FCC CFR47 PART 15 SUBPART C

DTS Wireless LAN

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER : SM-N976B

FCC ID: A3LSMN976B

REPORT NUMBER: 4789009800-E5V4

ISSUE DATE: JUN 26, 2019

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

Prepared by
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TEL: (031) 337-9902
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ACCREDITED
Testing Laboratory

TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	06/17/19	Initial issue	Seokhwan Hong
V2	06/19/19	Updated to address TCB's question	Seokhwan Hong
V3	06/20/19	Updated to address TCB's question	Seokhwan Hong
V4	06/26/19	Updated to address TCB's question	Seokhwan Hong

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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, ANT+, NFC and WPT
MODEL NUMBER:	SM-N976B
SERIAL NUMBER:	R3CM506PPBA, R3CM506PPKV, cea741c773197e35, R3CM506Q9KN (RADIATED); R3CM506PPMB (CONDUCTED)
DATE TESTED:	MAY 30, 2019 – JUN 17, 2019

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass

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:

SungGil Park
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Seokhwan Hong
Suwon Lab Engineer
UL Korea, Ltd.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 558074 D01 DTS Meas Guidance v05r02.
4. ANSI C63.10-2013.
5. KDB 662911 D01 v02r01

3. FACILITIES AND ACCREDITATION

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

218 Maeyeong-ro
☒ Chamber 1
☒ Chamber 2
☒ Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at http://www.iasonline.org/PDF/TL/TL-637.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:

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

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

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	2.32 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.86 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.97 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.57 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

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

WiFi operating mode

Frequency Range	Mode	Antenna1	Antenna2
2.4GHz	802.11 b	TX/RX	TX/RX
	802.11 g	TX/RX	TX/RX
	802.11 g MIMO	TX/RX	TX/RX
	802.11 n	TX/RX	TX/RX
	802.11 n MIMO	TX/RX	TX/RX
	802.11 ax	TX/RX	TX/RX
	802.11 ax MIMO	TX/RX	TX/RX
5GHz	802.11 a	TX/RX	TX/RX
	802.11 a MIMO	TX/RX	TX/RX
	802.11 n	TX/RX	TX/RX
	802.11 n MIMO	TX/RX	TX/RX
	802.11 ac	TX/RX	TX/RX
	802.11 ac MIMO	TX/RX	TX/RX
	802.11 ax	TX/RX	TX/RX
	802.11 ax MIMO	TX/RX	TX/RX

Simultaneous TX Condition

Simultaneous Tx condition - **RSDB**

Mode	# of TX	5GHz		2.4GHz		Test Case
		Ant1	Ant2	Ant1	Ant2	
2.4GHz + 5GHz RSDB Only	2	**A**	-	-	**B**	**V**
	2	-	**A**	**B**	-	**V**
	2	A	-	B	-	-
	2	-	A	-	B	-
2.4GHz + 5GHz RSDB & MIMO	3	A	A	B	-	-
	3	A	A	-	B	-
	3	A	-	B	B	-
	3	-	A	B	B	-
2.4GHz + 5GHz RSDB MIMO	4	**A**	**A**	**B**	**B**	**V**

Simultaneous Tx condition - **Bluetooth with 5 GHz WLAN(not RSDB)**

Mode	# of TX	5GHz WLAN		2.4GHz Bluetooth	Test Case
		Ant1	Ant2	Ant1	
2.4GHz Bluetooth +5GHz WLAN (Not RSDB)	2	A	-	B	-
	2	-	A	B	-
	3	**A**		**B**	**V**

Spurious Emissions for Simultaneous Transmission were reported on the UNII 802.11ax test report(4789009800-E9) section 11.9.

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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]	
		Antenna1	Antenna2	Antenna1	Antenna2
2412 - 2472	802.11b SISO	**18.90**	18.26	**77.62**	66.99
	802.11g SISO	15.68	15.83	36.98	38.28
	802.11g MIMO	18.49		70.63	
	802.11n HT20 SISO	15.71	15.84	37.24	38.37
	802.11n HT20 MIMO	**18.58**		**72.11**	

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an internal antennas, with antenna1's maximum gain of -6.11 dBi and antenna2's maximum gain of -6.02 dBi .

WIFI1 and WIFI2 as indicated in antenna specification are written as ANT1 (Antenna 1) and ANT2 (Antenna 2) in this report

5.4. TESTED CHANNELS LIST

802.11b mode	CHANNEL	Frequency (MHz)
LOW	1	2412
MID	6	2437
HIGH	11	2462
REDUCTION HIGH 1	12	2467
REDUCTION HIGH 2	13	2472

802.11g/n mode	CHANNEL	Frequency (MHz)
LOW	1	2412
MID	6	2437
HIGH	11	2462
REDUCTION HIGH 1	12	2467
REDUCTION HIGH 2	13	2472

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.

For SISO (ANT1), the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

For SISO (ANT2), the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

For MIMO, the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

Based on the baseline scan, the worst-case data rates were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps (2TX CDD)
802.11n HT20 mode: MCS0 (2TX CDD)

The spot-check was performed for both SISO and MIMO mode, and it was determined that the MIMO mode is worst than SISO mode. Therefore, all testing was performed with MIMO mode.

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

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Charger	SAMSUNG	EP-TA800	R37M55W0ZE1SE3	N/A
Data Cable	SAMSUNG	EP-DG977	N/A	N/A

I/O CABLE

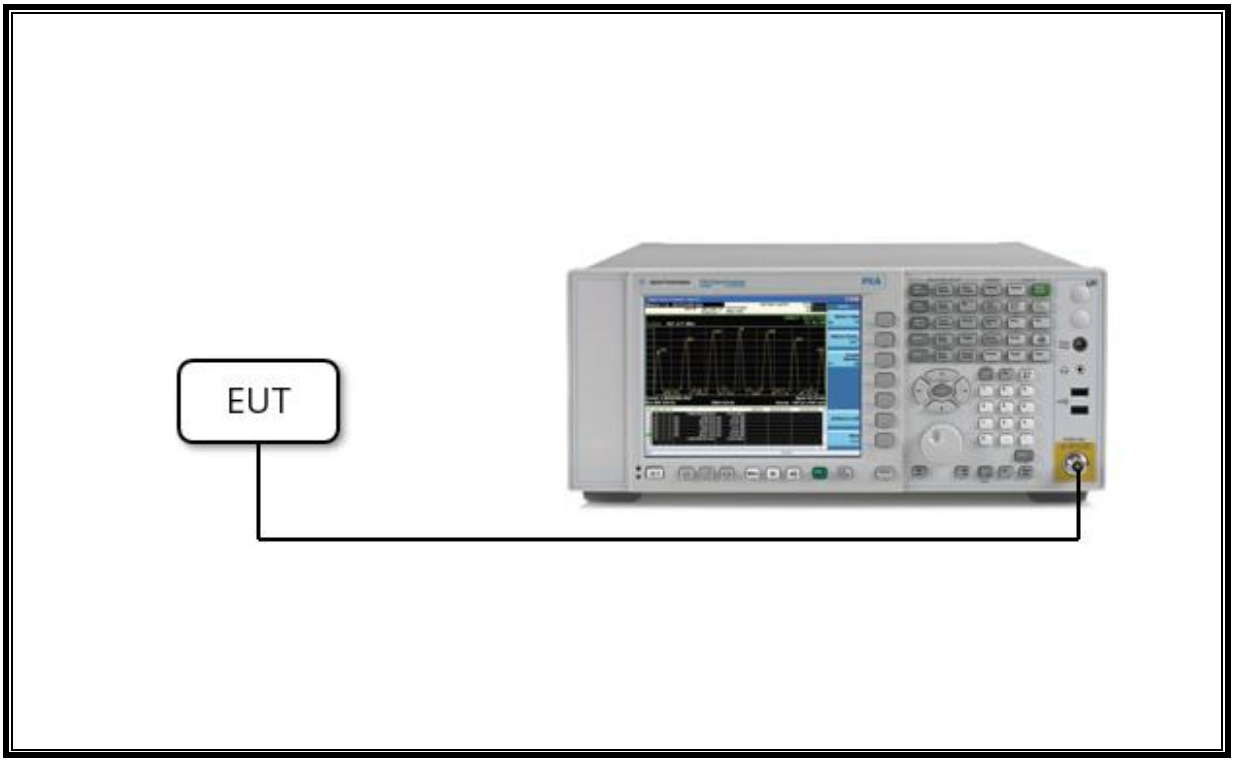
I/O Cable List						
Cable No.	**Port**	**# of identical**	**Connector**	**Cable**	**Cable**	**Remarks**
1	DC Power	1	C Type	Shielded	1.1m	N/A

TEST SETUP

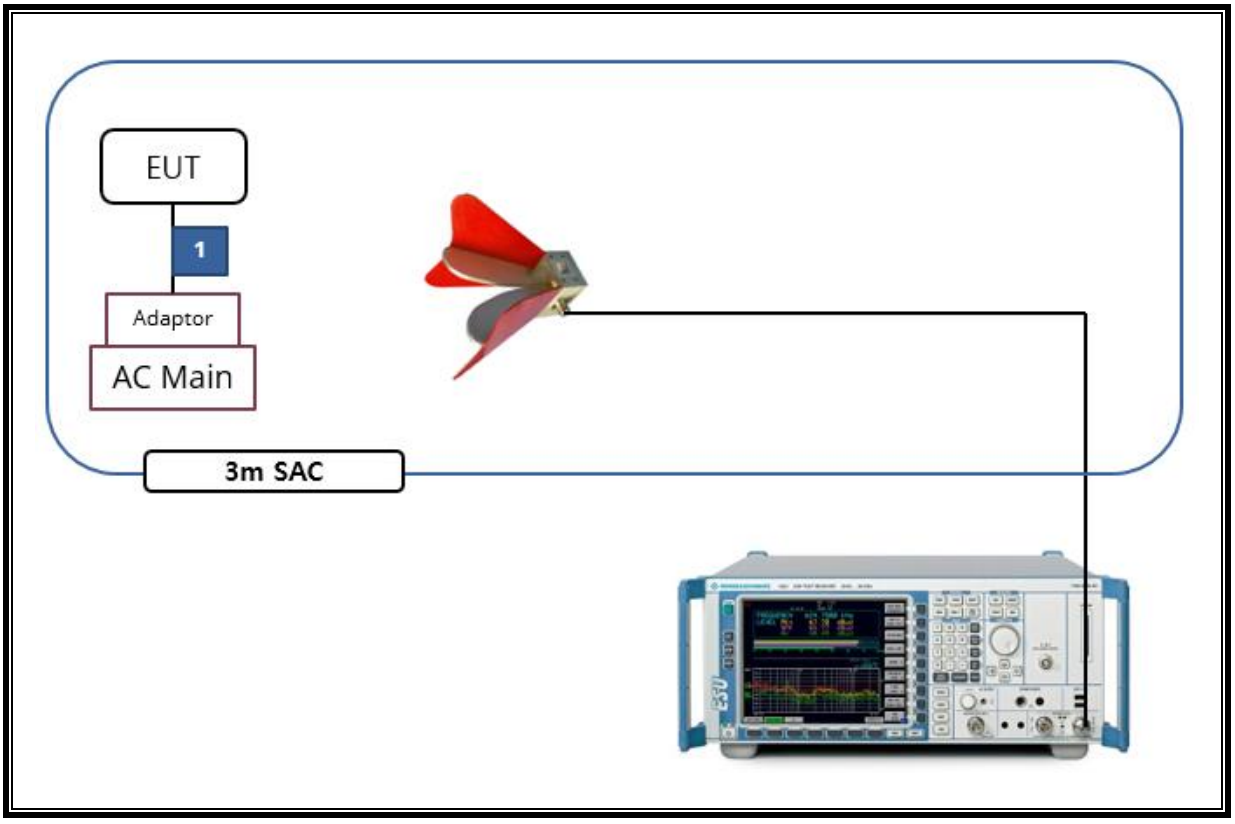
The EUT is a stand-alone unit during the tests.
Test software in hidden menu exercised the EUT to enable DTS mode.

This EUT is able to equipped with S-pen on the inside. Spot check were performed both inserted and removed condition. Because there is no deviation between the two data, all tests were performed under equipped with the S-pen.

