



CERTIFICATION TEST REPORT

Report Number. : 4790047196-E3V2

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

Model : SM-G780G/DSM, SM-G780G/DS, SM-G780G

FCC ID : A3LSMG780G1

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

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

Date Of Issue:
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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2021-08-18	Initial issue	Dexter(Hyunsik) Yun
V2	2021-08-24	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 Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, WPT and NFC

MODEL NUMBER: SM-G780G/DSM, SM-G780G/DS, SM-G780G

SERIAL NUMBER: R38R301JNJM, R38R301JPNJ (CONDUCTED);
R38R301JN8P, R38R301JPWD, R38R301JR3B, R38R301JQRJ (RADIATED);

DATE TESTED: 2021-07-26 ~ 2021-08-18;

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:



Junwhan Lee
Suwon Lab Engineer
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Tested By:



Dexter(Hyunsik) Yun
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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	
<input checked="" type="checkbox"/>	Chamber 1
<input checked="" type="checkbox"/>	Chamber 2
<input checked="" type="checkbox"/>	Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

4. 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:

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

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	3.01 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.26 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.90 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.49 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 115:2007.

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

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

This report covers the Samsung models SM-G780G/DSM, SM-G780G/DS and SM-G780G. These models are identical in hardware except SM-G780G/DSM is supported MST and SMG780G/DS has dual SIM tray and SM-G780G has single SIM tray. All series model was same hardware thus, SM-G780G/DS (Dual SIM tray) was set for final test.

WiFi operating mode

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

Simultaneous TX Condition

Simultaneous Tx Condition - RSDB

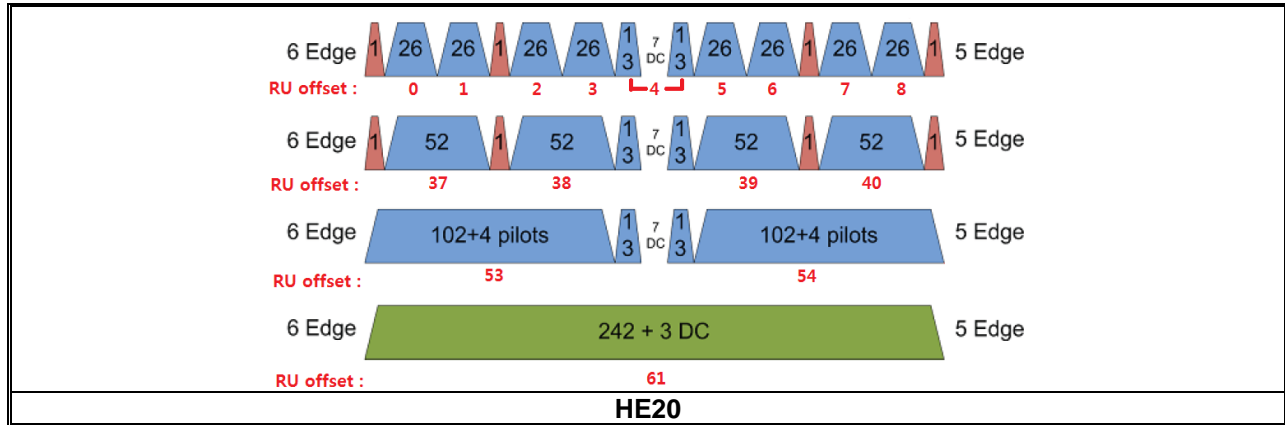
Mode	# of TX	5GHz WLAN		2.4GHz WLAN		Test Case
		ANT1	ANT2	ANT1	ANT2	
2.4GHz + 5GHz RSDB MIMO	4	0	0	0	0	0

Note. Please refer to the report "4790047196-E6 FCC Report UNII(a,n,ac,ax) WLAN"

Simultaneous Tx Condition - RSDB + Bluetooth

Mode	# of TX	5GHz WLAN		2.4GHz Bluetooth	2.4GHz WLAN	Test Case
		ANT1	ANT2	ANT1	ANT2	
2.4GHz + 5GHz MIMO RSDB & Bluetooth	4	0	0	0	0	0

802.11ax RU allocations



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 <small>Note 1</small>	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	18.59		72.28	
	802.11g MIMO	20.23		105.44	
	802.11n(HT20) MIMO	19.95		98.86	
	802.11ax(HE20) MIMO	20.23		105.44	

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

**The internal antenna was Permanently attached.
 Therefore this E.U.T Complies with the requirement of §15.203.**

The radio utilizes an internal antennas, with Antenna 1's maximum gain of -4.12 dBi and Antenna 2's maximum gain of -8.30 dBi

"Ant1" and "Ant2" as indicated in antenna specification are written as ANT1 and ANT2 in this report.

5.4. TESTED CHANNELS LIST

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

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 condition

ANT1	ANT2	ANT ALL
Axis	Axis	Axis
Y	X	X

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.

Depending on spot-check results for 802.11b / g / n HT20, MIMO mode is worst case than SISO(Antenna1 and Antenna 2). So radiation test for 802.11b / g / n HT20 were evaluated at MIMO mode.

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

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

SISO Target[dBm]						MIMO Target[dBm]					
Ch.	Freq.	802.11b	802.11g	802.11n HT20	802.11ax HE20(SU)	Ch.	Freq.	802.11b	802.11g	802.11n HT20	802.11ax HE20(SU)
1	2412	17	17	17	17	1	2412	18	20	20	20
6	2437	17	17	17	17	6	2437	18	20	20	20
11	2462	17	17	17	17	11	2462	18	20	20	20
12	2467	8	8	8	8	12	2467	11	11	11	11
13	2472	2	2	2	2	13	2472	5	5	5	5

 Band-Edge & Spurious Emission
 Band-Edge

Note1. The target power of 12 and 13 channel is lower than 11 channel in 802.11ax HE20(RU) mode, So radiated emissions test of 12 and 13 channel was excluded.

Note2. In 11ax RU mode, MIMO target power is higher than SISO(+3 dB), therefore radiated emissions test was performed in worst case MIMO mode.

Note3. In 802.11ax(RU mode), 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]				
Ch.	Freq.	Tone	RU offset	Test Case
1	2412	26 T	0	-
			4	-
			8	O
6	2437		0	O
			4	-
			8	-
11	2462		0	O
			4	-
			8	-

Note. In 802.11ax HE20(RU) mode, the test case according to RU offset was selected from the offset with worst average power.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA200	R37M194G2J1SE3	N/A
Data Cable	SAMSUNG	EP-DR140AWE	N/A	N/A

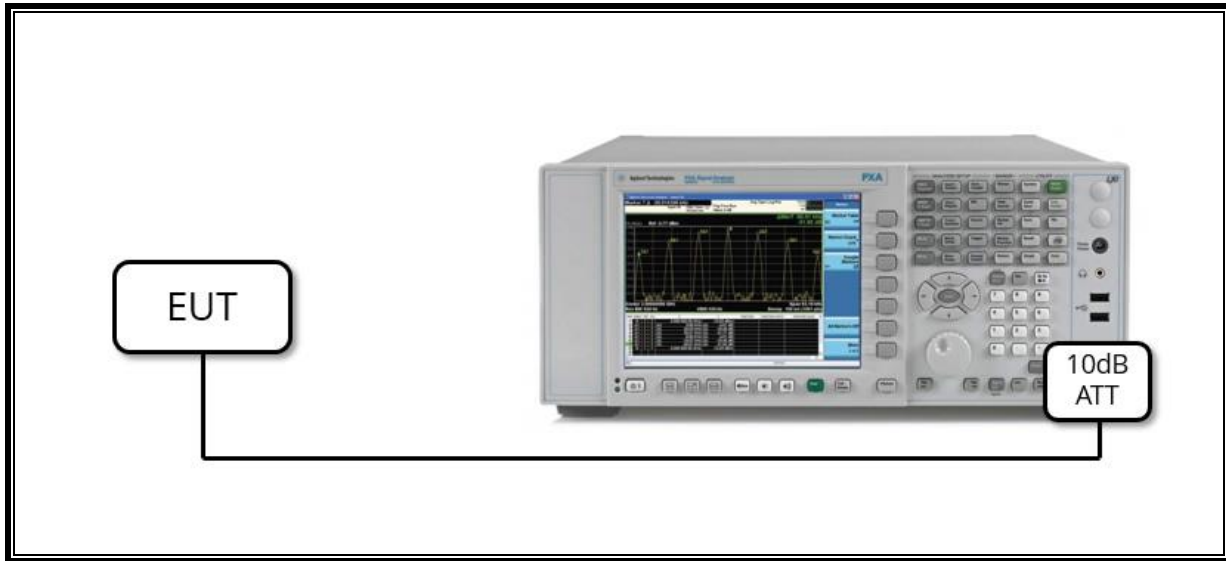
I/O CABLE

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	0.7 m	N/A

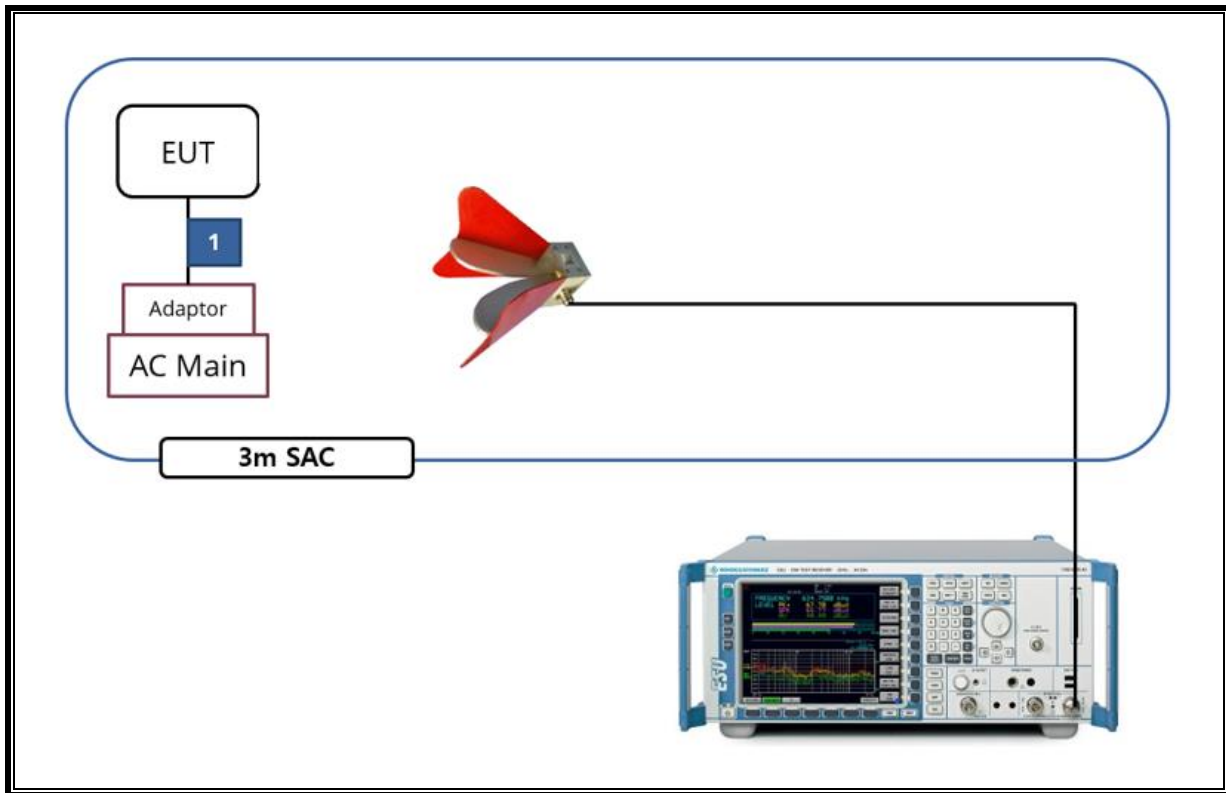
TEST SETUP

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 : KDB 558074 D01 v05r02, Section 8.2

OUTPUT POWER : KDB 558074 D01 v05r02, Section 8.3.2.3.

