3	0	47.84	-	-	74	-26.16	0	100	V

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

HARMONICS AND SPURIOUS EMISSIONS TEST DATA

Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBuV]	Detector Mode	ANT Factor	Loss [dB]	DC Corr [dB]	Result [dBuV/m]	AV Limit [dBuV/m]	AV Margin [dB]	PK Limit [dBuV/m]	PK Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity
2412	MIMO	* 4.82825	38.65	PK2	34.20	-30.30	0.00	42.55	-	-	74.00	-31.45	0	100	H
		* 4.82244	39.04	PK2	34.30	-30.20	0.00	43.14	-	-	74.00	-30.86	0	100	V
		7.236	35.47	PK2	35.80	-25.80	0.00	45.47	-	-	74.00	-28.53	0	100	H
		7.235	35.05	PK2	35.80	-25.80	0.00	45.05	-	-	74.00	-28.95	0	100	V
		9.649	33.21	PK2	36.80	-21.40	0.00	48.61	-	-	74.00	**-25.39**	0	100	H
		9.646	32.34	PK2	36.80	-21.30	0.00	47.84	-	-	74.00	-26.16	0	100	V
2437	MIMO	* 4.87343	39.79	PK2	34.20	-30.80	0.00	43.19	-	-	74.00	-30.81	0	100	H
		* 4.8777	39.37	PK2	34.20	-30.80	0.00	42.77	-	-	74.00	-31.23	0	100	V
		* 7.31409	34.83	PK2	35.80	-25.50	0.00	45.13	-	-	74.00	-28.87	0	100	H
		* 7.31314	35.46	PK2	35.80	-25.50	0.00	45.76	-	-	74.00	-28.24	0	100	V
		9.748	32.51	PK2	36.90	-21.20	0.00	48.21	-	-	74.00	-25.79	0	100	H
		9.745	32.12	PK2	36.90	-21.20	0.00	47.82	-	-	74.00	-26.18	0	100	V
2462	MIMO	* 4.92032	39.78	PK2	34.20	-31.00	0.00	42.98	-	-	74.00	-31.02	0	100	H
		* 4.92263	39.69	PK2	34.20	-30.90	0.00	42.99	-	-	74.00	-31.01	0	100	V
		* 7.37926	34.68	PK2	35.70	-24.90	0.00	45.48	-	-	74.00	-28.52	0	100	H
		* 7.38575	34.61	PK2	35.70	-24.80	0.00	45.51	-	-	74.00	-28.49	0	100	V
		9.855	31.31	PK2	37.10	-21.30	0.00	47.11	-	-	74.00	-26.89	0	100	H
		9.844	31.73	PK2	37.10	-21.30	0.00	47.53	-	-	74.00	-26.47	0	100	V

Note1. PK2 - KDB558074 Method: Maximum Peak / MAv1 - KDB558074 Option 1 Maximum RMS Average
Note2. * - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

UL KOREA LTD. Suwon Laboratory FORM ID: FCC_15C(05)
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433