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



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6. 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**	**New Cal Due**
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00167211	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00161451	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168724	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00205959	08-04-20
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-14-20
Antenna, Horn, 40 GHz	ETS	3116C	00168645	12-04-19
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	08-09-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-06-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-19
Spectrum Analyzer, 43.5 GHz	R&S	FSW43	104089	08-06-19
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-07-19
Attenuator	PASTERNACK	PE7087-10	A001	08-08-19
Attenuator	PASTERNACK	PE7087-10	A008	08-08-19
Attenuator	PASTERNACK	PE7004-10	2	08-07-19
Attenuator	PASTERNACK	PE7087-10	A009	08-08-19
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-19
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-06-19
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-06-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-07-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-07-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	08-06-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-07-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-07-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	08-06-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-07-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-07-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	08-06-19
LISN	R&S	ENV-216	101837	08-09-19
UL Software				
Description	**Manufacturer**	**Model**	**Version**	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

7. REFERENCE MEASUREMENT RESULTS

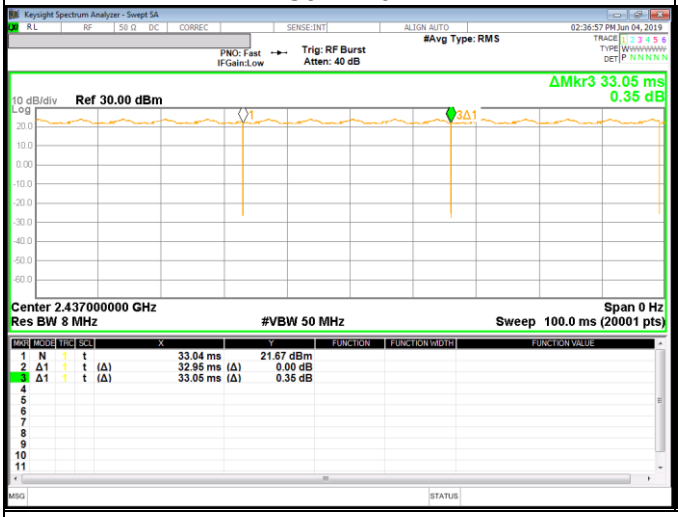
7.1. ON TIME AND DUTY CYCLE RESULTS

LIMITS

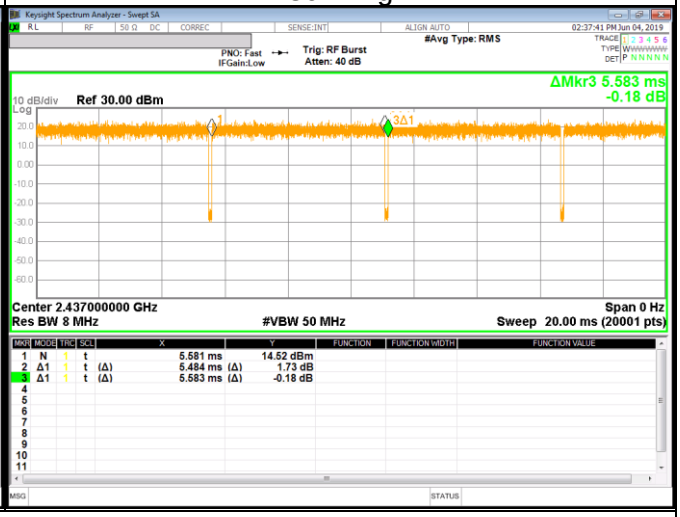
None; for reporting purposes only.

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	32.950	33.050	0.997	99.7	0.00	0.010
802.11g	5.484	5.583	0.982	98.2	0.00	0.010
802.11n HT20	5.080	5.180	0.981	98.1	0.00	0.010

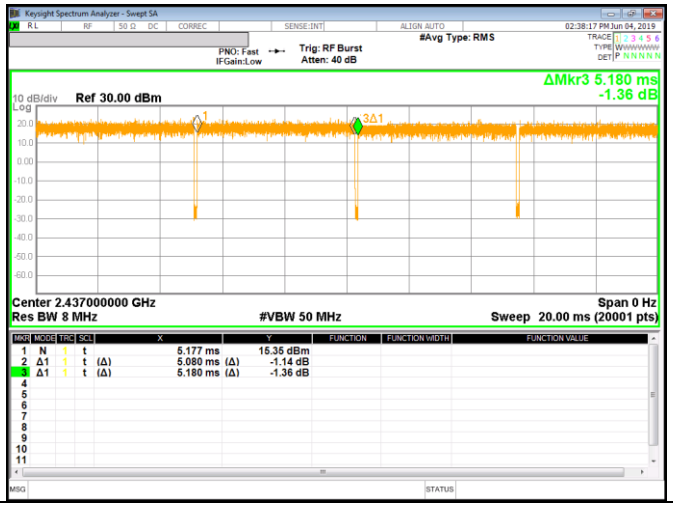
802.11b



802.11g



802.11n



8. MEASUREMENT METHODS

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.

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9. SUMMARY TABLE

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

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10. ANTENNA PORT TEST RESULTS

10.1. 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 to100KHz, the VBW >= 3 x RBW, peak detector and max hold.

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RESULTS

10.1.1. 802.11b MODE IN THE 2.4 GHz BAND

ANT	Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
1	Low	2412	7.033	0.5
	Mid	2437	7.052	0.5
	High	2462	8.004	0.5
	12	2467	7.547	0.5
	13	2472	7.036	0.5
	Worst		**7.033**	0.5
2	Low	2412	7.530	0.5
	Mid	2437	6.586	0.5
	High	2462	7.555	0.5
	12	2467	7.007	0.5
	13	2472	7.074	0.5
	Worst		**6.586**	0.5

10.1.2. 802.11g MODE IN THE 2.4 GHz BAND

ANT	Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
1	Low	2412	16.360	0.5
	Mid	2437	16.310	0.5
	High	2462	16.340	0.5
	12	2467	16.330	0.5
	13	2472	16.340	0.5
	Worst		**16.310**	0.5
2	Low	2412	16.340	0.5
	Mid	2437	16.340	0.5
	High	2462	16.350	0.5
	12	2467	16.510	0.5
	13	2472	16.400	0.5
	Worst		**16.340**	0.5

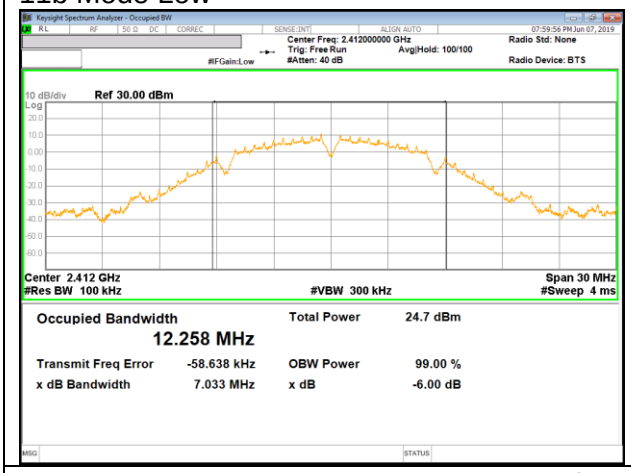
10.1.3. **802.11n HT20 MODE IN THE 2.4 GHz BAND**

ANT	Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
1	Low	2412	17.570	0.5
	Mid	2437	17.570	0.5
	High	2462	17.600	0.5
	12	2467	17.570	0.5
	13	2472	17.590	0.5
	Worst		**17.570**	0.5
2	Low	2412	17.580	0.5
	Mid	2437	17.570	0.5
	High	2462	17.570	0.5
	12	2467	17.580	0.5
	13	2472	17.590	0.5
	Worst		**17.570**	0.5

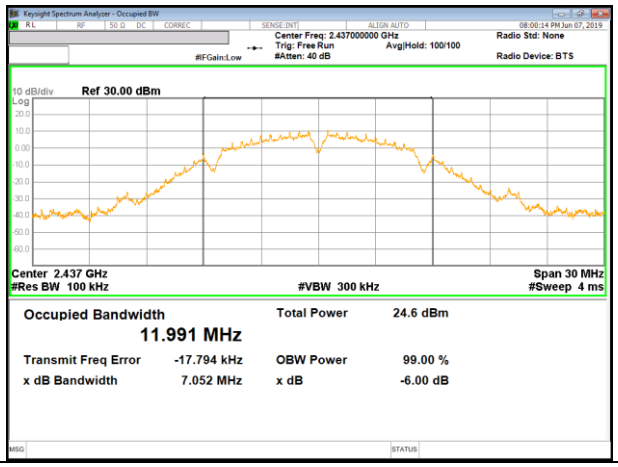
10.1.4. 6 dB BANDWIDTH PLOTS

1TX_ANT 1

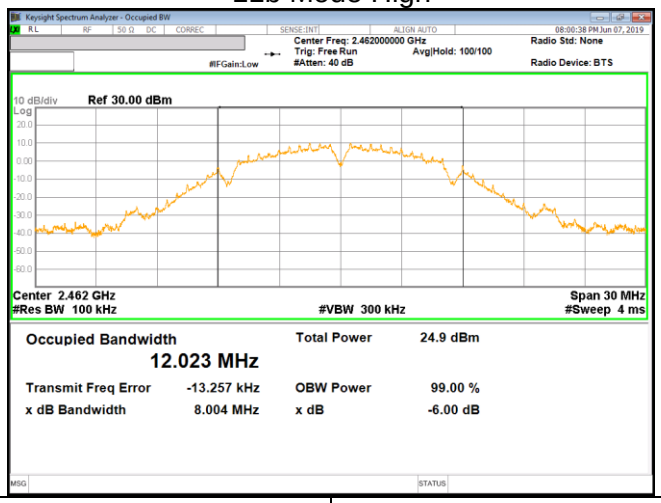
11b Mode Low



11b Mode Mid



11b Mode High



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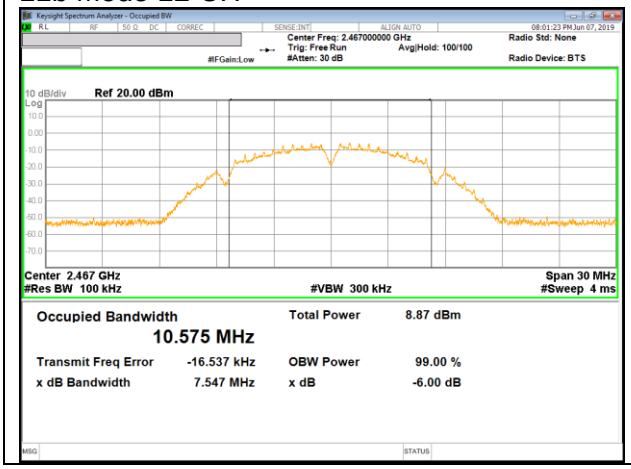

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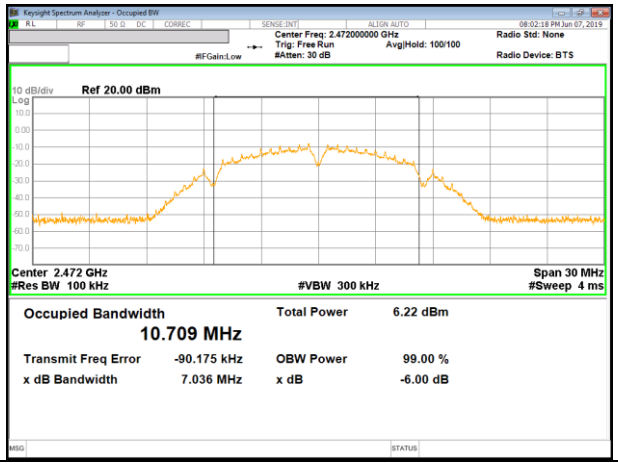
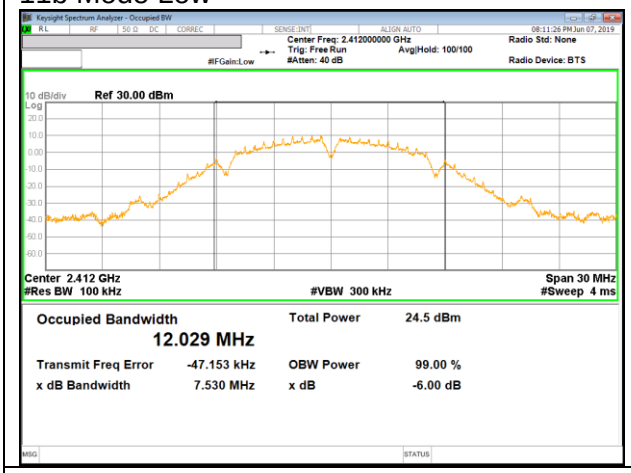
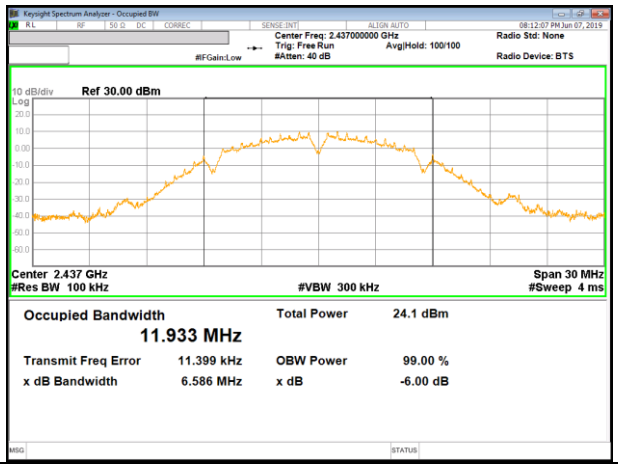