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

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

Out-of-band EMISSIONS IN NON-RESTRICTED BANDS: KDB 558074 D01 v05r02, Section 8.5.

Out-of-band EMISSIONS IN RESTRICTED BANDS KDB 558074 D01 v05r02, Section 8.6.

AC Power Line Conducted Emission : ANSI C63.10-2013, Section 6.2.

7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	2022/08/19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2022/08/13
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	2022/08/13
Antenna, Horn, 18 GHz	ETS	3115	00167211	2022/07/27
Antenna, Horn, 18 GHz	ETS	3115	00161451	2022/08/15
Antenna, Horn, 18 GHz	ETS	3117	00168724	2022/07/27
Antenna, Horn, 18 GHz	ETS	3117	00168717	2022/08/15
Antenna, Horn, 40 GHz	ETS	3116C	00166155	2022/08/04
Antenna, Horn, 40 GHz	ETS	3116C	00168645	2021/10/02
Preamplifier	ETS	3116C-PA	00168841	2022/08/04
Preamplifier, 1000 MHz	Sonoma	310N	341282	2022/08/02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2022/08/02
Preamplifier, 1000 MHz	Sonoma	310N	370599	2022/08/02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	2022/08/02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	2022/08/02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029168	2022/08/02
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	2022/08/04
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	2022/08/04
Average Power Sensor	Agilent / HP	U2000	MY54270007	2022/08/04
Average Power Sensor	Agilent / HP	U2000	MY54260010	2022/08/04
Attenuator	PASTERNAK	PE7087-10	A001	2022/08/03
Attenuator	PASTERNAK	PE7087-10	A008	2022/08/03
Attenuator	PASTERNAK	PE7004-10	2	2022/08/02
Attenuator	PASTERNAK	PE7087-10	A009	2022/08/03
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2022/08/02
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2022/08/02
EMI Test Receive, 3 GHz	R&S	ESR3	101832	2022/08/02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	2022/08/02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	2022/08/02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	019	2022/08/02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	2022/08/02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	2022/08/02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	2022/08/02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	2022/08/02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	2022/08/02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	020	2022/08/02
LISN	R&S	ENV-216	101837	2022/08/05
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2021/10/02
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	PASS
2.1051, 15.247(d)	Band Edge / Conducted Spurious Emission	-30 dBc		PASS
15.247 (b)(3)	TX conducted output power	< 30 dBm		PASS
15.247(e)	PSD	< 8 dBm/3kHz		PASS
15.207(a)	AC Power Line conducted emissions	Section 11	Power Line conducted	PASS
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m(Av)	Radiated	PASS

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

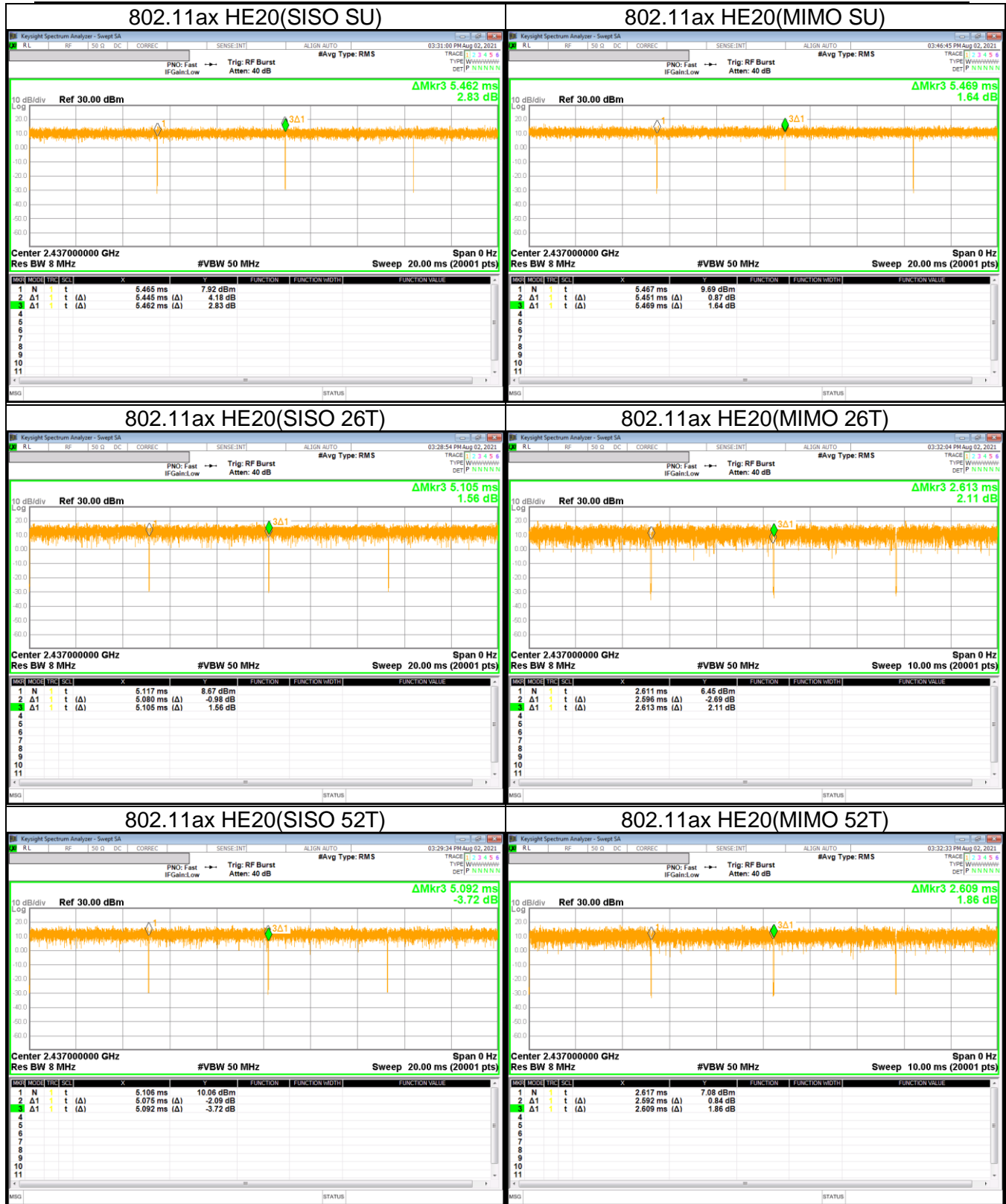
LIMITS

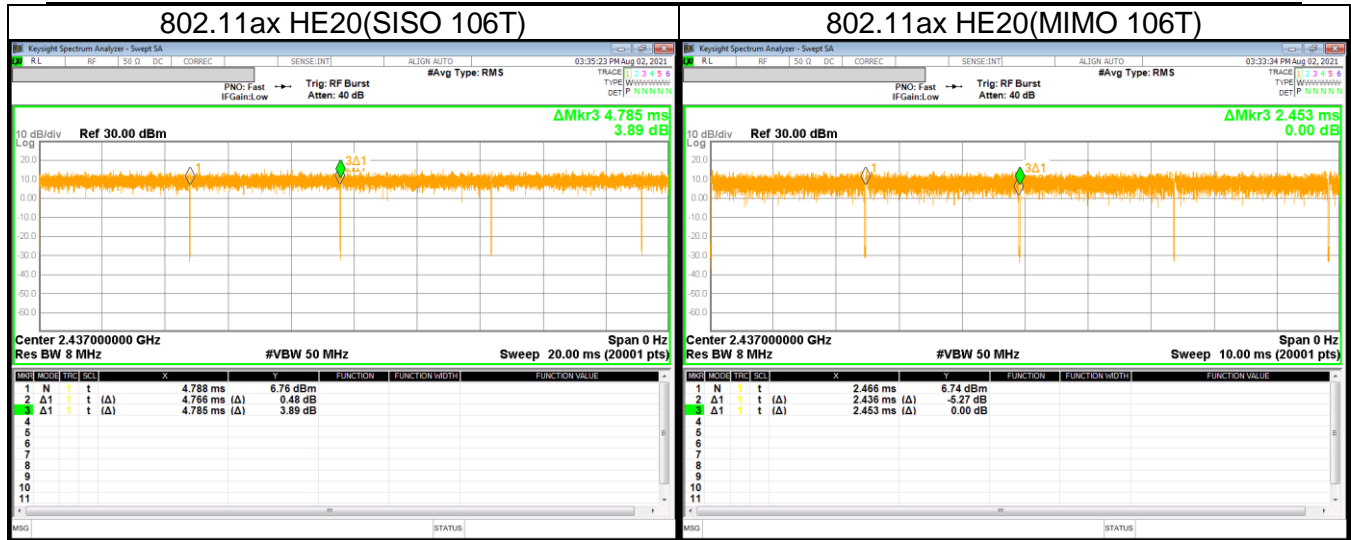
None; for reporting purposes only.

Mode	On Time [ms]	Period [ms]	Duty Cycle X [Linear]	Duty Cycle X [%]	Duty Cycle Correction Factor[dB]	1/T Minimum VBW[kHz]
802.11b MIMO	8.815	8.829	0.998	99.841	-	0.113
802.11g MIMO	1.463	1.482	0.987	98.718	-	0.684
802.11n(HT20) MIMO	5.426	5.445	0.997	99.651	-	0.184
802.11ax(HE20) SISO SU	5.445	5.462	0.997	99.689	-	0.184
802.11ax(HE20) MIMO SU	5.451	5.469	0.997	99.671	-	0.183
802.11ax(HE20) SISO 26T	5.080	5.105	0.995	99.510	-	0.197
802.11ax(HE20) MIMO 26T	2.596	2.613	0.993	99.349	-	0.385
802.11ax(HE20) SISO 52T	5.075	5.092	0.997	99.666	-	0.197
802.11ax(HE20) MIMO 52T	2.592	2.609	0.993	99.348	-	0.386
802.11ax(HE20) SISO 106T	4.766	4.785	0.996	99.603	-	0.210
802.11ax(HE20) MIMO 106T	2.436	2.453	0.993	99.307	-	0.411

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.







9.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

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

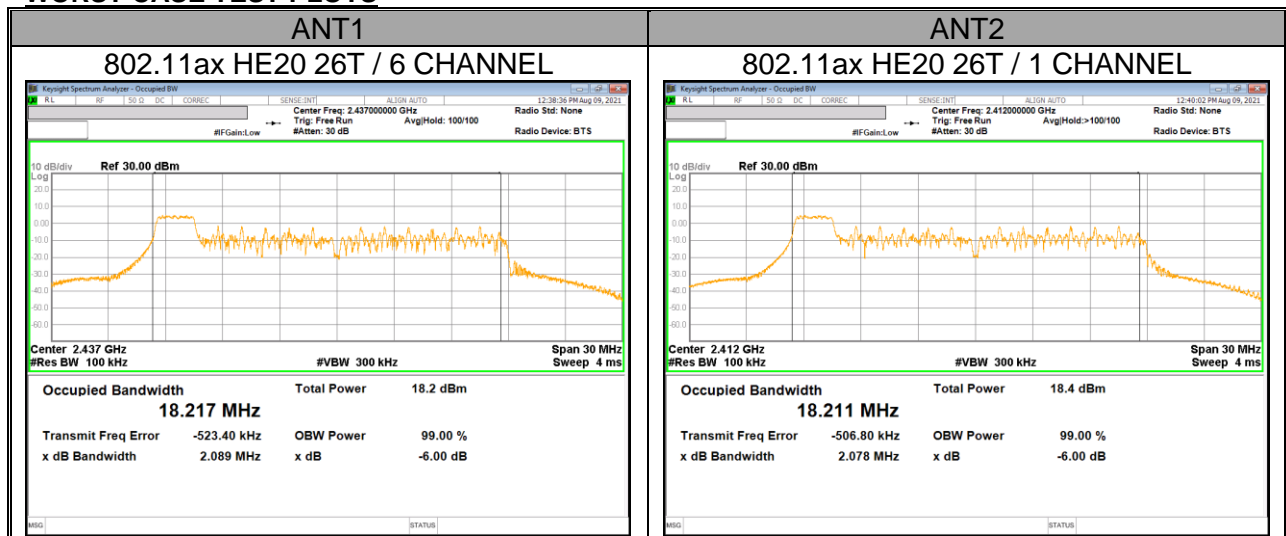
TEST PROCEDURE

Reference to KDB 558074 D01 15.247 Meas Guidance: The transmitter output is connected to a spectrum analyzer with the RBW set to 100 kHz, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

- Please refer to the next page

WORST CASE TEST PLOTS



9.2.1. 802.11b SISO MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		ANT 1	ANT 2	
1	2 412	12.580	13.010	0.5
6	2 437	13.030	13.530	
11	2 462	12.580	12.570	
12	2 467	13.050	13.060	
13	2 472	13.050	13.070	
Worst		12.580	12.570	

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	16.040	15.790	0.5
6	2 437	16.280	16.270	
11	2 462	16.000	16.030	
12	2 467	16.020	15.700	
13	2 472	16.020	15.720	
Worst		16.000	15.700	

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	16.290	16.770	0.5
6	2 437	17.000	16.790	
11	2 462	16.780	15.900	
12	2 467	16.640	16.300	
13	2 472	16.640	16.310	
Worst		16.290	15.900	

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	17.030	2.078	0.5
6	2 437	2.089	2.095	
11	2 462	2.093	2.089	
Worst		2.089	2.078	

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	-4.12	-8.30	-2.95

9.3.1. TEST RESULTS

Included in Calculations of Corr'd Power			
Duty Cycle CF	802.11b	-	dB
	802.11g	-	dB
	802.11n HT20	-	dB
	802.11ax(HE20) SU	-	dB
	802.11ax(HE20) 26T	-	dB
	802.11ax(HE20) 52T	-	dB
	802.11ax(HE20) 106T	-	dB

Calculation of Output Power result

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

- 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	16.82	16.90	15.68	15.48	18.59	30.00
	6	2 437	16.71	17.34	15.36	15.77	18.58	
	11	2 462	16.84	17.04	15.08	15.29	18.20	
	12	2 467	8.77	8.88	8.63	8.33	11.49	
	13	2 472	2.52	2.41	2.52	2.34	5.44	
Worst Case			16.84	17.34	18.59			
802.11g	1	2 412	17.08	16.82	17.11	16.88	20.01	
	6	2 437	17.09	17.28	17.09	17.34	20.23	
	11	2 462	16.69	17.10	16.64	17.04	19.85	
	12	2 467	7.84	7.71	7.78	7.84	10.82	
	13	2 472	1.89	2.31	1.84	2.11	4.99	
Worst Case			17.09	17.28	20.23			
802.11n HT20	1	2 412	16.81	16.53	16.81	16.59	19.71	
	6	2 437	16.83	17.02	16.80	17.07	19.95	
	11	2 462	16.39	16.78	16.32	16.74	19.55	
	12	2 467	7.52	7.51	7.47	7.54	10.52	
	13	2 472	1.58	1.77	1.53	1.82	4.69	
Worst Case			16.83	17.02	19.95			
802.11ax HE20(SU)	1	2 412	16.46	16.41	16.43	16.41	19.43	
	6	2 437	16.52	16.99	16.45	16.99	19.74	
	11	2 462	17.07	16.60	16.98	17.45	20.23	
	12	2 467	8.26	7.47	7.10	7.51	10.32	
	13	2 472	2.07	1.71	1.19	1.71	4.47	
Worst Case			17.07	16.99	20.23			

- 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	9.71	9.86	9.65	10.02	12.85	30.00
			4	9.45	9.88	9.24	10.06	12.68	
			8	10.63	10.20	10.52	10.26	13.40	
		52T	37	11.69	11.92	11.60	12.09	14.86	
			38	11.60	12.05	11.60	12.00	14.81	
			40	12.46	12.26	12.38	12.34	15.37	
		106T	53	13.98	14.26	13.90	14.36	17.15	
			54	14.39	14.20	14.18	14.29	17.25	
6	2 437	26T	0	10.21	9.65	10.09	10.95	13.55	
			4	9.64	9.50	9.47	10.46	13.00	
			8	10.15	10.45	9.43	10.54	13.03	
		52T	37	12.06	11.73	11.96	12.93	15.48	
			38	11.77	11.41	11.81	12.49	15.17	
			40	12.01	11.87	10.92	11.95	14.48	
		106T	53	14.03	14.42	13.94	14.48	17.23	
			54	14.35	15.05	13.05	14.29	16.72	
11	2 462	26T	0	9.77	9.81	9.64	10.20	12.94	
			4	9.14	9.01	8.92	9.89	12.44	
			8	9.02	9.60	8.96	9.38	12.19	
		52T	37	11.66	12.08	11.55	12.17	14.88	
			38	11.45	12.03	11.37	11.90	14.65	
			40	11.88	11.62	10.82	11.44	14.15	
		106T	53	13.95	14.55	13.85	14.73	17.32	
			54	14.00	13.40	13.81	14.46	17.16	
12	2 467	26T	0	8.69	8.39	7.66	8.54	11.13	
			4	7.41	8.01	7.29	8.19	10.77	
			8	7.70	6.90	7.63	7.00	10.34	
		52T	37	8.58	8.24	7.50	8.39	10.98	
			38	7.92	7.64	7.00	7.63	10.34	
			40	7.70	7.04	7.62	7.12	10.39	
		106T	53	8.32	8.02	7.25	8.13	10.72	
			54	7.66	7.38	7.55	7.47	10.52	
13	2 472	26T	0	0.44	0.12	0.27	0.19	3.24	
			4	-0.28	-0.12	0.60	-0.04	3.30	
			8	-0.85	-0.65	0.11	-0.63	2.77	
		52T	37	0.33	0.07	0.26	0.26	3.27	
			38	-0.22	0.52	0.00	-0.62	2.71	
			40	-0.70	-0.65	0.36	-0.51	2.96	
		106T	53	0.07	-0.14	-0.11	-0.37	2.77	
			54	-0.45	-0.56	0.43	-0.46	3.02	
Worst Case				14.39	15.05			17.32	

9.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

RSS-247 (5.2) (b)

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

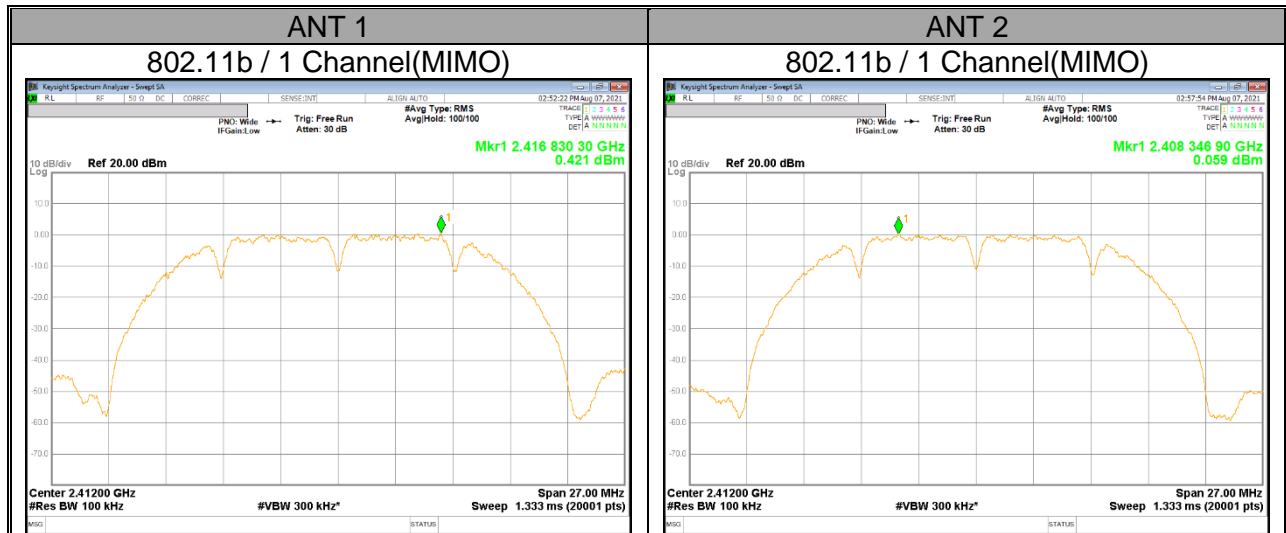
TEST PROCEDURE

Power Spectral Density was performed utilizing the section 8.4 under KDB558074 D01 15.247 Meas Guidance.