1TX_ANT 2

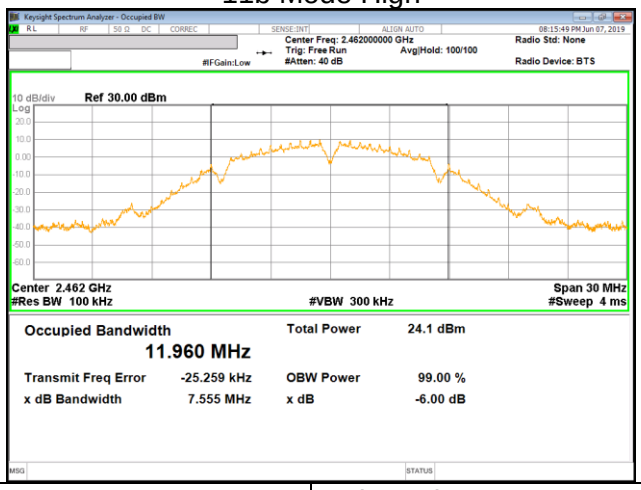
11b Mode Low



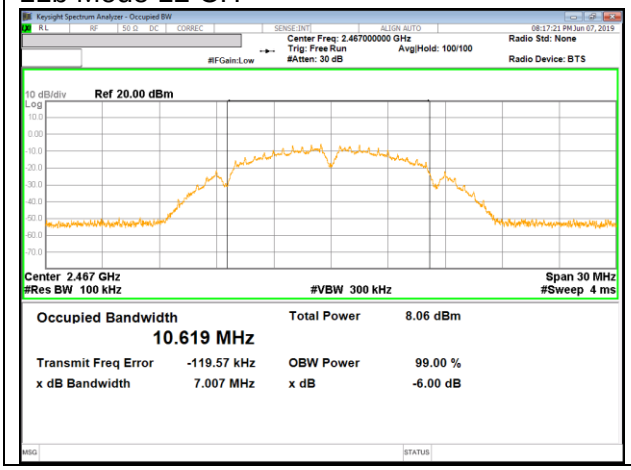
11b Mode Mid



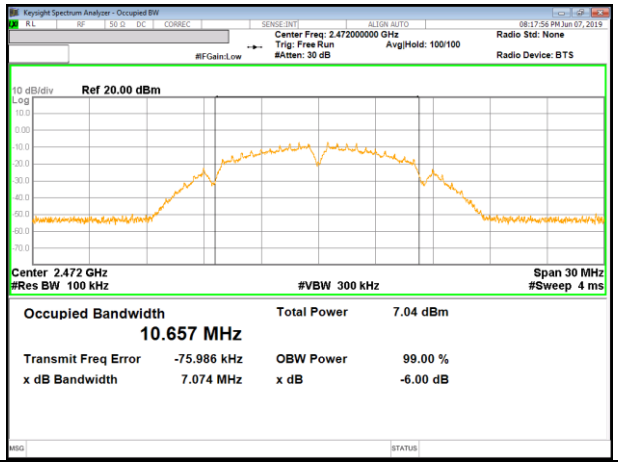
11b Mode High



11b Mode 12 CH

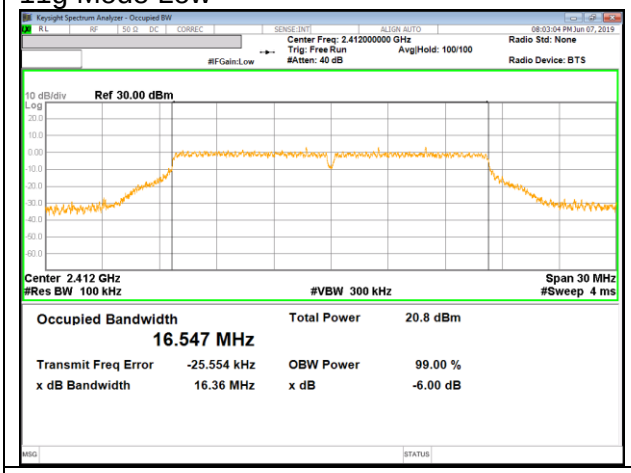


11b Mode 13 CH

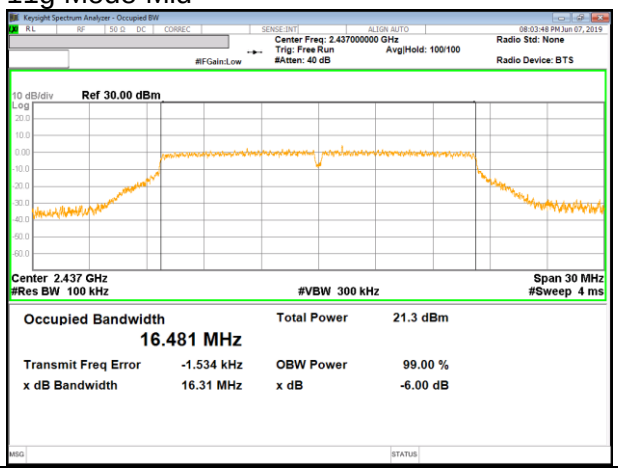


1TX_ANT 1

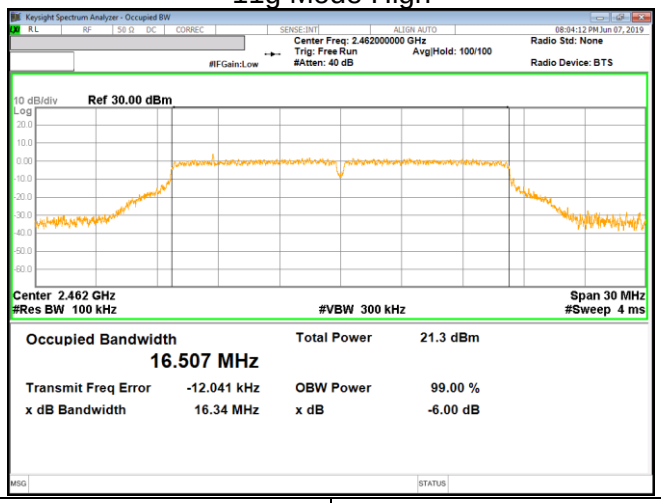
11g Mode Low



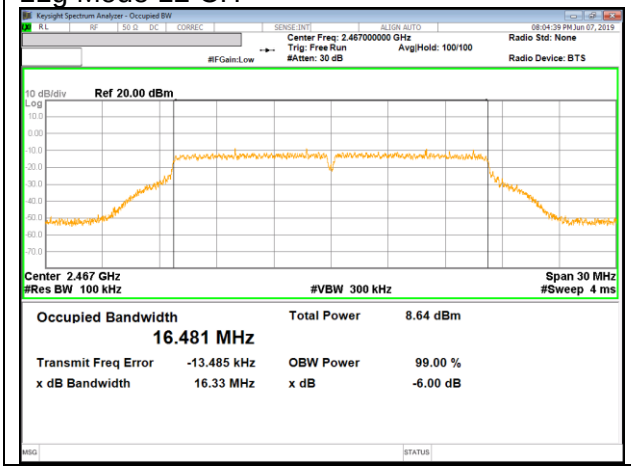
11g Mode Mid



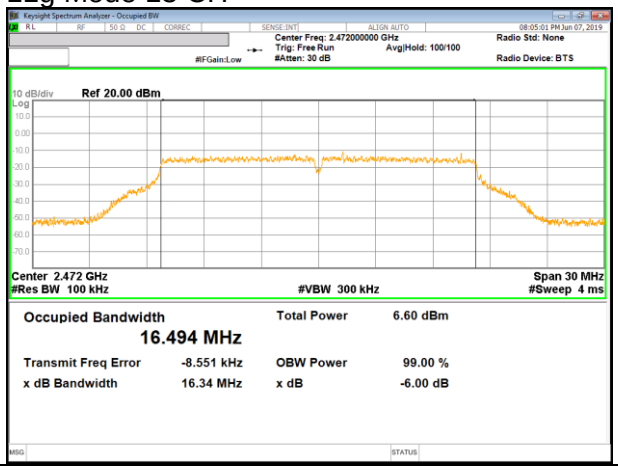
11g Mode High



11g Mode 12 CH

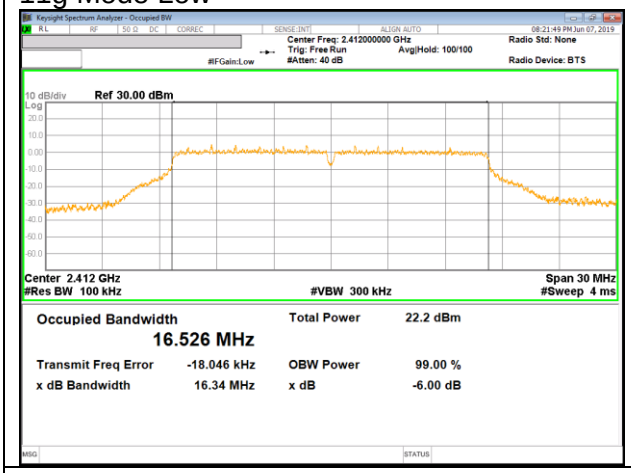


11g Mode 13 CH

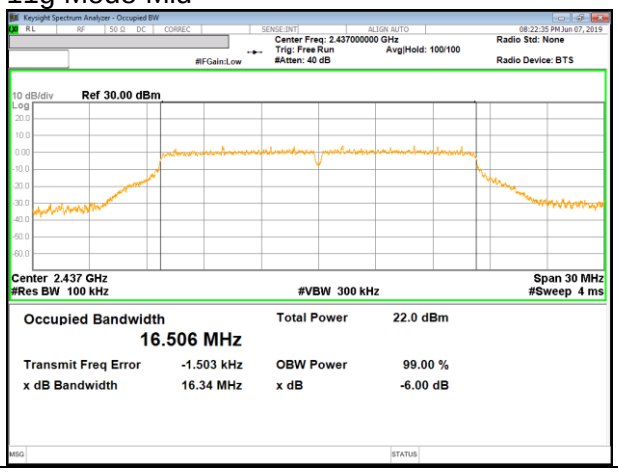


1TX_ANT 2

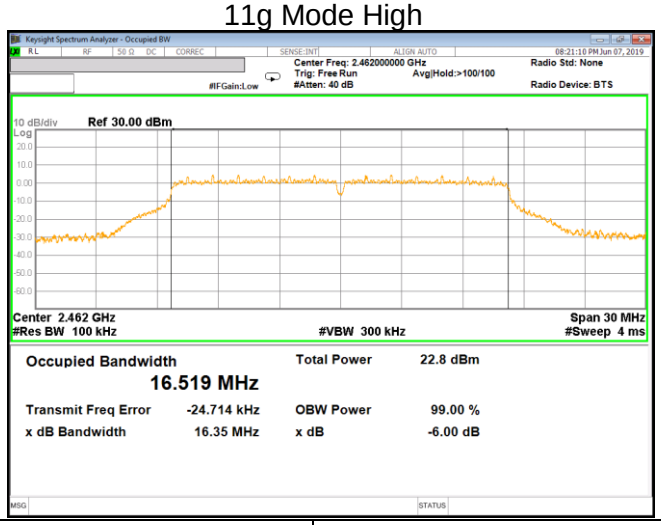
11g Mode Low



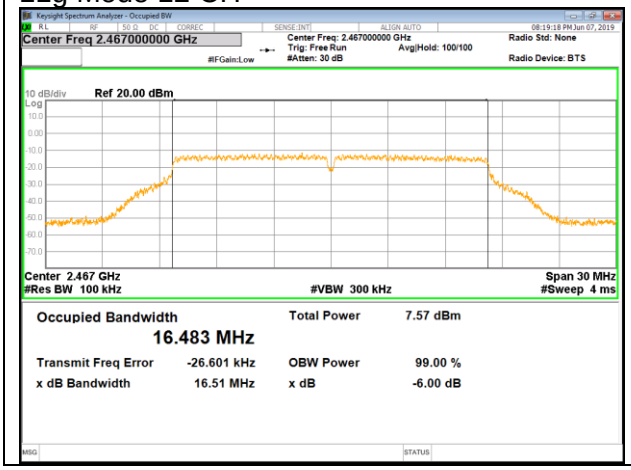
11g Mode Mid



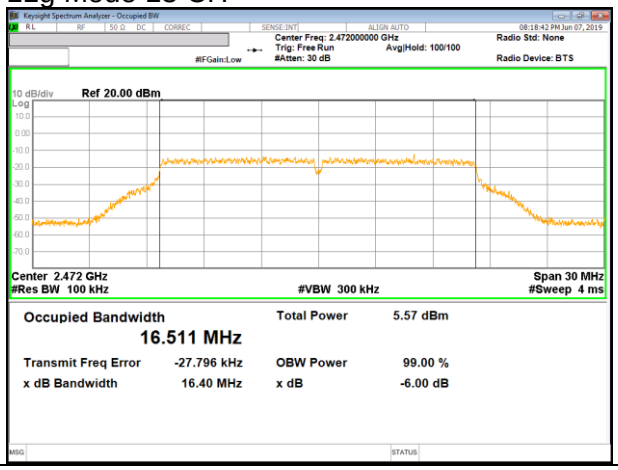
11g Mode High



11g Mode 12 CH

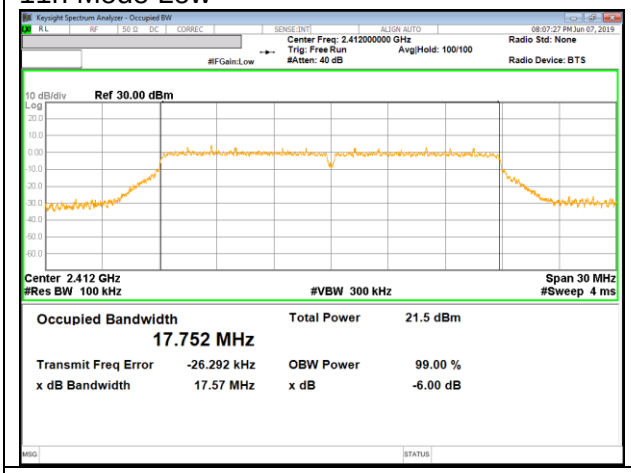


11g Mode 13 CH

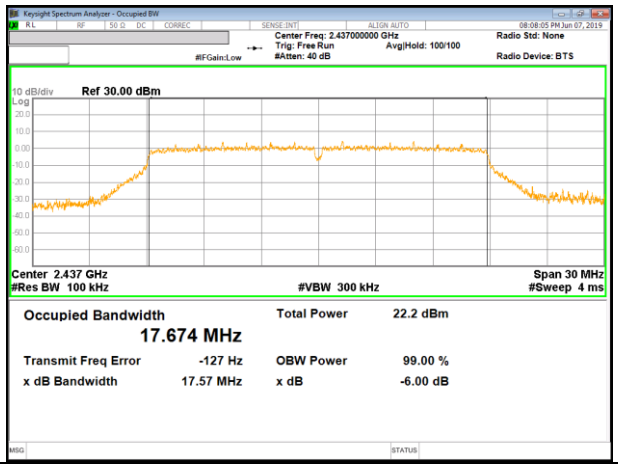


1TX_ANT 1

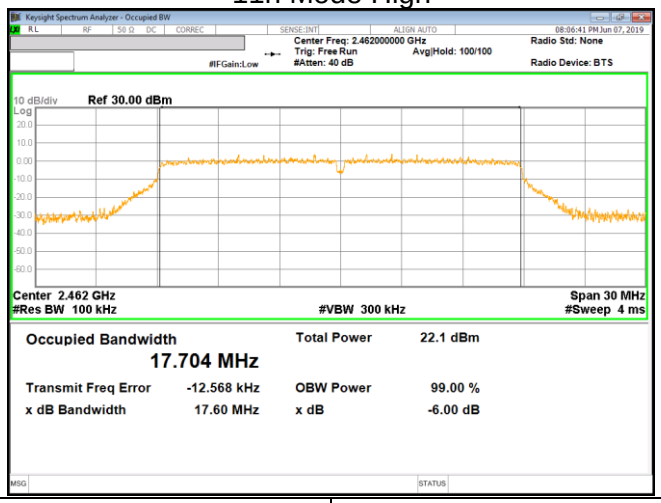
11n Mode Low



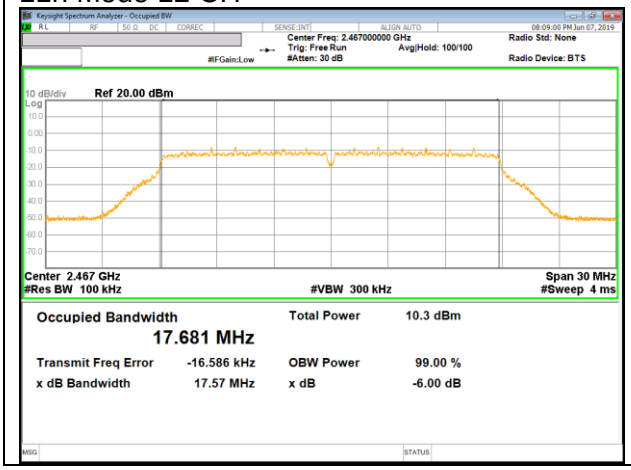
11n Mode Mid



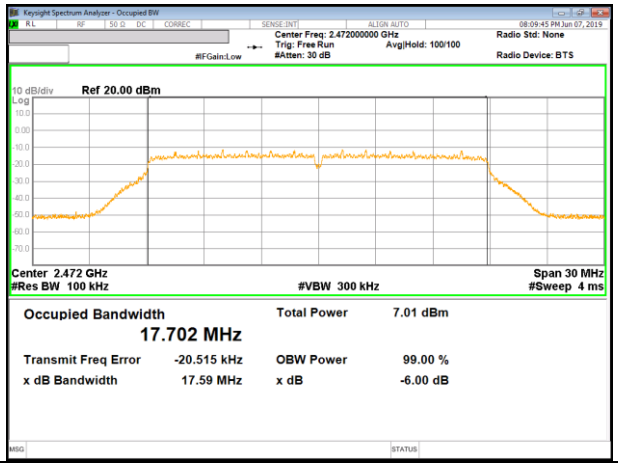
11n Mode High



11n Mode 12 CH

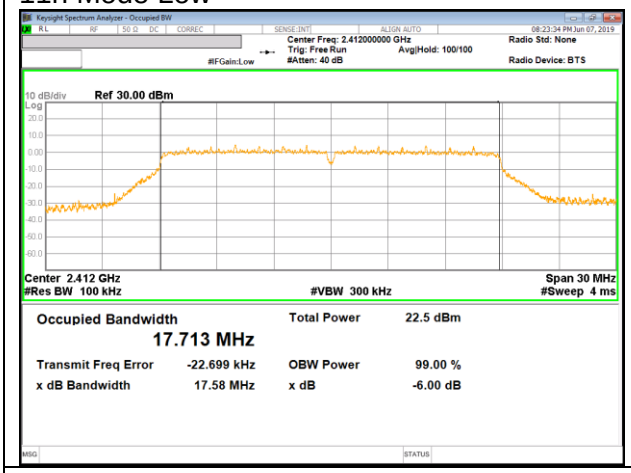


11n Mode 13 CH

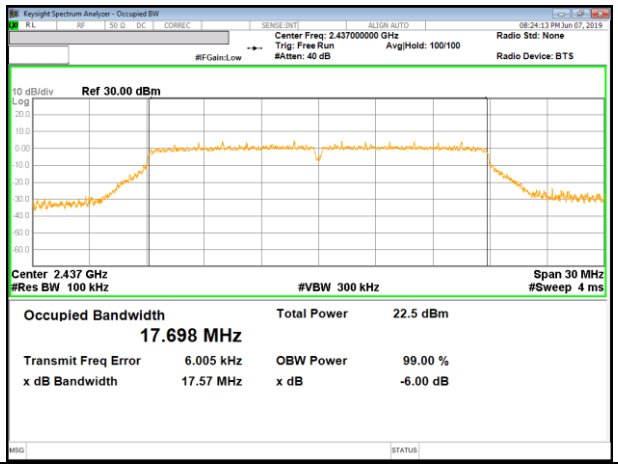


1TX_ANT 2

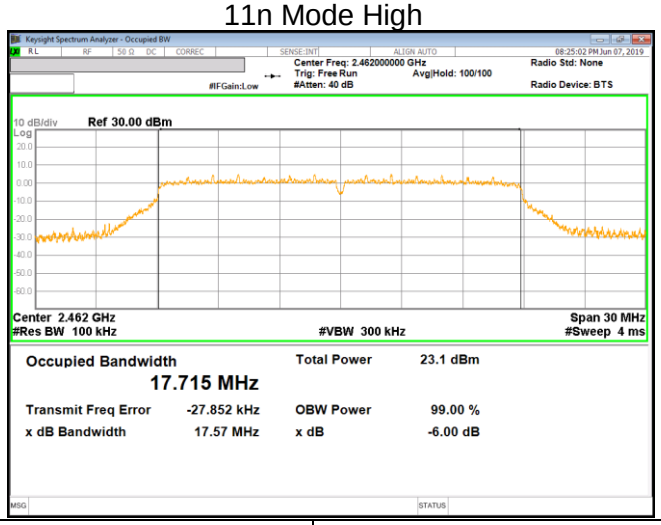
11n Mode Low



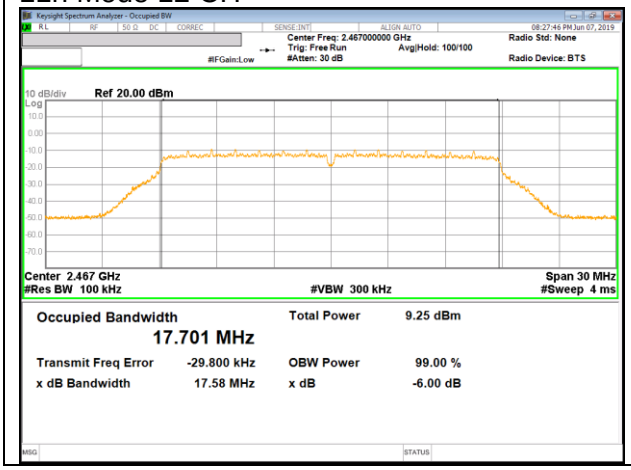
11n Mode Mid



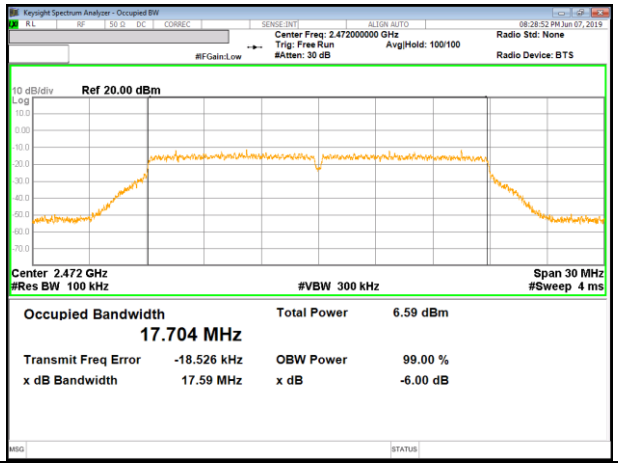
11n Mode High



11n Mode 12 CH



11n Mode 13 CH



10.2. OUTPUT POWER

LIMITS

FCC §15.247

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

The transmitter output is connected to a power meter.

The cable assembly insertion loss was entered as an offset in the power meter 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.

Duty cycle correction factor is not added to the average output power results for duty cycle factor > 98%.

DIRECTIONAL ANTENNA GAIN

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

Frequency Band [MHz]	Antenna1 Gain [dBi]	Antenna2 Gain [dBi]	Correlated Chains Directional Gain [dBi]
2400 ~ 2483.5	-6.11	-6.02	-3.05

- IEEE 802.11b Mode is not supported MIMO operation. So can't transmit on two antennas as the same time.

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RESULTS

10.2.1. 1TX_TEST RESULTS

Limits

Frequency Range [MHz]	Directional Gain ANTENNA1 [dBi]	Directional Gain ANTENNA2 [dBi]	FCC Power Limit [dBm]	Max Power [dBm]
2412 - 2472	-6.11	-6.02	30.00	30.00

Included in Calculations of Corr'd Power			
Duty Cycle CF [dB]	b	0.00	dB
	g	0.00	dB
	n	0.00	dB

Calculation of Outpu Power result
Corr'd Power [dBm] = Meas Power [dBm] + Duty CF [dB]

Output Power Results