RESULTS

- Please refer to the next page

WORST CASE TEST PLOTS



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

Included in Calculations of Corr'd Power			
Duty Cycle CF	802.11b SISO	-	dB
	802.11g MIMO	-	dB
	802.11n HT20 MIMO	-	dB
	802.11ax(HE20) MIMO SU	-	dB
	802.11ax(HE20) MIMO 26T	-	dB
	802.11ax(HE20) MIMO 52T	-	dB
	802.11ax(HE20) MIMO 106T	-	dB

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

- MIMO Mode

Mode	Channel	Frequency [MHz]	Meas PSD [dBm/100kHz]		Total Corr'd PSD [dBm/100kHz]	PSD Limit [dBm/3kHz]
			ANT1	ANT2		
802.11b	1	2 412	0.421	0.059	3.254	8.00 ^{Note}
	6	2 437	0.220	-0.466	2.901	
	11	2 462	0.037	0.099	3.078	
	12	2 467	-9.395	-9.770	-6.568	
	13	2 472	-15.611	-16.573	-13.055	
802.11g	1	2 412	-1.782	-2.263	0.994	
	6	2 437	-2.006	-2.121	0.947	
	11	2 462	-1.940	-1.942	1.069	
	12	2 467	-10.712	-10.671	-7.681	
	13	2 472	-17.149	-16.698	-13.907	
802.11n HT20	1	2 412	-2.563	-3.145	0.166	
	6	2 437	-2.422	-2.578	0.511	
	11	2 462	-2.834	-2.599	0.295	
	12	2 467	-11.590	-11.810	-8.688	
	13	2 472	-18.163	-17.256	-14.676	

- MIMO Mode(802.11ax HE20)

Channel	Frequency [MHz]	Tones	RU Offset	Meas PPSD [dBm/100kHz]		Total Corr'd PPSD [dBm/100kHz]	PSD Limit [dBm/3kHz]
				ANT1	ANT2		
1	2 412	26T	0	-2.504	-2.499	0.509	8.00 ^{Note}
			4	-2.690	-2.635	0.348	
			8	-2.051	-2.225	0.873	
		SU	-	-4.832	-4.567	-1.687	
6	2 437	26T	0	-1.931	-2.777	0.677	
			4	-2.815	-2.890	0.158	
			8	-2.157	-2.011	0.927	
		SU	-	-4.740	-4.612	-1.665	
11	2 462	26T	0	-2.485	-2.241	0.649	
			4	-3.072	-3.315	-0.182	
			8	-3.357	-2.788	-0.053	
		SU	-	-5.404	-4.741	-2.050	

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

9.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

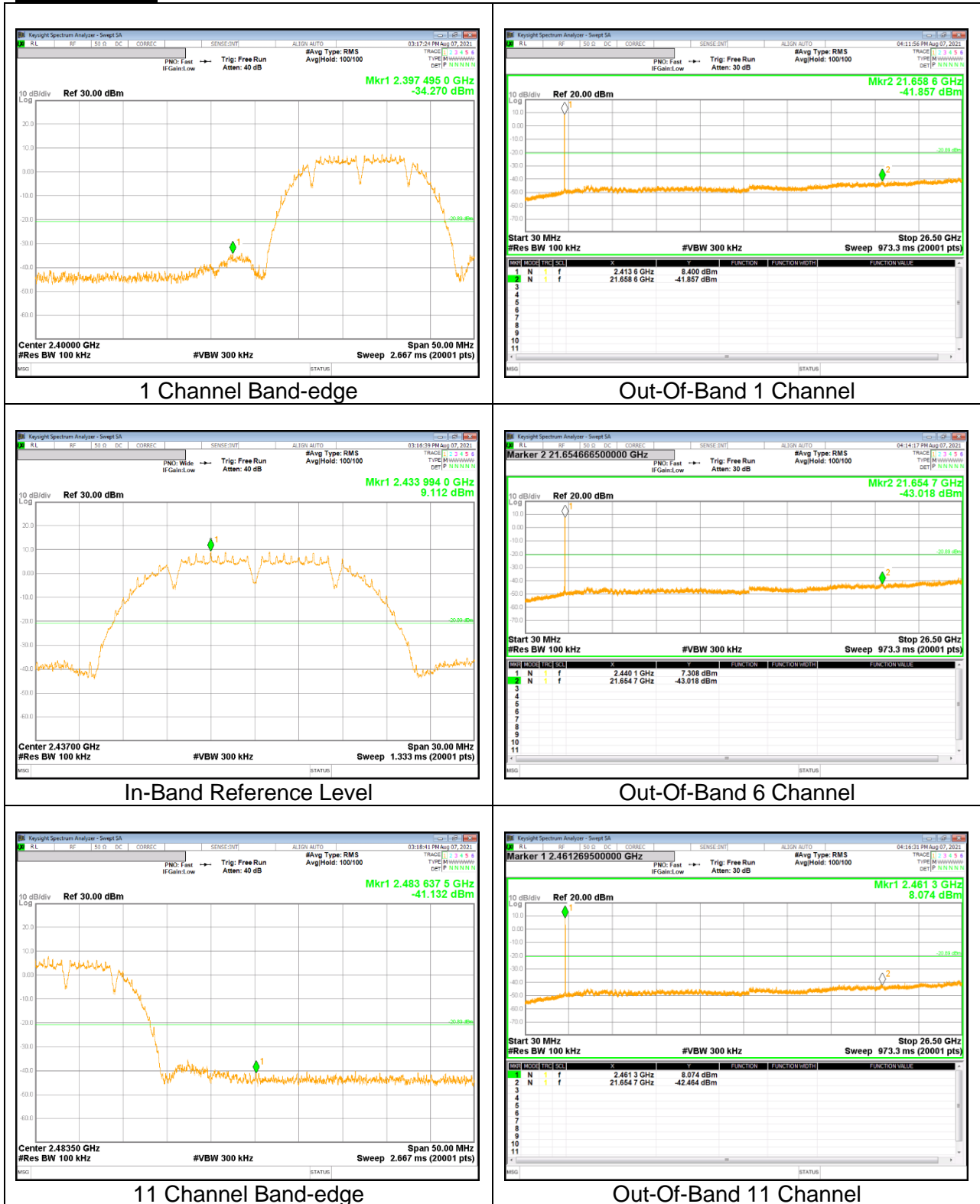
RSS-247 5.5

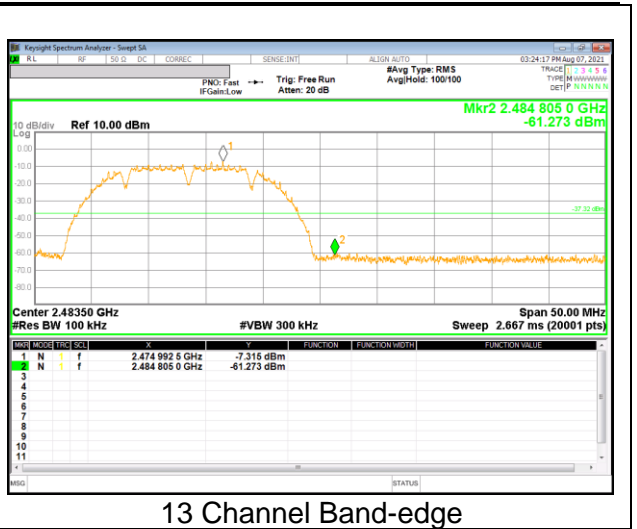
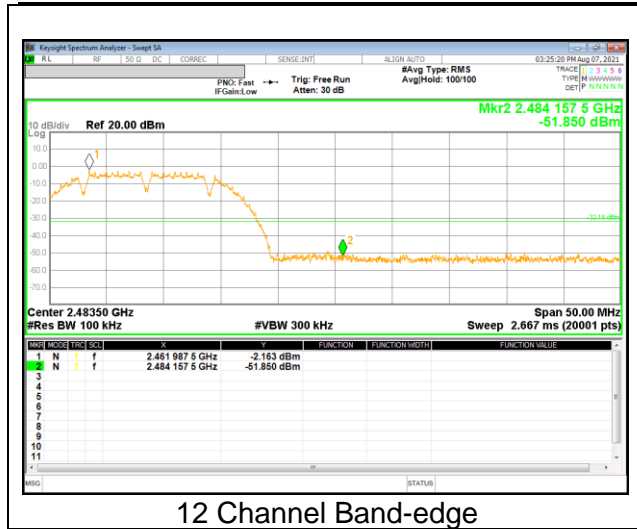
Output power was measured based on the use of average measurement, therefore the required attenuation is 30 dB.