Mode	Channel	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Antenna 1 Corr'd Power [dBm]	Antenna 2 Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
802.11b	Low	2412	18.69	18.26	18.69	**18.26**	30.00	-11.31
	Mid	2437	18.40	17.90	18.40	17.90	30.00	-11.60
	High	2462	18.90	17.72	**18.90**	17.72	30.00	**-11.10**
	12	2467	3.23	2.53	3.23	2.53	30.00	-26.77
	13	2472	0.88	1.10	0.88	1.10	30.00	-28.90
Worst Case					***18.90***	18.26	30.00	***-11.10***

Output Power Results

Mode	Channel	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Antenna 1 Corr'd Power [dBm]	Antenna 2 Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
802.11g	Low	2412	15.12	15.55	15.12	15.55	30.00	-14.45
	Mid	2437	15.33	15.83	15.33	**15.83**	30.00	**-14.17**
	High	2462	15.68	15.82	**15.68**	15.82	30.00	-14.18
	12	2467	3.25	2.47	3.25	2.47	30.00	-26.75
	13	2472	1.31	0.54	1.31	0.54	30.00	-28.69
Worst Case					15.68	***15.83***	30.00	***-14.17***

Output Power Results

Mode	Channel	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Antenna 1 Corr'd Power [dBm]	Antenna 2 Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
802.11n	Low	2412	15.22	15.52	15.22	15.52	30.00	-14.48
	Mid	2437	15.64	15.84	15.64	**15.84**	30.00	**-14.16**
	High	2462	15.71	15.81	**15.71**	15.81	30.00	-14.19
	12	2467	3.35	2.45	3.35	2.45	30.00	-26.65
	13	2472	0.57	1.32	0.57	1.32	30.00	-28.68
Worst Case					15.71	***15.84***	30.00	***-14.16***

10.2.2. **2TX_TEST RESULTS**

Limits

Frequency Range [MHz]	Correlated Chains Directional Gain [dBI]	FCC Power Limit [dBm]	Max Power [dBm]
2412 - 2472	-3.05	30.00	30

Included in Calculations of Corr'd Power			
Duty Cycle CF [dB]	g	0.00	dB
	n	0.00	dB

Calculation of Outpu Power result
Sum PW
= ANTENNA1_Meas Power [mW] + ANTENNA2_Meas Power [mW]
Total Corr'd Power [dBm]
= Sum PW [dBm] + Duty CF [dB]

Output Power Results

Mode	Channel	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
802.11g	Low	2412	15.35	15.03	18.20	30.00	-11.80
	Mid	2437	15.94	14.95	18.48	30.00	-11.52
	High	2462	15.84	15.08	**18.49**	30.00	**-11.51**
	12	2467	3.20	2.60	5.92	30.00	-24.08
	13	2472	0.58	0.52	3.56	30.00	-26.44
Worst Case					***18.49***	30.00	***-11.51***

Mode	Channel	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
802.11n	Low	2412	15.44	15.01	18.24	**30.00**	-11.76
	Mid	2437	15.98	15.11	**18.58**	**30.00**	**-11.42**
	High	2462	15.90	14.90	18.44	**30.00**	-11.56
	12	2467	3.11	2.56	5.85	**30.00**	-24.15
	13	2472	0.57	0.51	3.55	**30.00**	-26.45
Worst Case					***18.58***	30.00	***-11.42***

10.3. PSD

LIMITS

FCC §15.247

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.