RESULTS

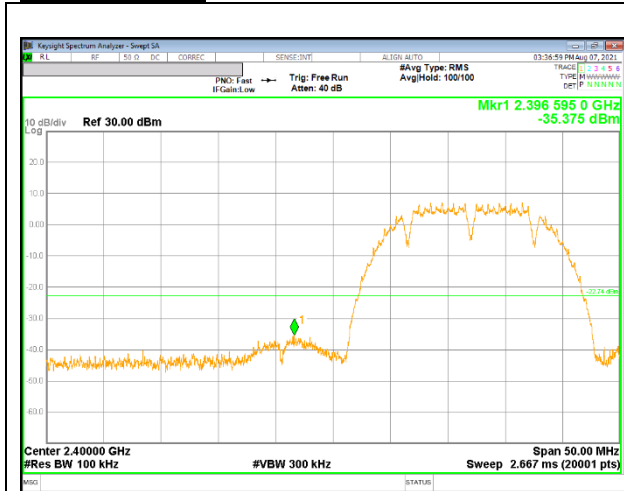
9.5.1. 802.11b MODE

2TX Antenna 1

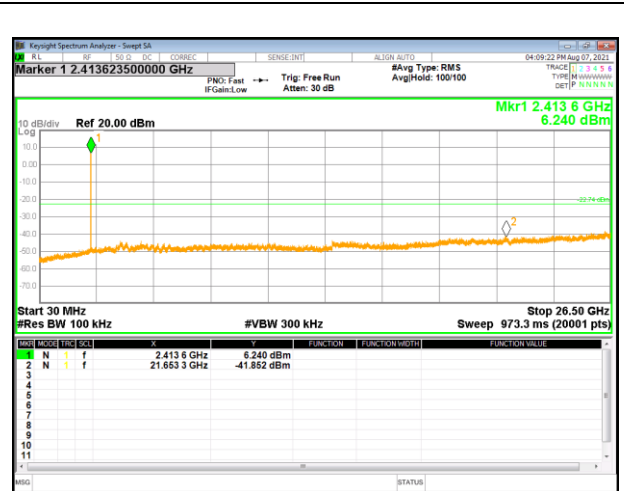




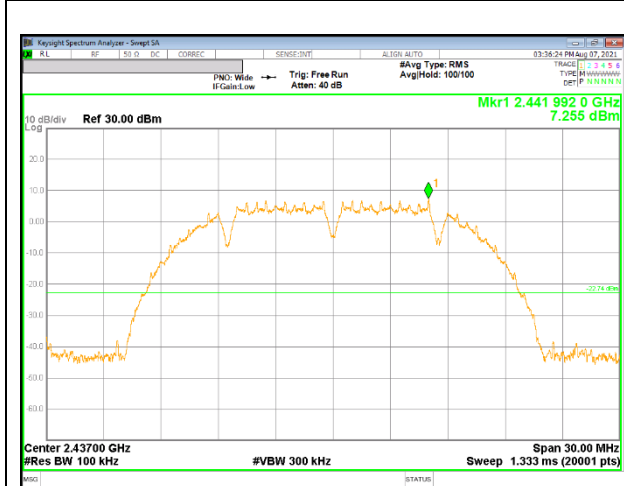
2TX Antenna 2



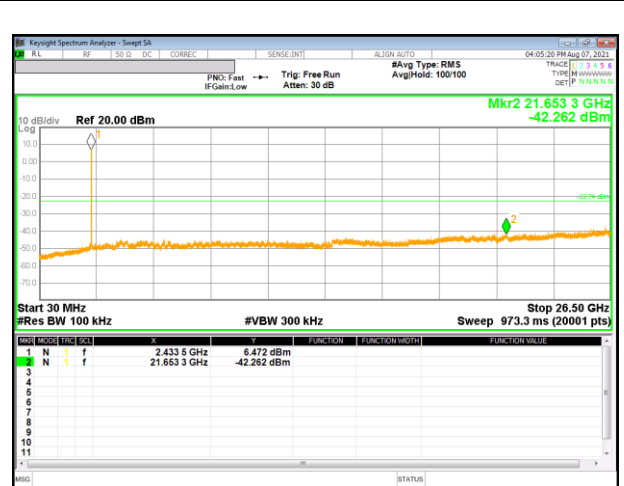
1 Channel Band-edge



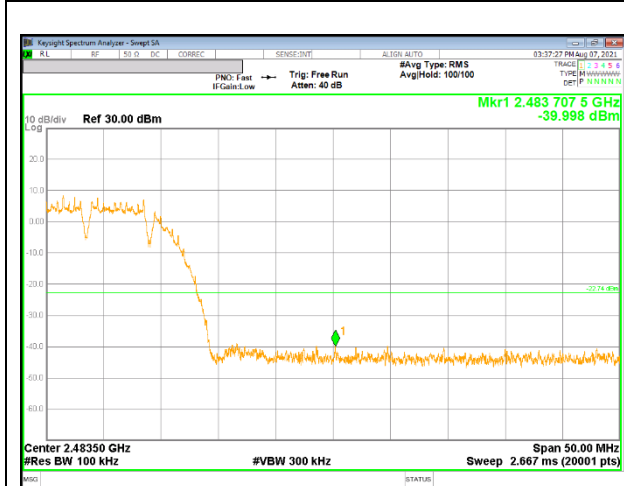
Out-Of-Band 1 Channel



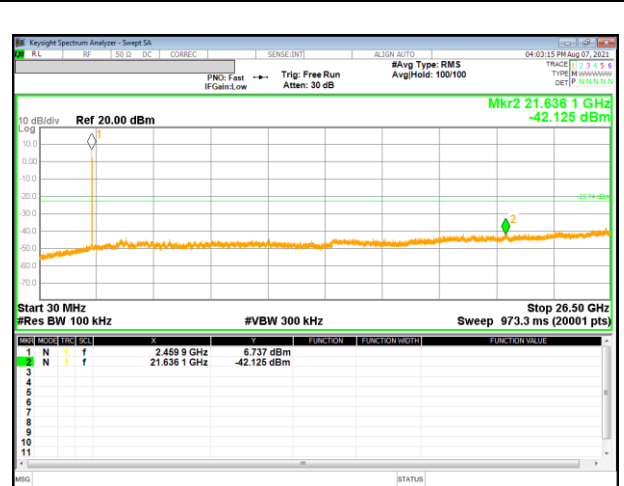
In-Band Reference Level



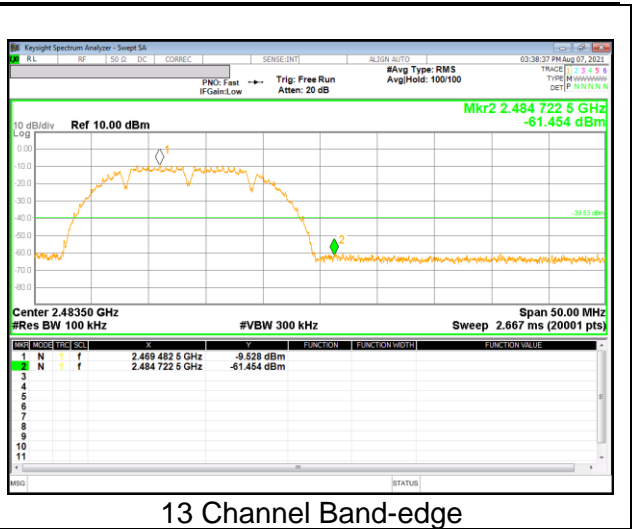
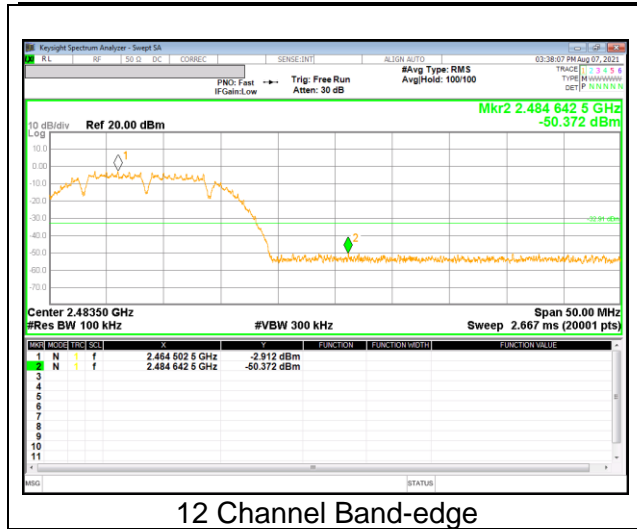
Out-Of-Band 6 Channel



11 Channel Band-edge

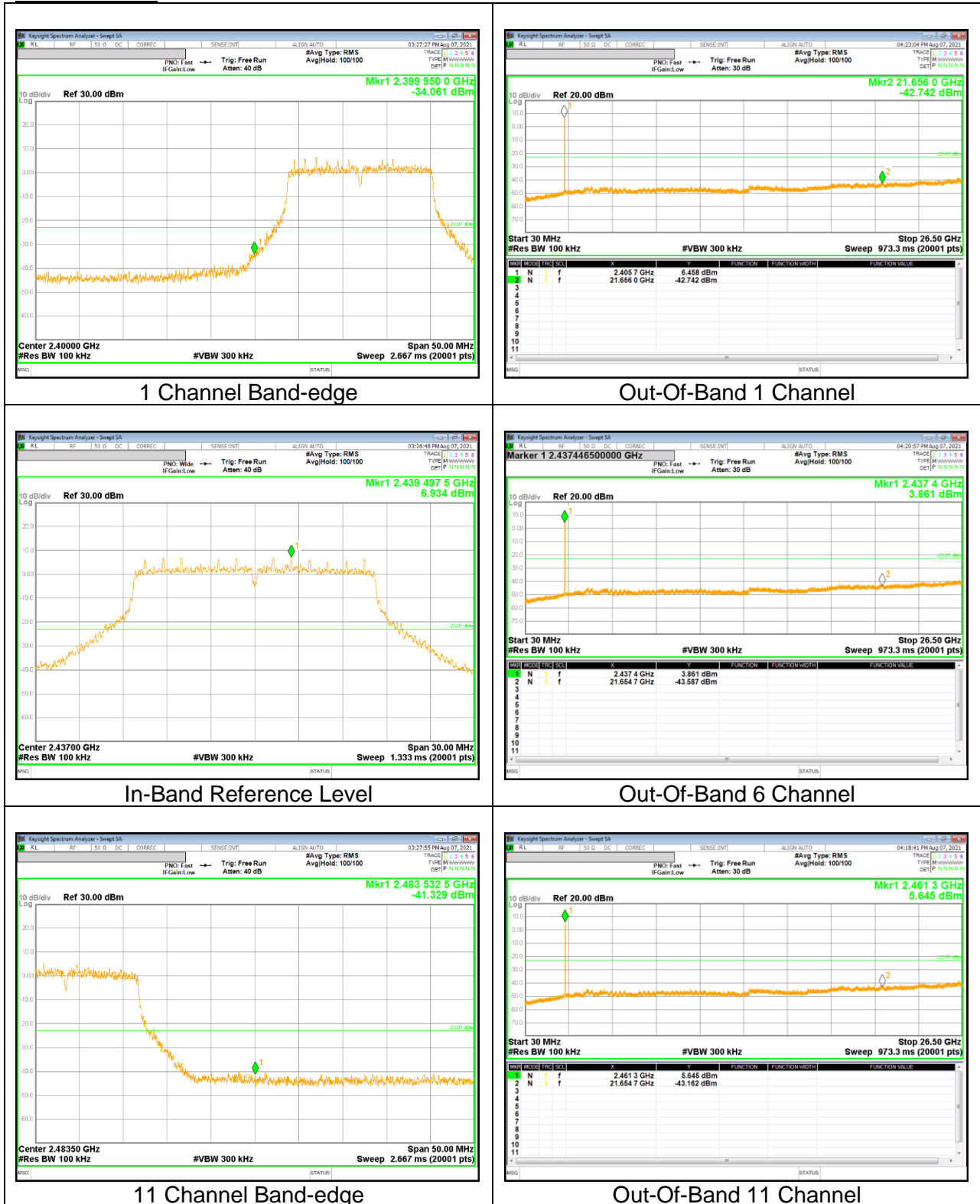


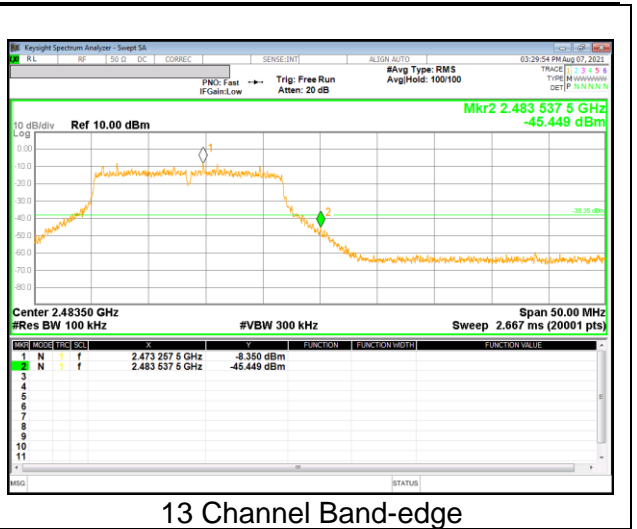
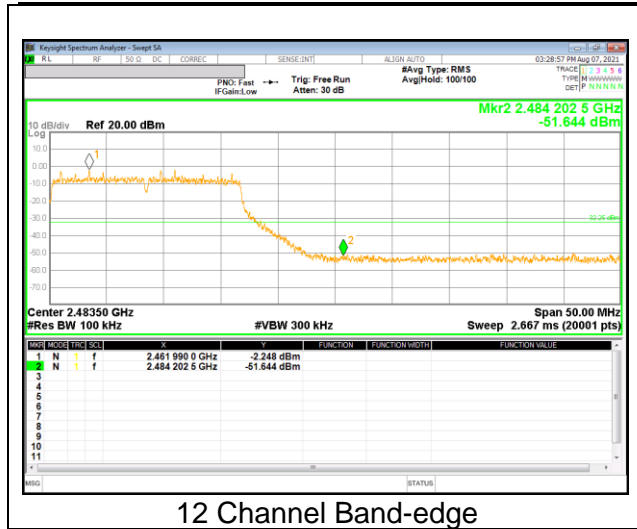
Out-Of-Band 11 Channel