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RESULTS

10.3.1. TEST RESULTS

Included in Calculations of Corr'd Power			
Duty Cycle CF [dB]	b	0.00	dB
	g	0.00	dB
	n	0.00	dB

Calculation of Outpu Power result

1. 1TX
Corr'd PSD [dBm] = Meas PSD [dBm] + Duty CF [dB]

2. 2TX
Sum PSD = Ant1_Meas PSD [mW] + Ant1_Meas PSD [mW]
Total Corr'd PSD [dBm] = Sum PW [dBm] + Duty CF [dB]

PSD Results

Mode	Channel	Frequency [MHz]	Antenna 1 Meas PSD [dBm/3kHz]	Antenna 2 Meas PSD [dBm/3kHz]	Antenna 1 Corr'd PSD [dBm/3kHz]	Antenna 2 Corr'd PSD [dBm/3kHz]	PSD Limit [dBm/3kHz]	PSD Margin [dB]
802.11b	Low	2412	-12.11	-12.51	-12.11	**-12.51**	8.00	-20.11
	Mid	2437	-12.39	-12.68	-12.39	-12.68	8.00	-20.39
	High	2462	-12.05	-12.81	**-12.05**	-12.81	8.00	**-20.05**
	12	2467	-27.68	-28.68	-27.68	-28.68	8.00	-35.68
	13	2472	-30.10	-30.53	-30.10	-30.53	8.00	-38.10
Worst Case					***-12.05***	-12.51	8.00	***-20.05***

PSD Results

Mode	Channel	Frequency [MHz]	Antenna 1 Meas PSD [dBm/3kHz]	Antenna 2 Meas PSD [dBm/3kHz]	Total Corr'd PSD [dBm/3kHz]	PSD Limit [dBm/3kHz]	PSD Margin [dB]
802.11g	Low	2412	-17.06	-16.31	-13.66	8.00	-21.66
	Mid	2437	-16.53	-16.62	-13.57	8.00	-21.57
	High	2462	-15.94	-16.07	**-12.99**	8.00	**-20.99**
	12	2467	-28.60	-29.44	-25.99	8.00	-33.99
	13	2472	-31.56	-31.99	-28.76	8.00	-36.76
Worst Case					***-12.99***	8.00	***-20.99***

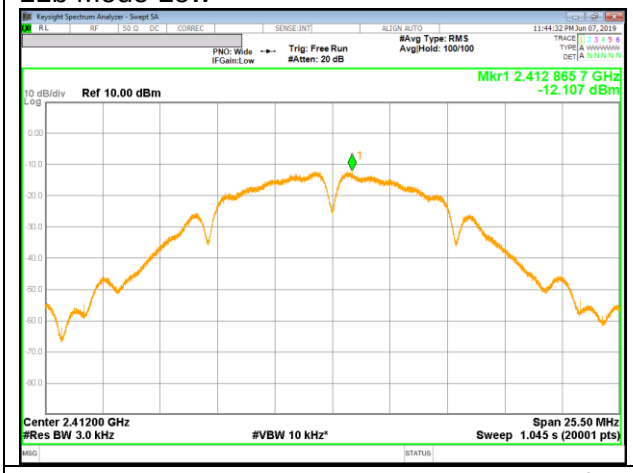
PSD Results

Mode	Channel	Frequency [MHz]	Antenna 1 Meas PSD [dBm/3kHz]	Antenna 2 Meas PSD [dBm/3kHz]	Total Corr'd PSD [dBm/3kHz]	PSD Limit [dBm/3kHz]	PSD Margin [dB]
802.11n	Low	2412	-19.08	-18.60	-15.82	8.00	-23.82
	Mid	2437	-18.46	-18.03	**-15.23**	8.00	**-23.23**
	High	2462	-18.49	-18.39	-15.43	8.00	-23.43
	12	2467	-31.06	-32.16	-28.56	8.00	-36.56
	13	2472	-34.06	-33.93	-30.99	8.00	-38.99
Worst Case					***-15.23***	8.00	***-23.23***