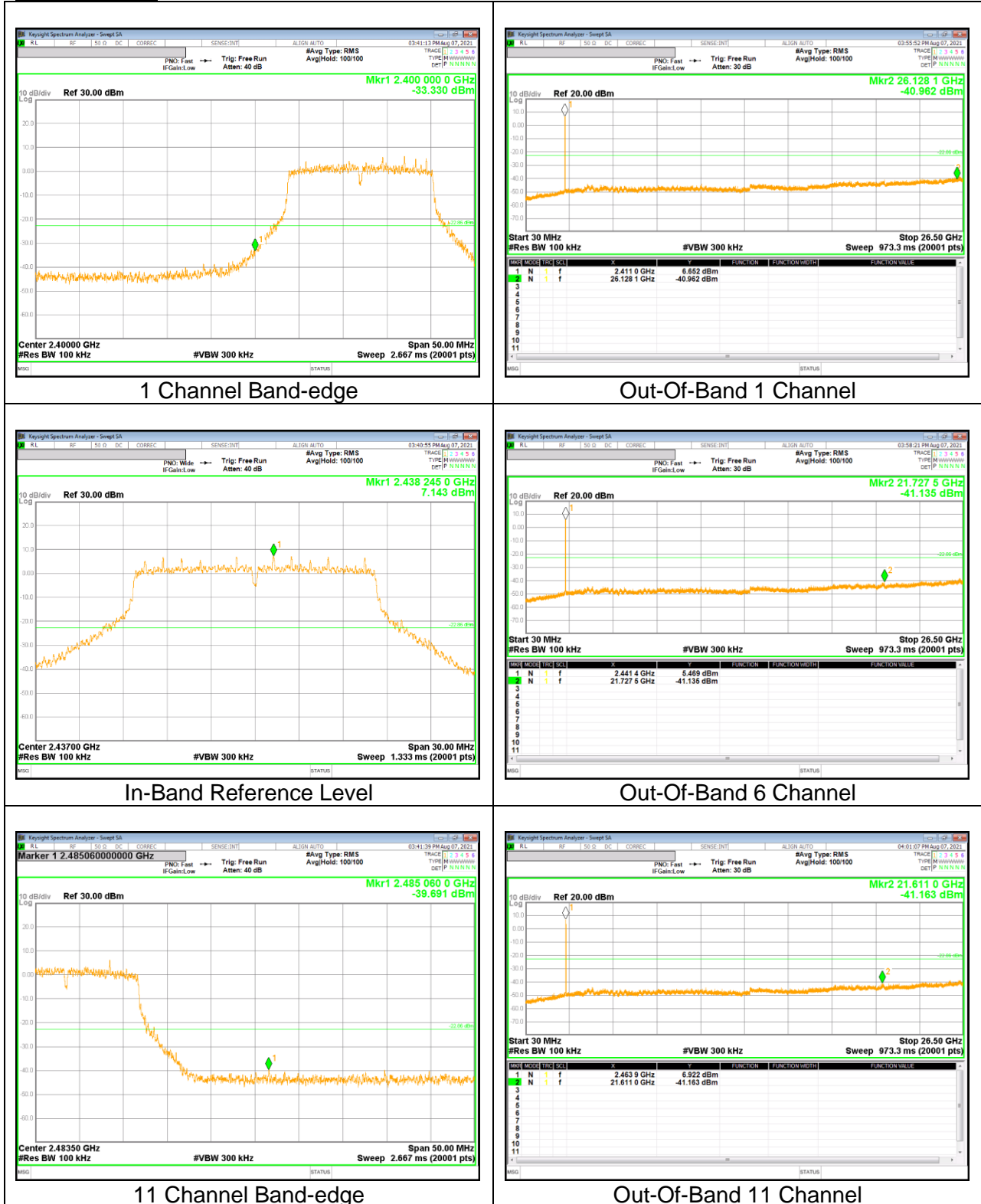
9.5.2. 802.11g MODE

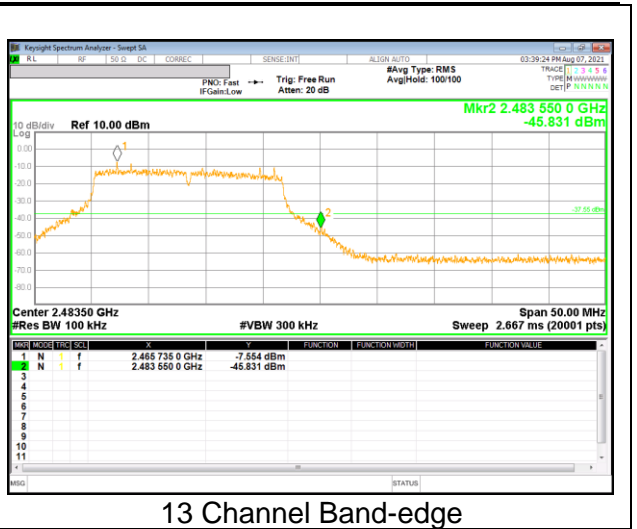
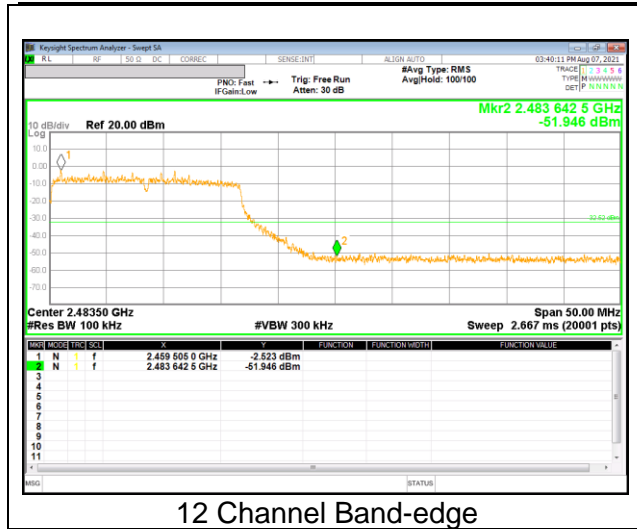
2TX Antenna 1





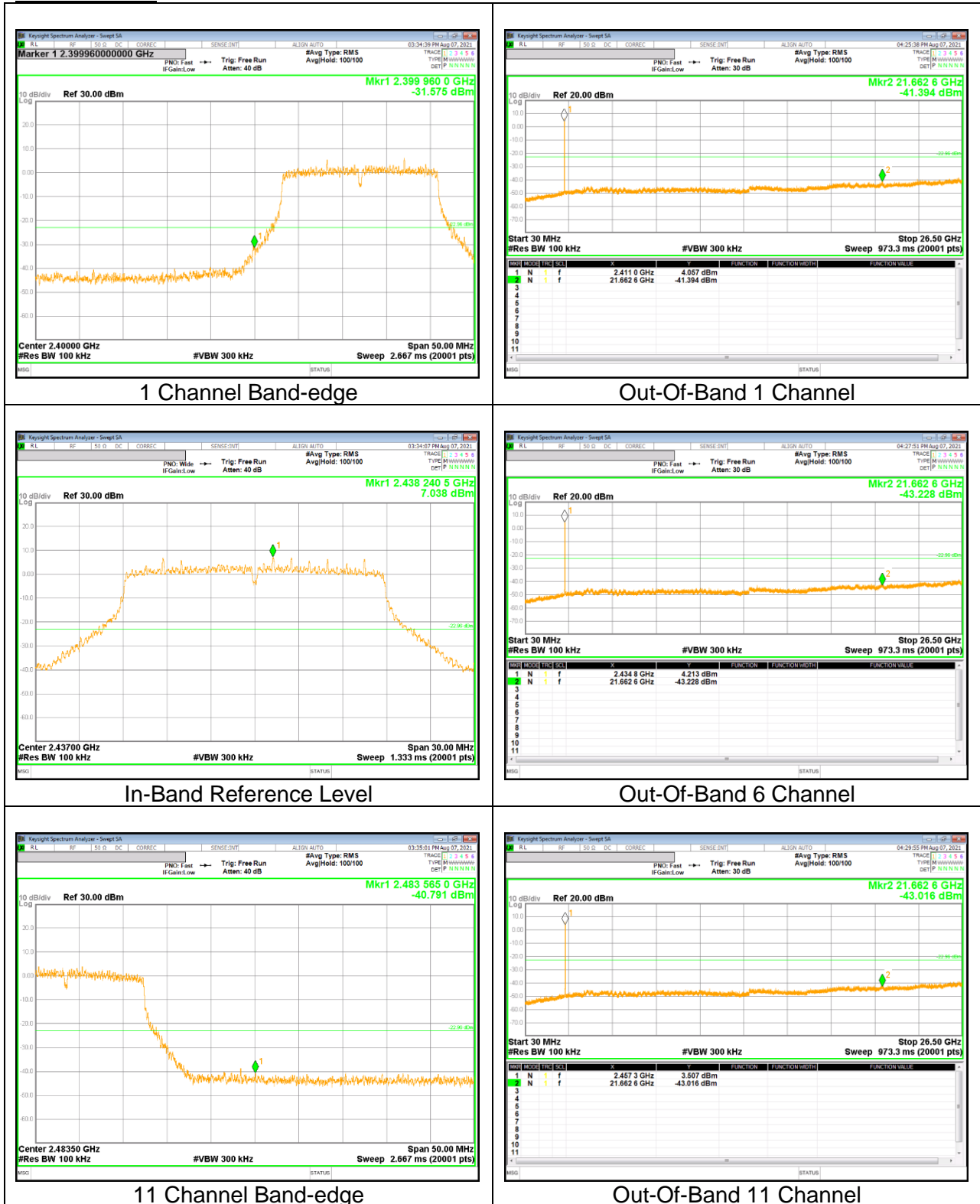
2TX Antenna 2

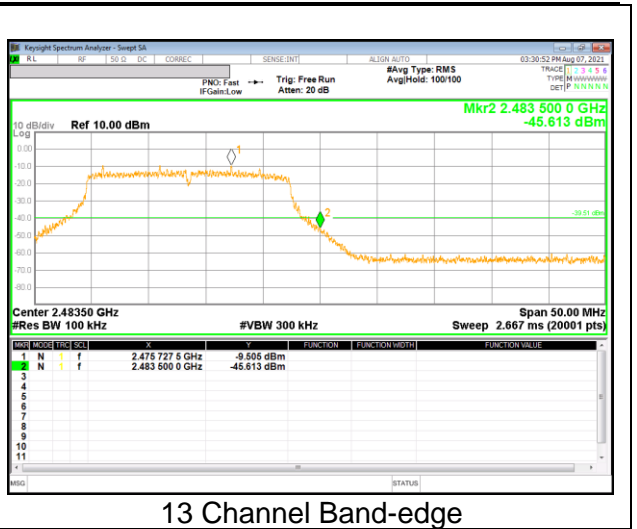
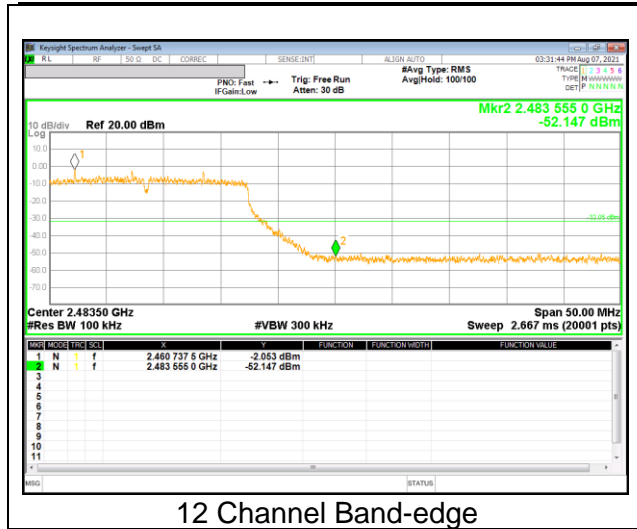