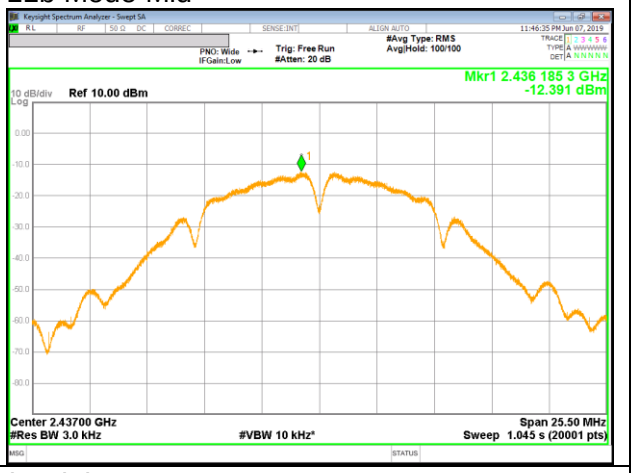
10.3.2. **PSD PLOTS**

ANT 1

11b Mode Low

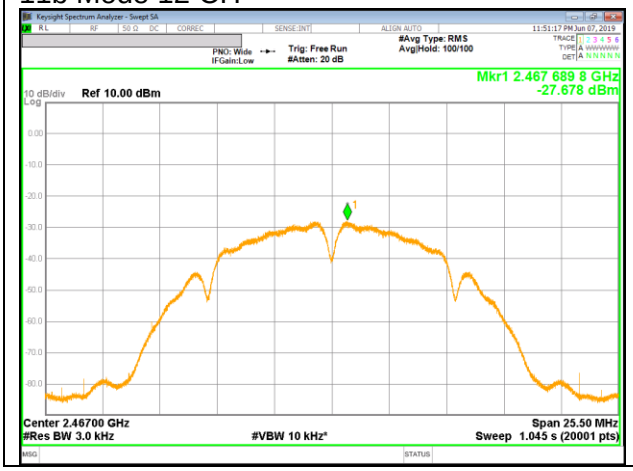


11b Mode Mid

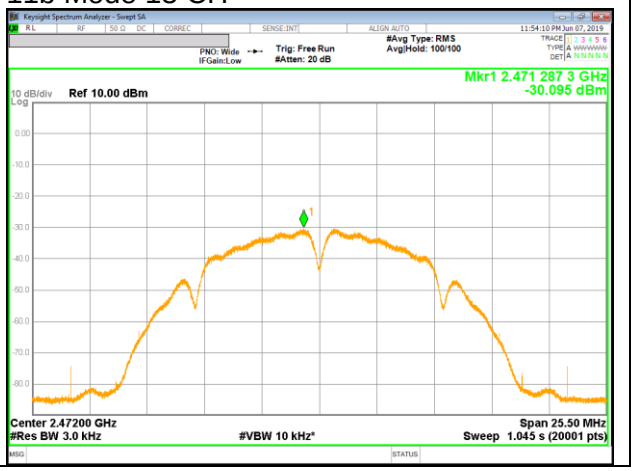


11b Mode High

11b Mode 12 CH

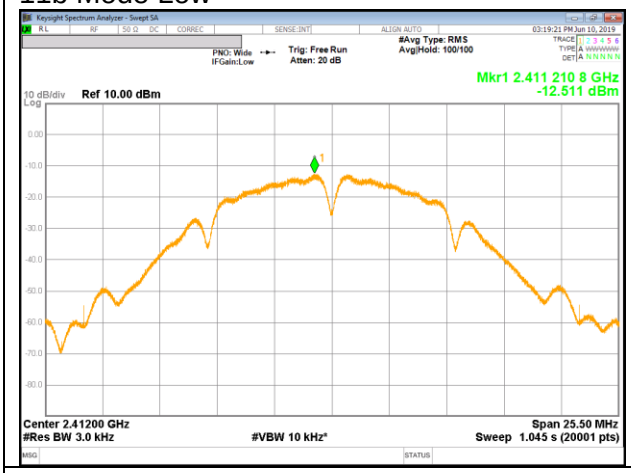


11b Mode 13 CH

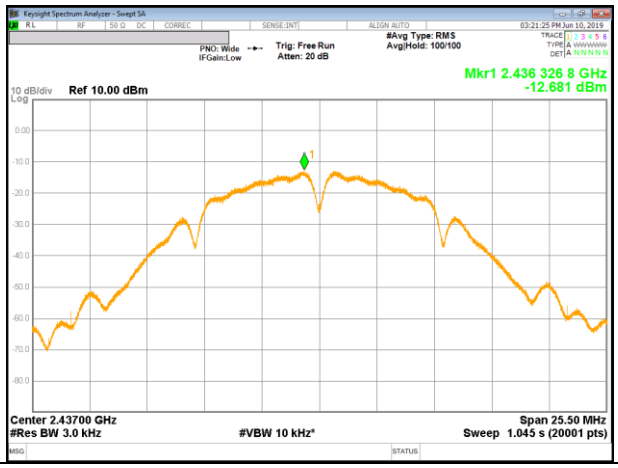


ANT 2

11b Mode Low

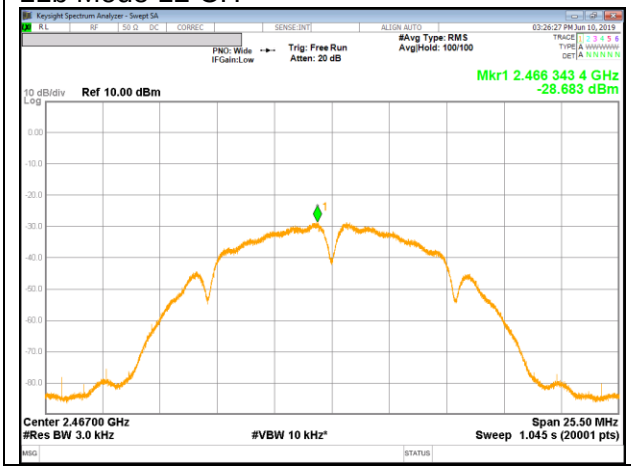


11b Mode Mid

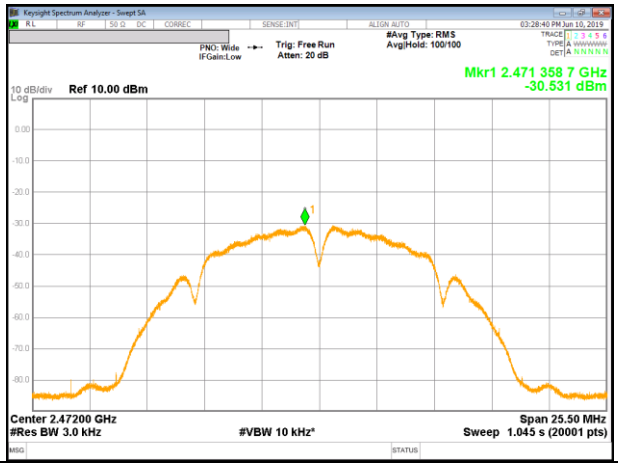


11b Mode High

11b Mode 12 CH

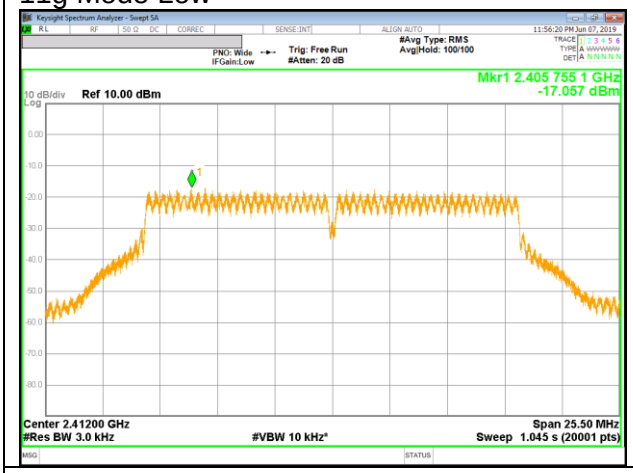


11b Mode 13 CH

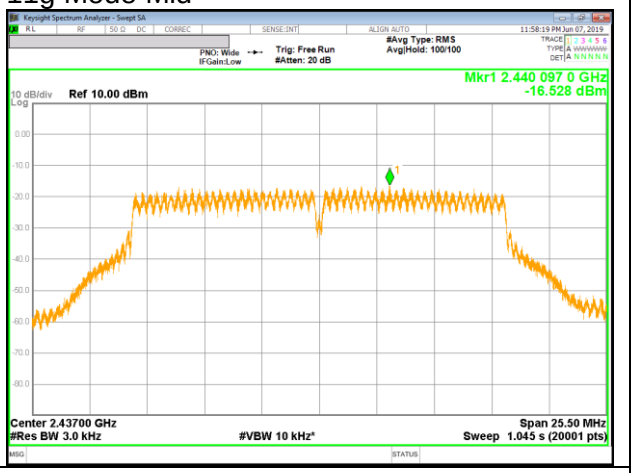


ANT 1

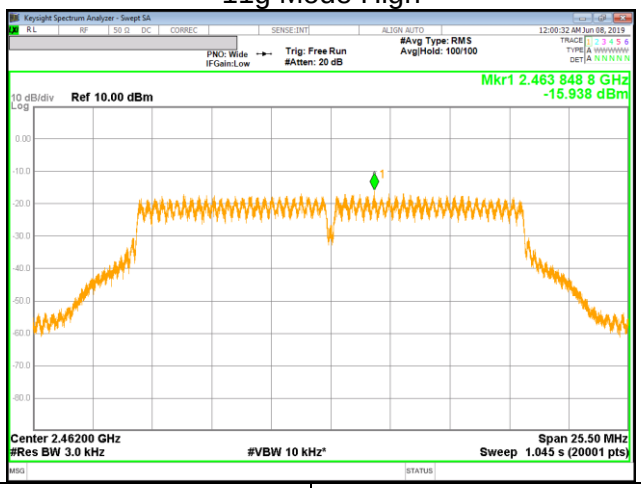
11g Mode Low



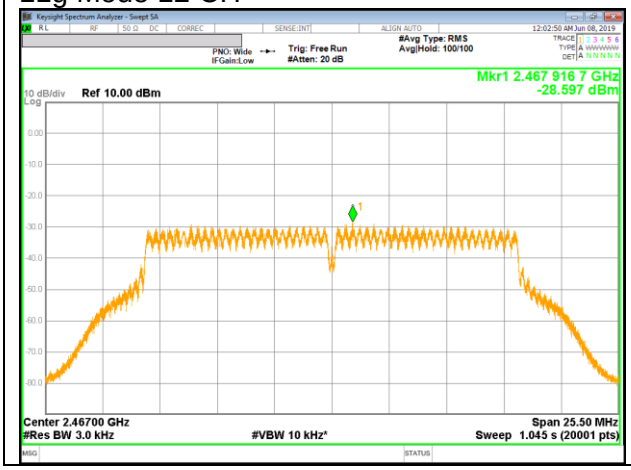
11g Mode Mid



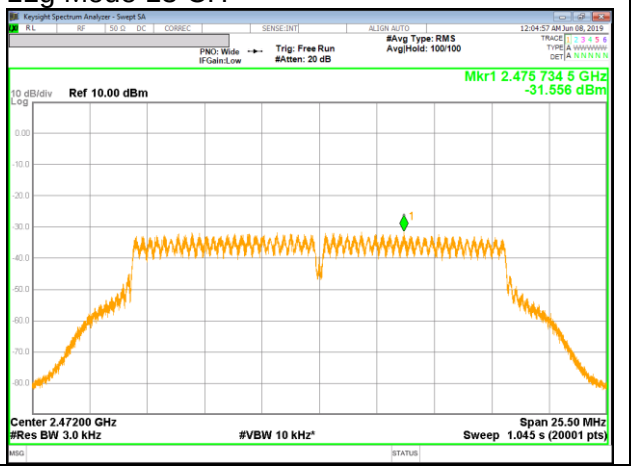
11g Mode High



11g Mode 12 CH

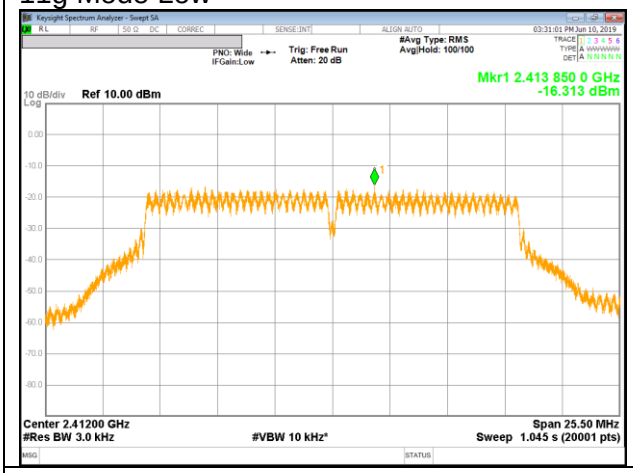


11g Mode 13 CH

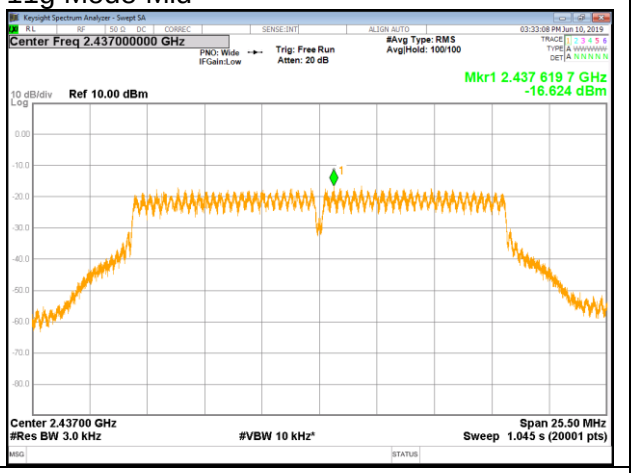


ANT 2

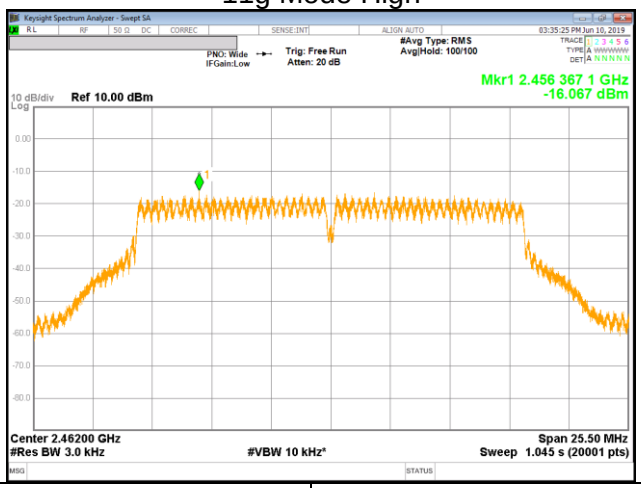
11g Mode Low



11g Mode Mid



11g Mode High



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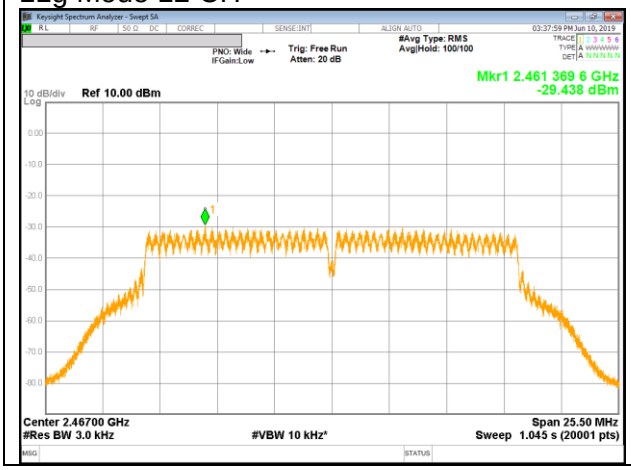
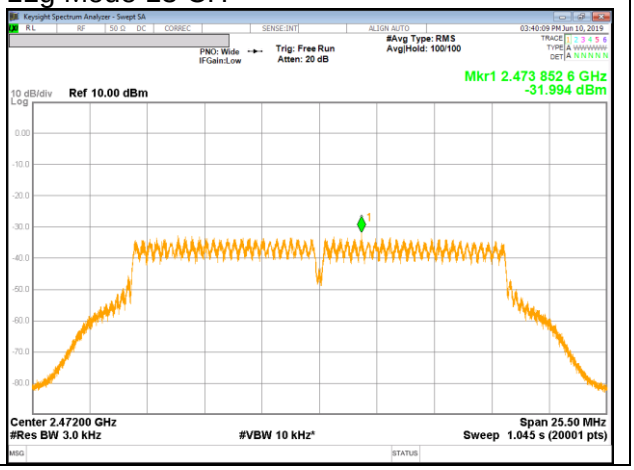
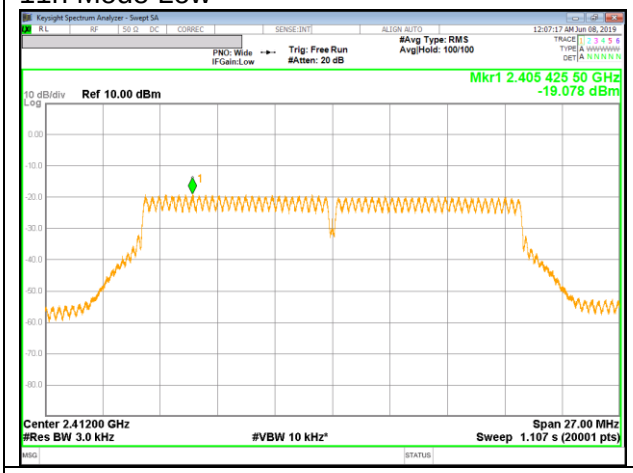


11g Mode 13 CH

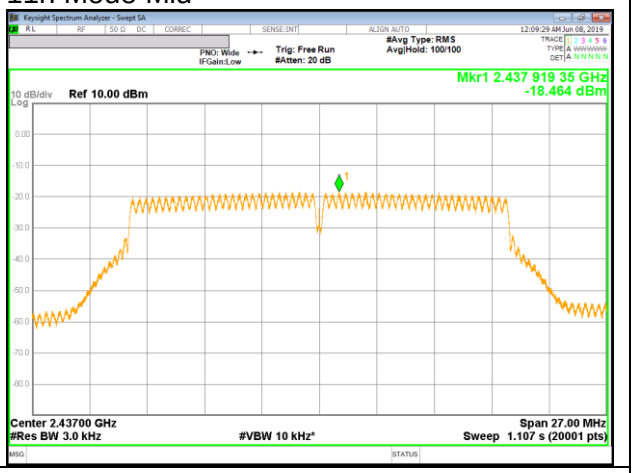


ANT 1

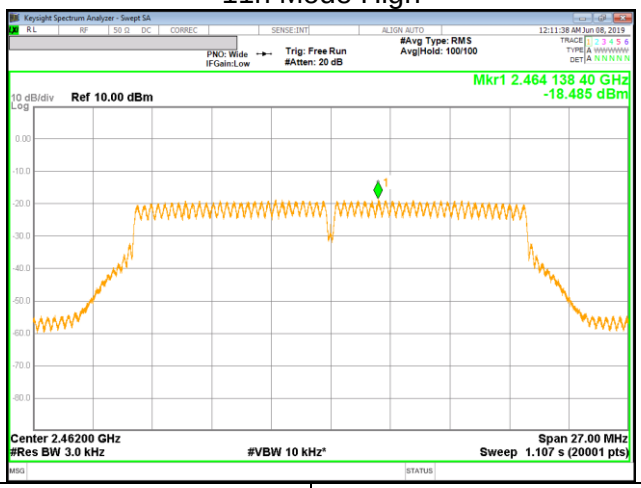
11n Mode Low



11n Mode Mid



11n Mode High



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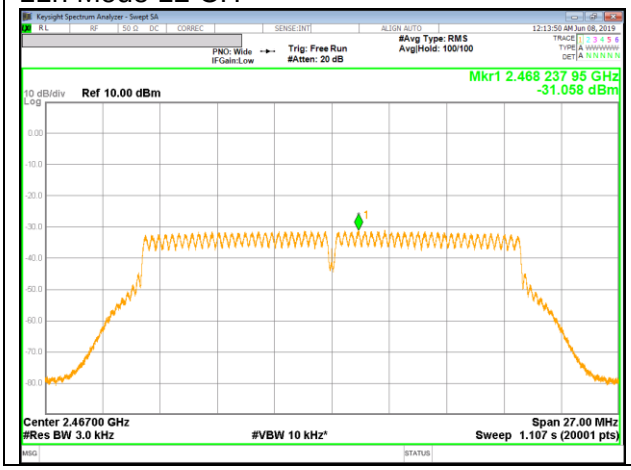

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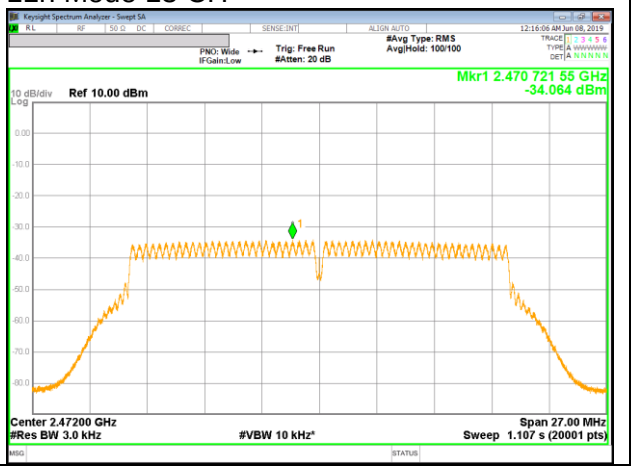
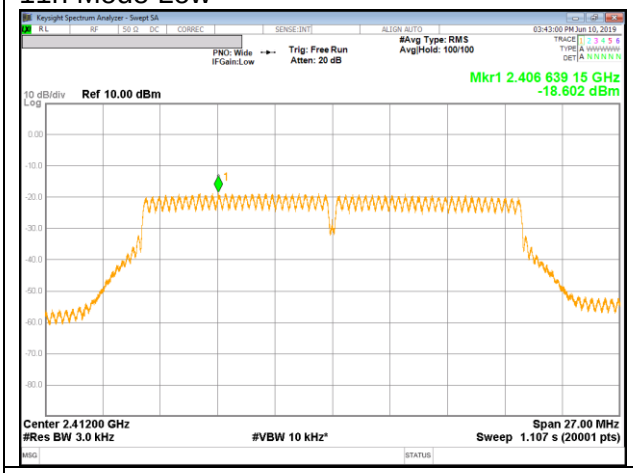
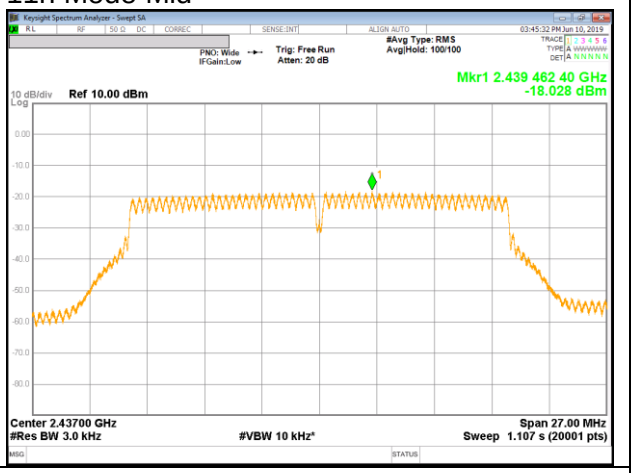


ANT 2

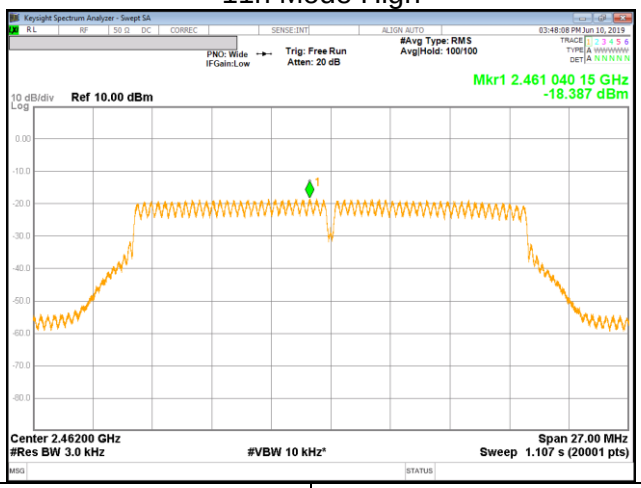
11n Mode Low



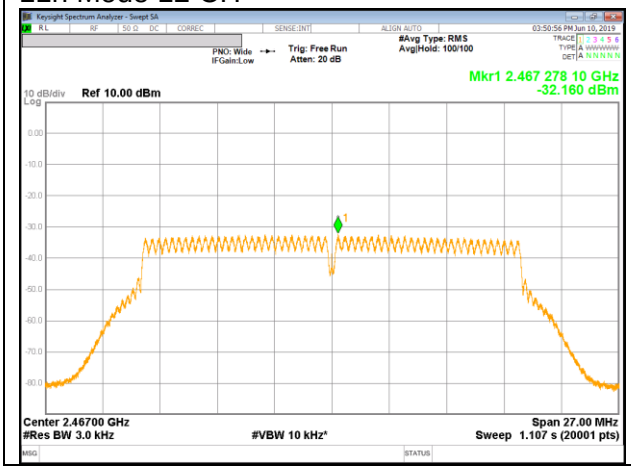
11n Mode Mid



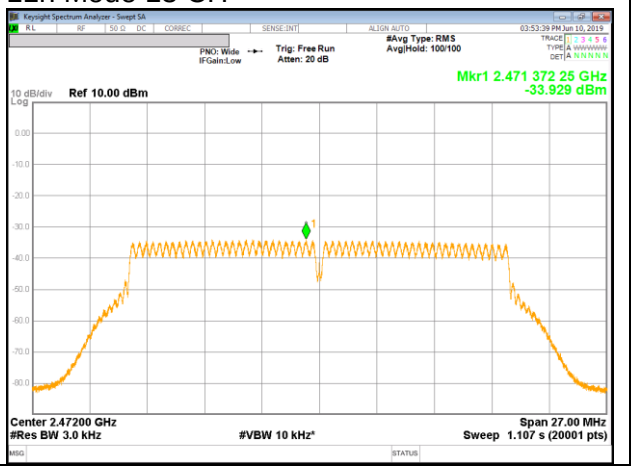
11n Mode High



11n Mode 12 CH



11n Mode 13 CH



10.4. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge, out-of-band emissions (where measurements to the general radiated limits will not be made)

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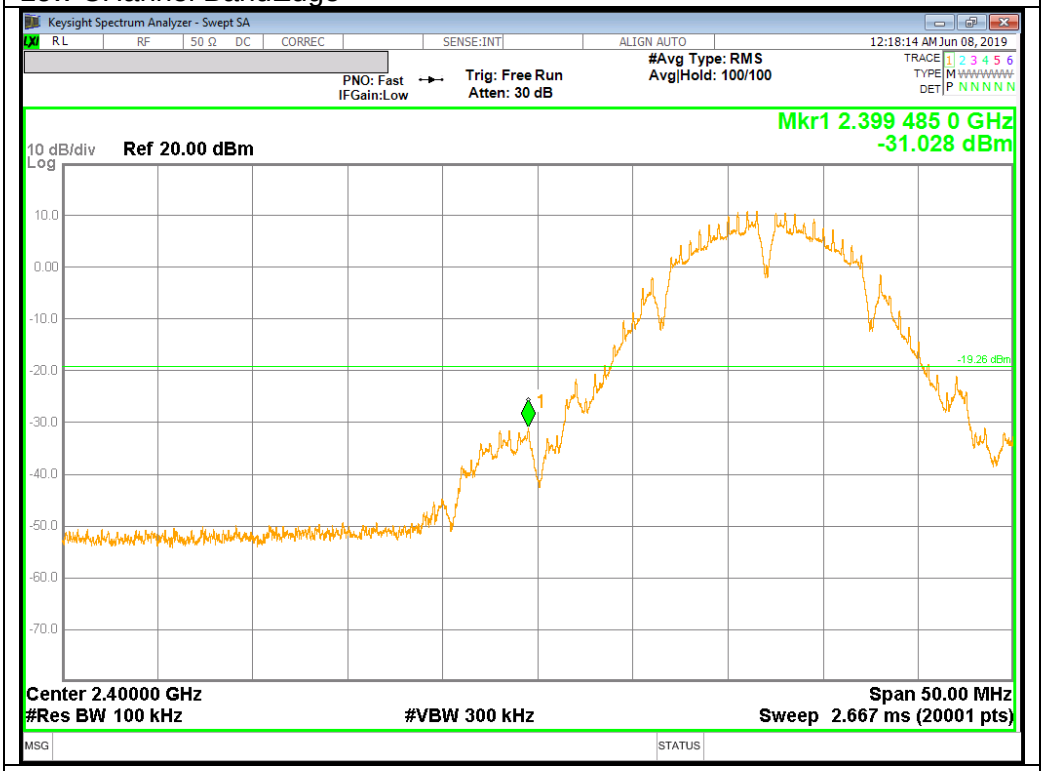
RESULTS

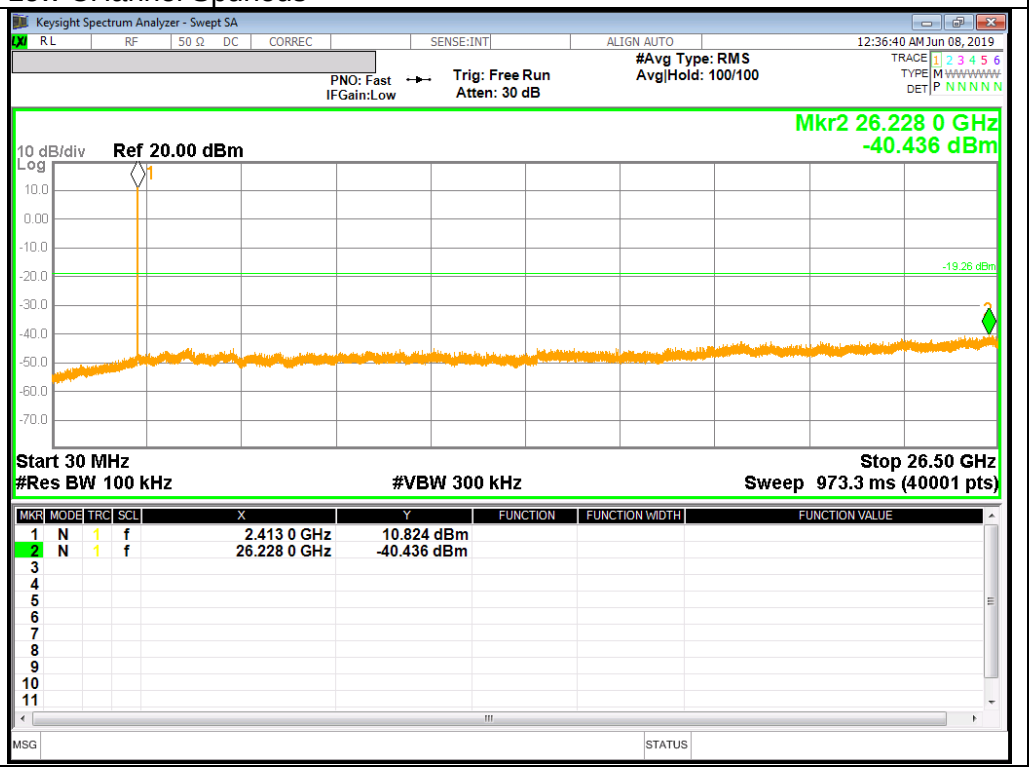
10.4.1. 802.11b MODE IN THE 2.4 GHz BAND