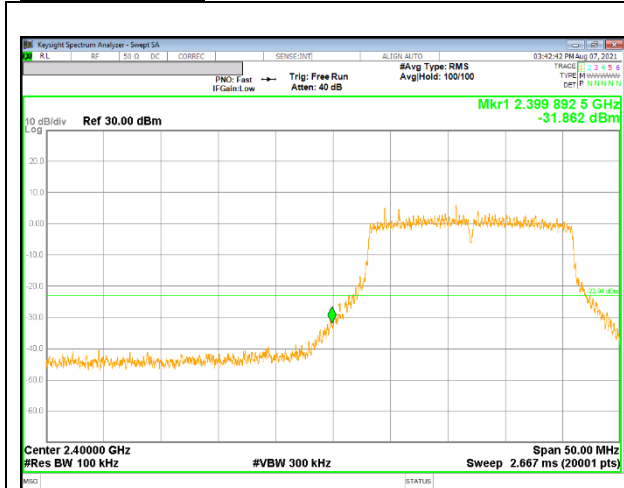
9.5.3. 802.11n HT20 MODE

2TX Antenna 1

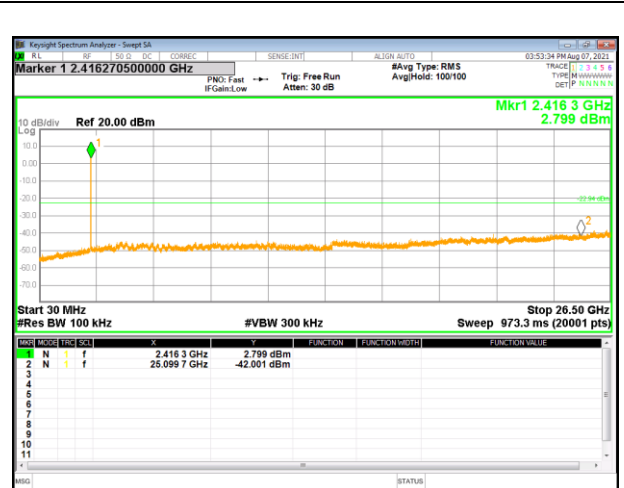




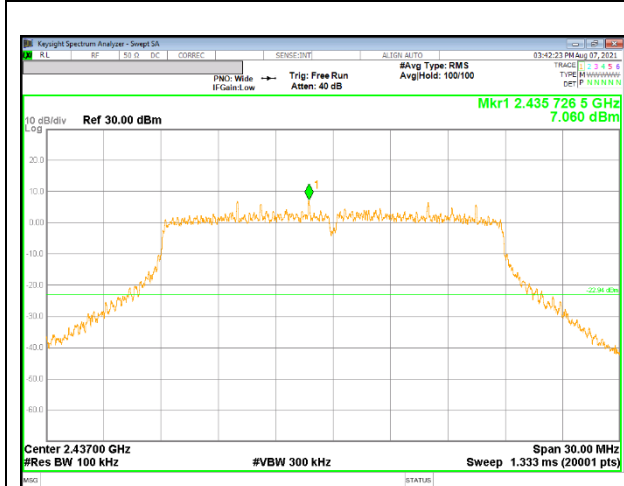
2TX Antenna 2



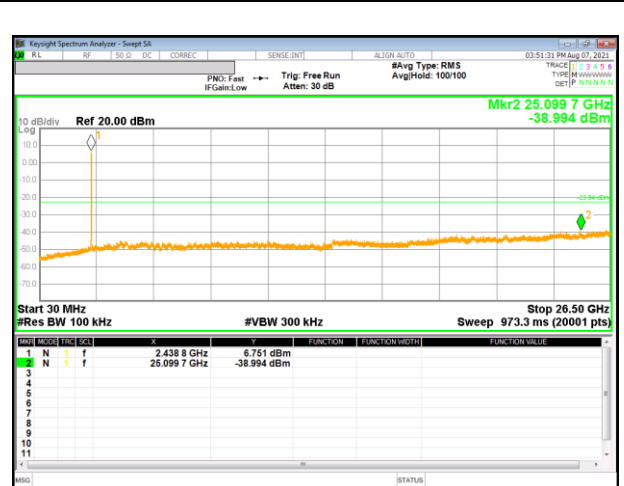
1 Channel Band-edge



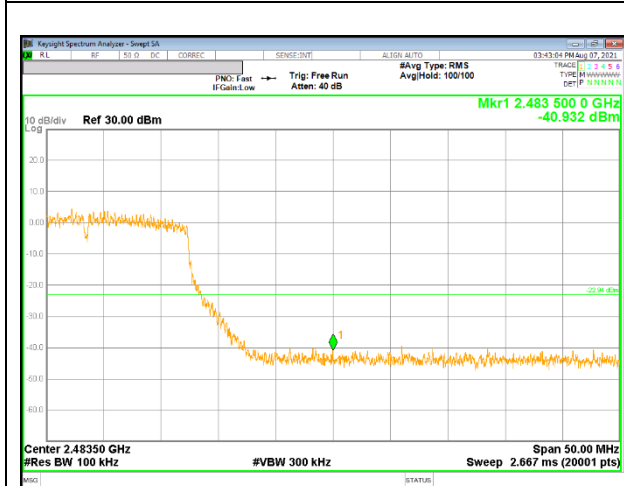
Out-Of-Band 1 Channel



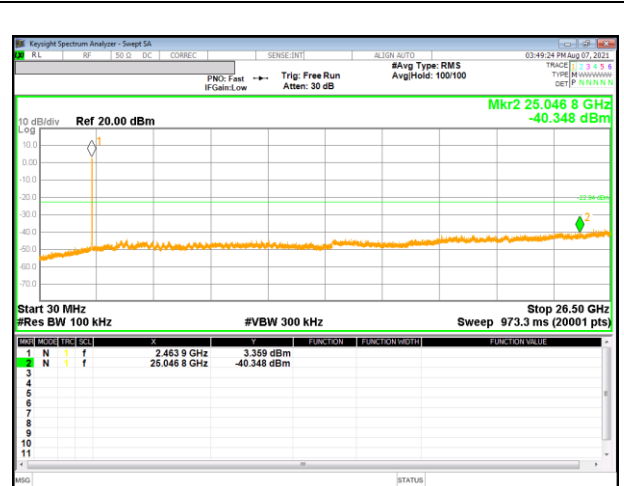
In-Band Reference Level



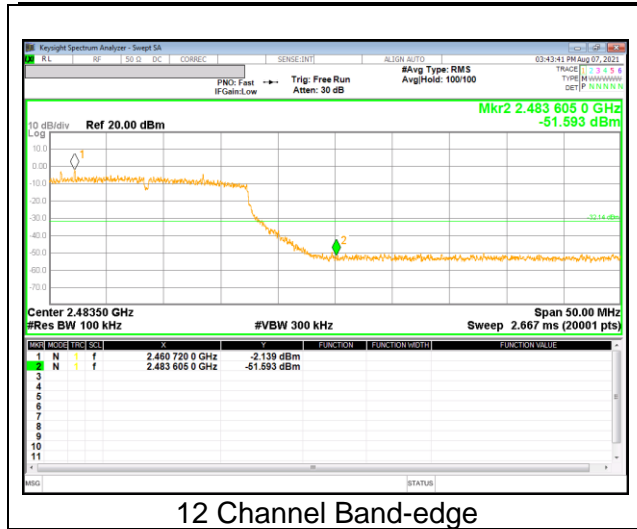
Out-Of-Band 6 Channel



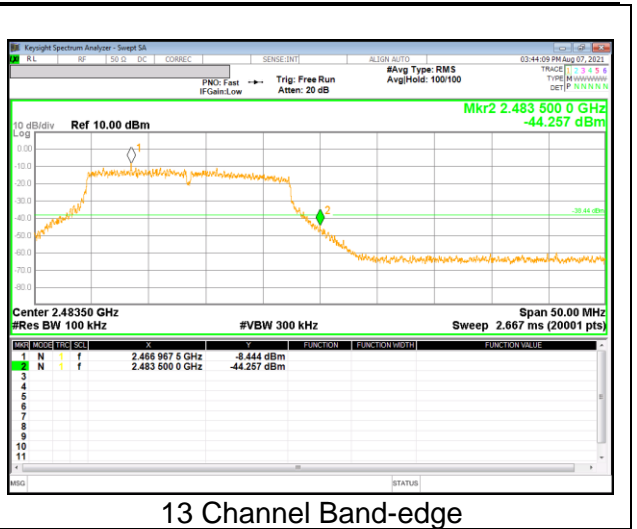
11 Channel Band-edge



Out-Of-Band 11 Channel



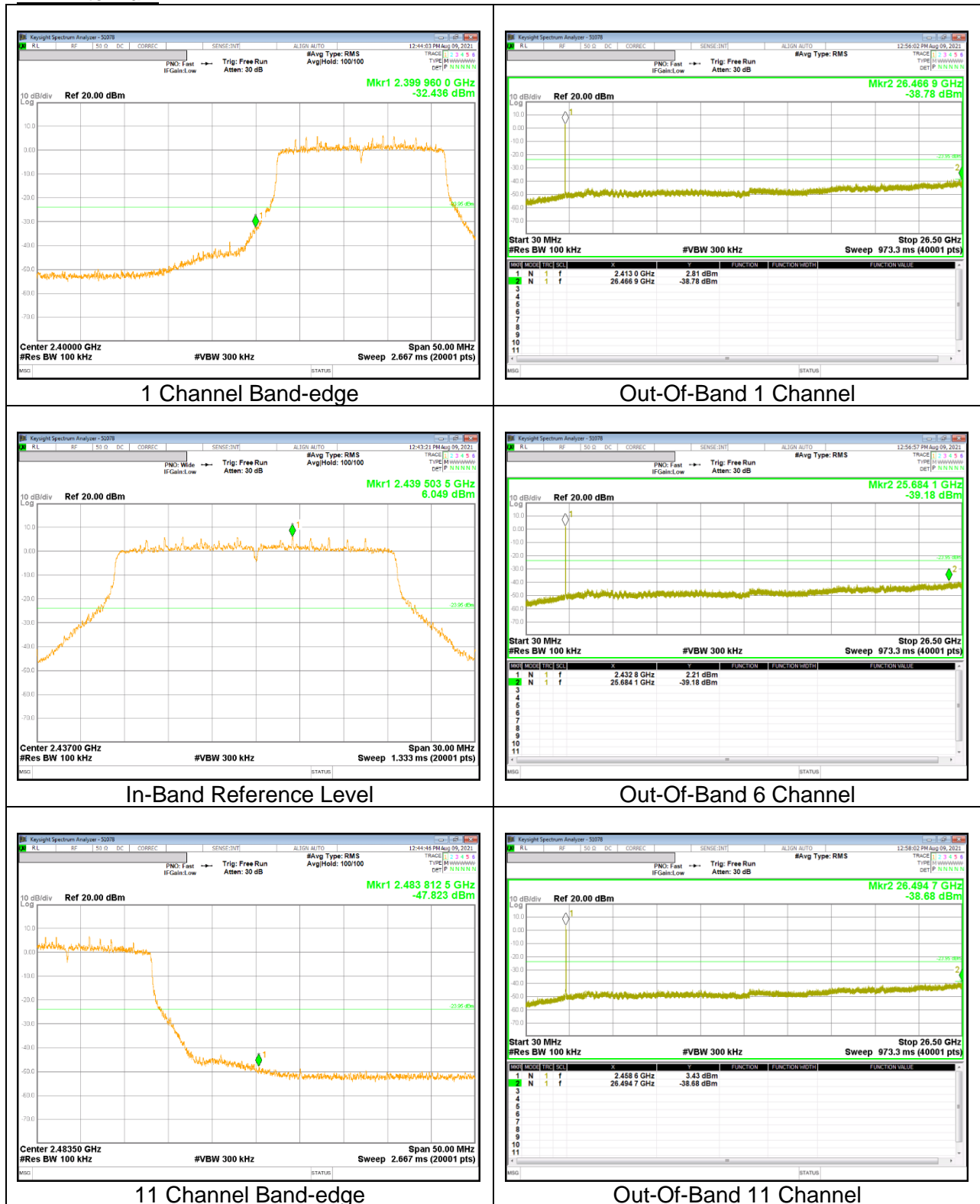
12 Channel Band-edge

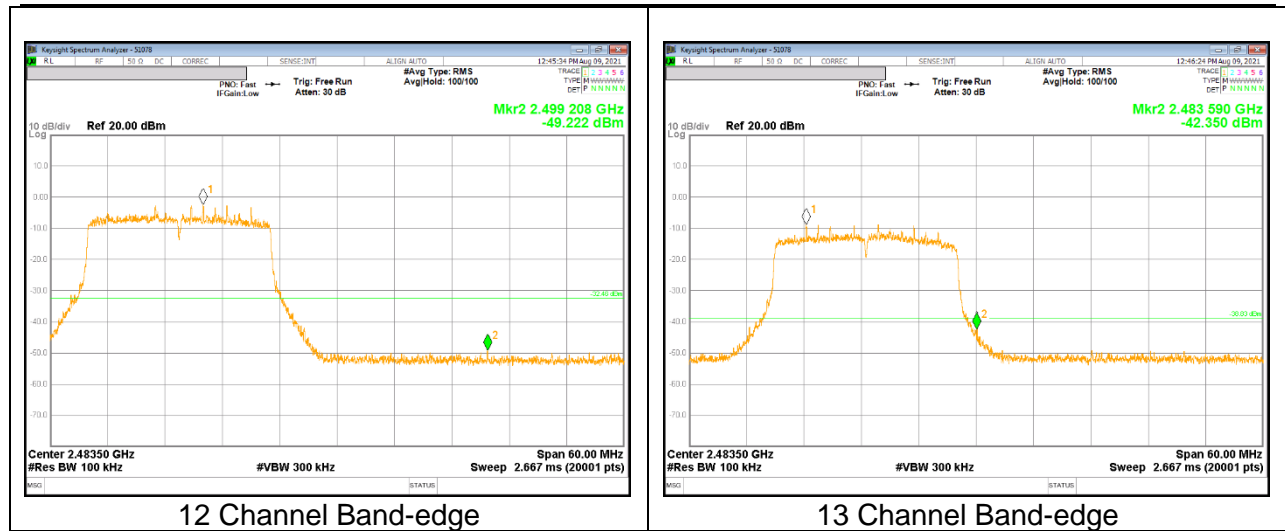


13 Channel Band-edge

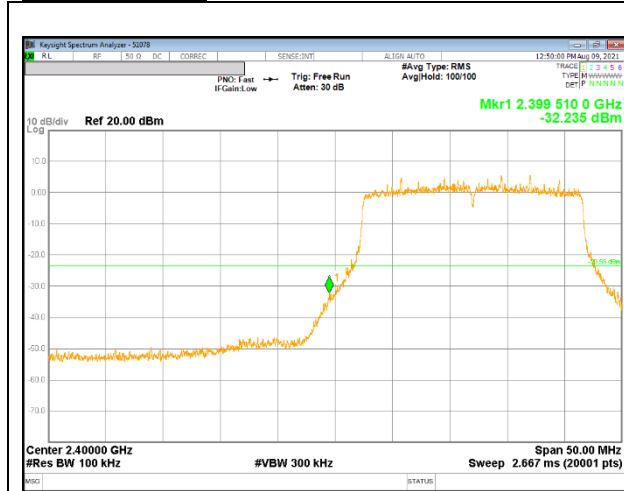
9.5.4. 802.11ax HE20(SU) MODE

2TX Antenna 1

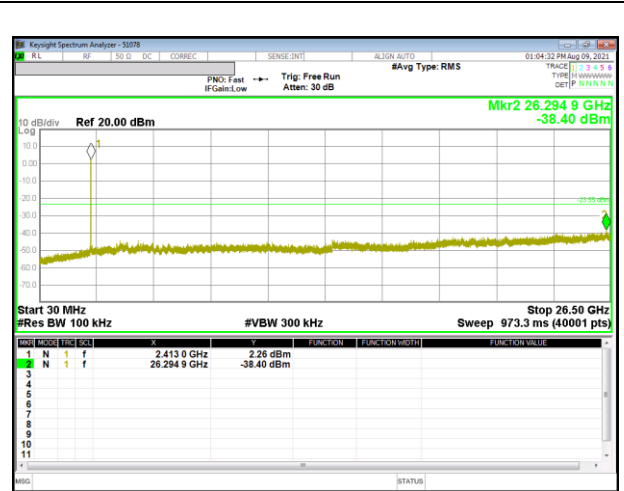




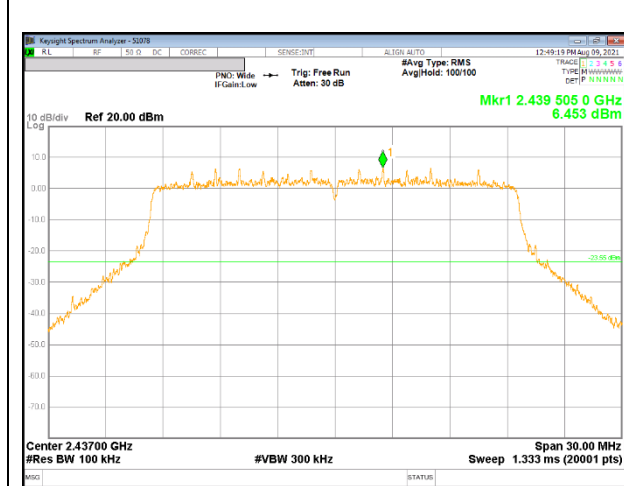
2TX Antenna 2



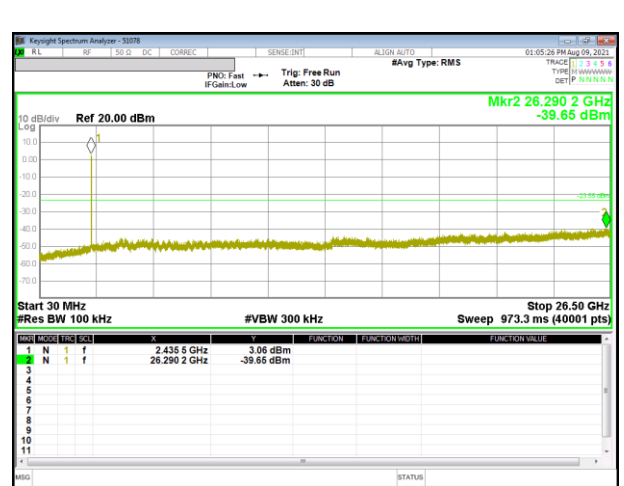
1 Channel Band-edge



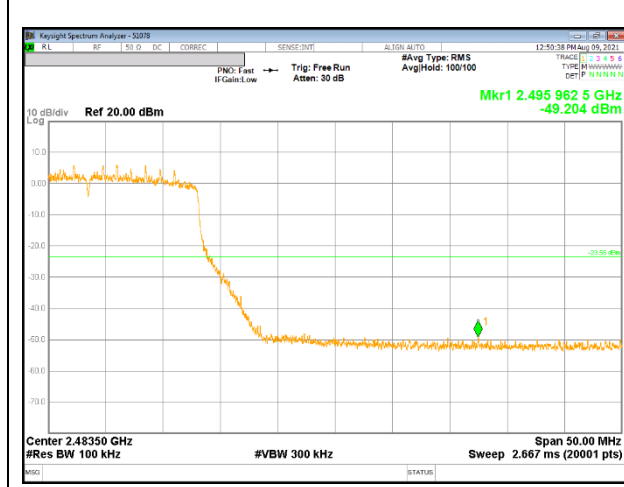
Out-Of-Band 1 Channel



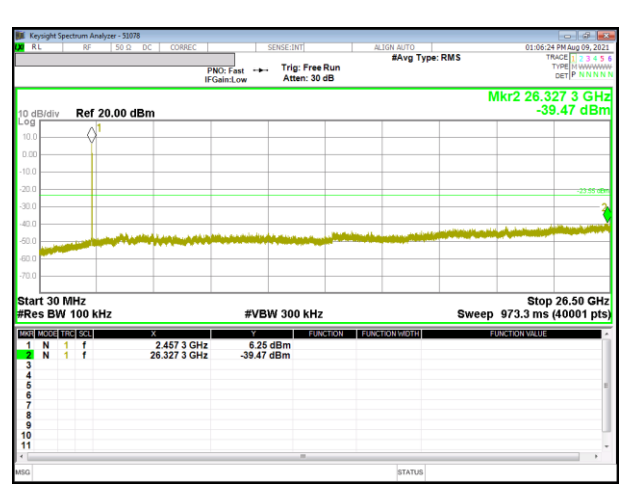
In-Band Reference Level



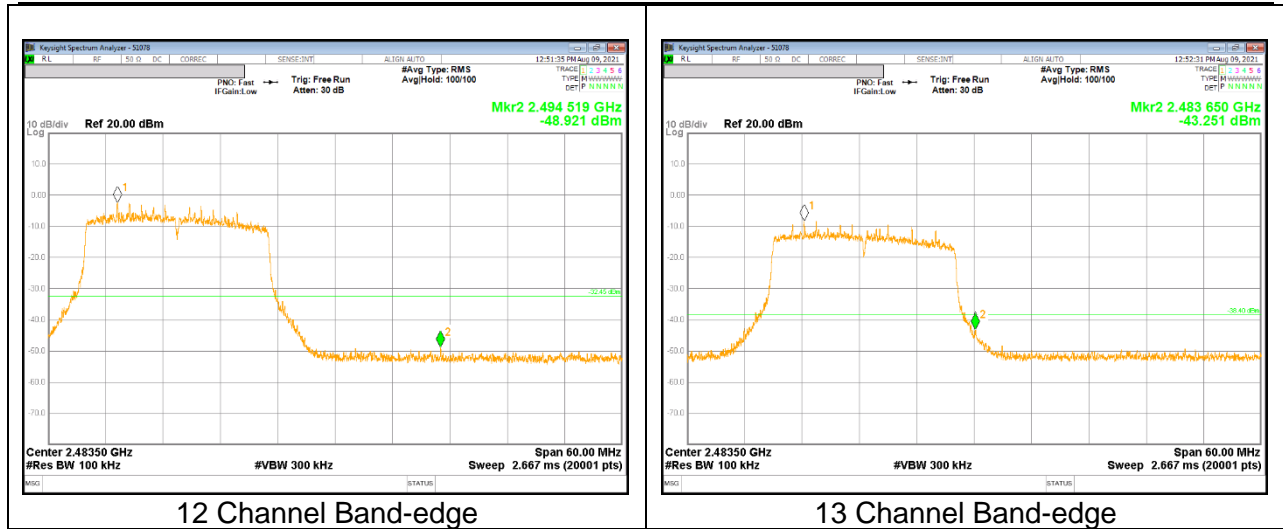
Out-Of-Band 6 Channel



11 Channel Band-edge



Out-Of-Band 11 Channel



9.5.5. 802.11ax HE20(RU) MODE

2TX Antenna 1 MODE