ANT1

Low CHannel BandEdge

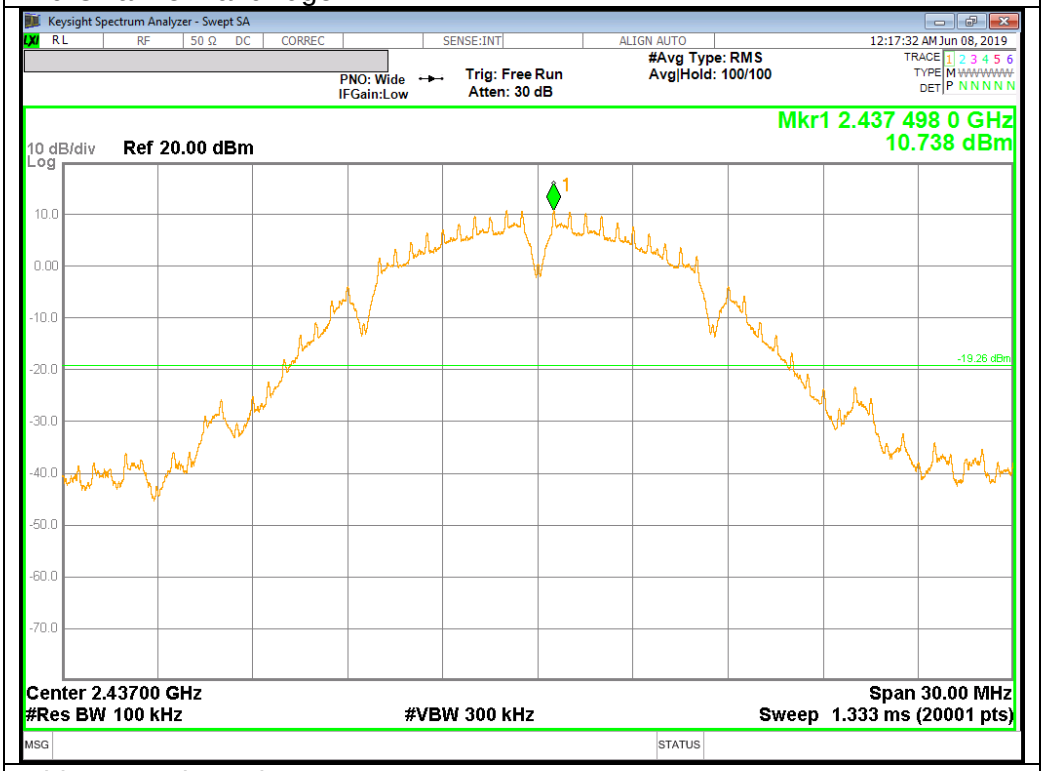


Low CHannel Spurious

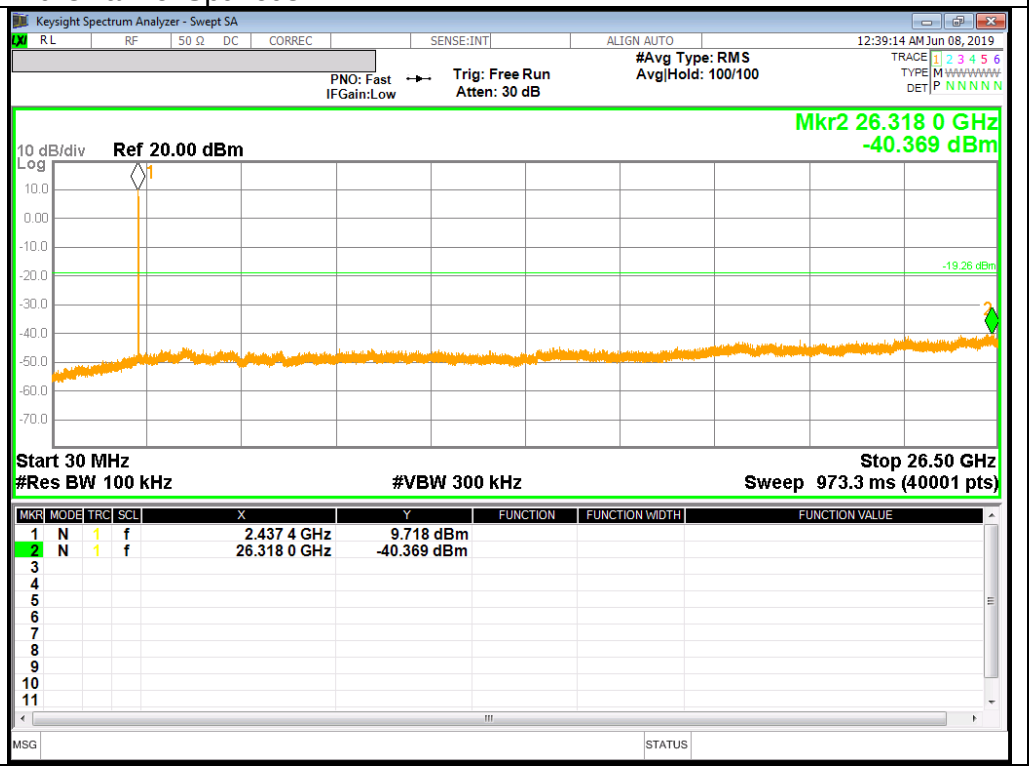


ANT1

Mid CHannel BandEdge

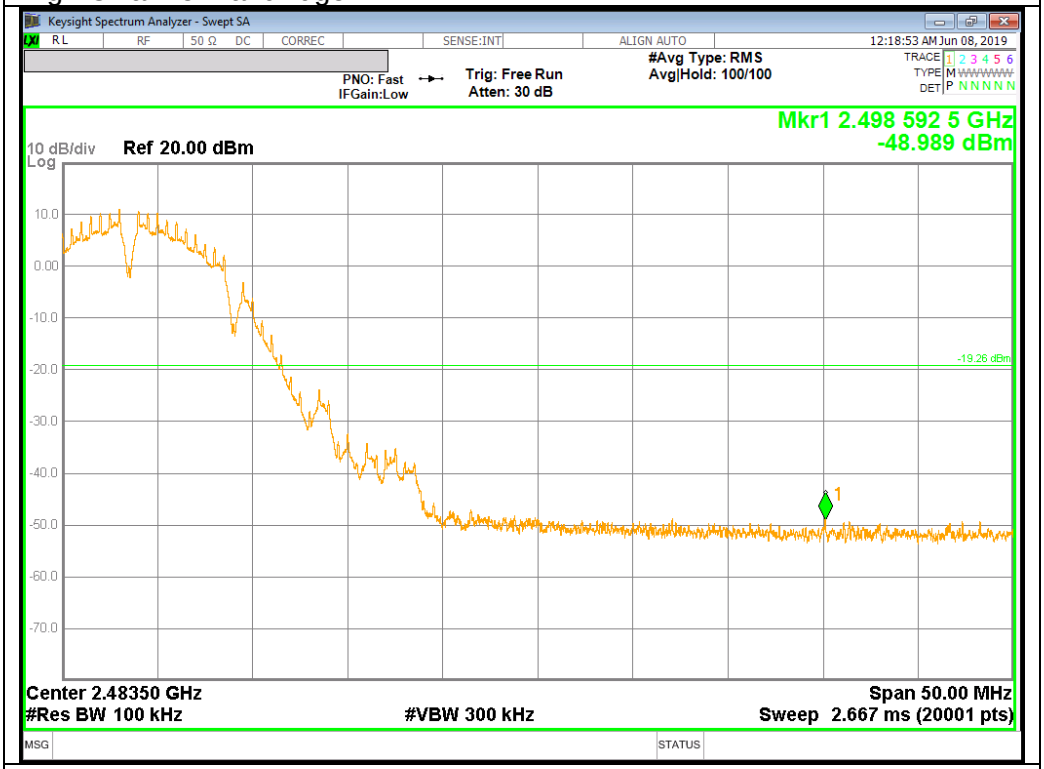


Mid CHannel Spurious



ANT1

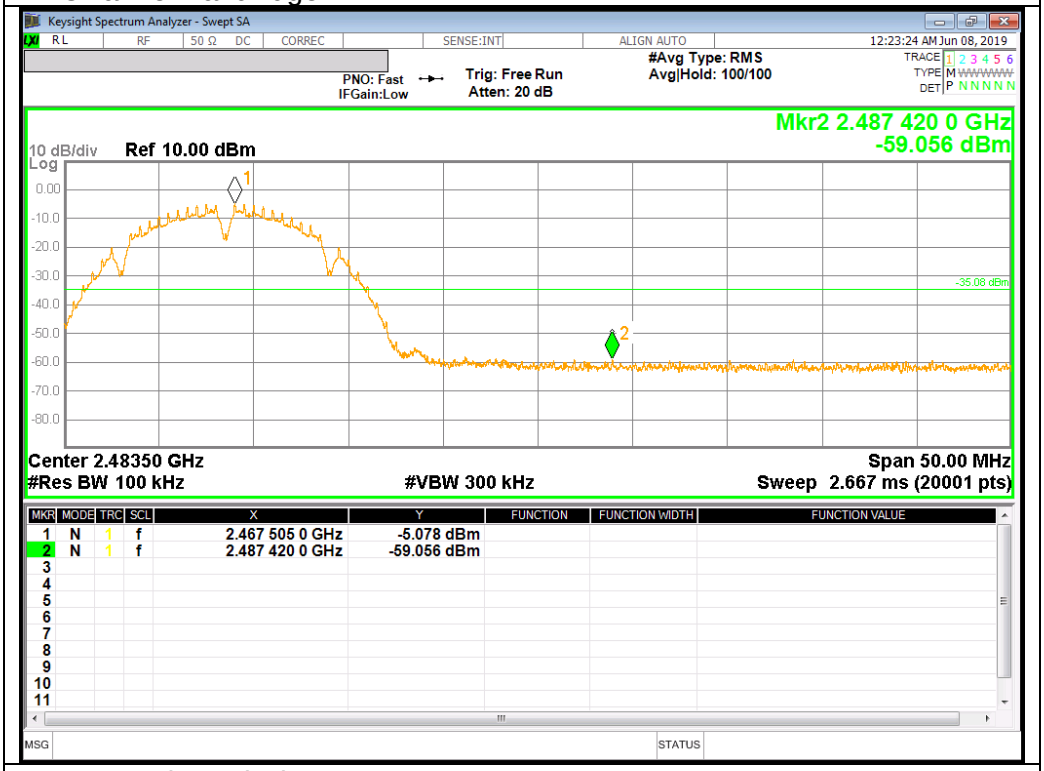
High CHannel BandEdge



High CHannel Spurious

ANT1

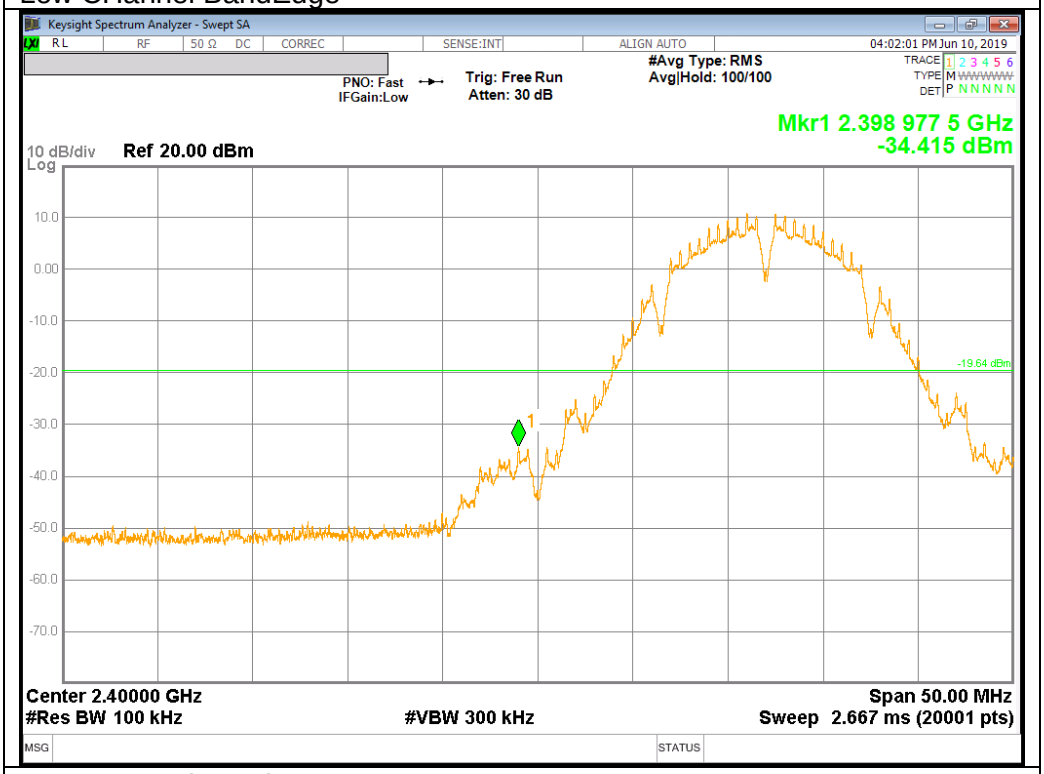
12 CHannel BandEdge



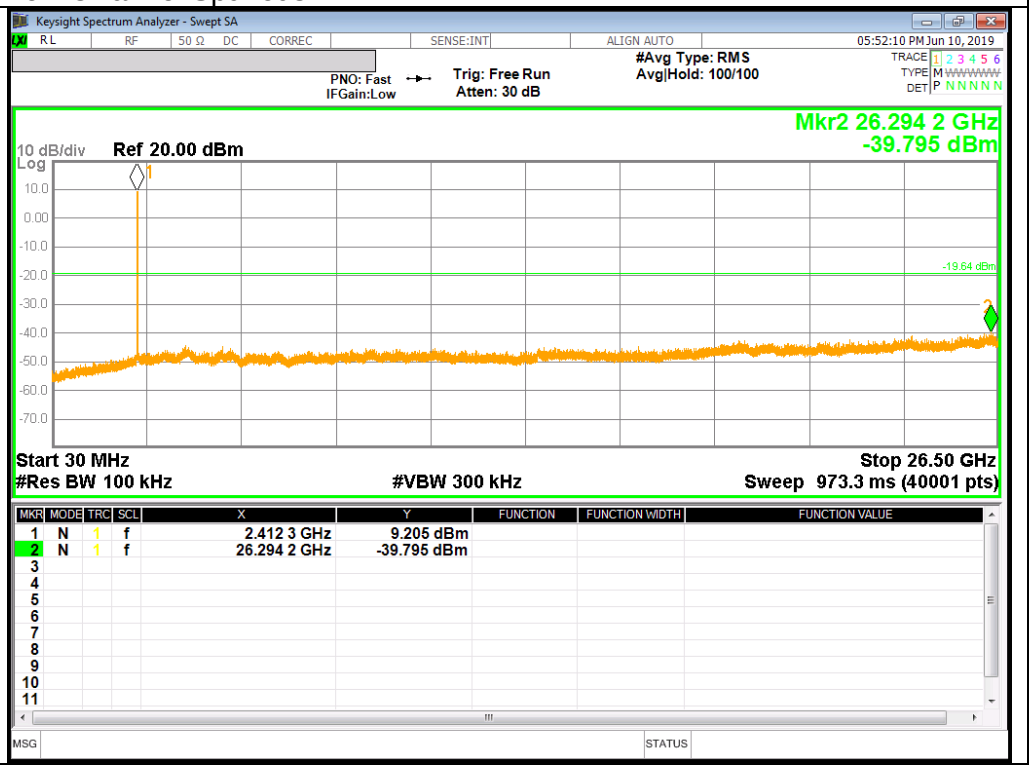
13 CHannel BandEdge

ANT2

Low CHannel BandEdge

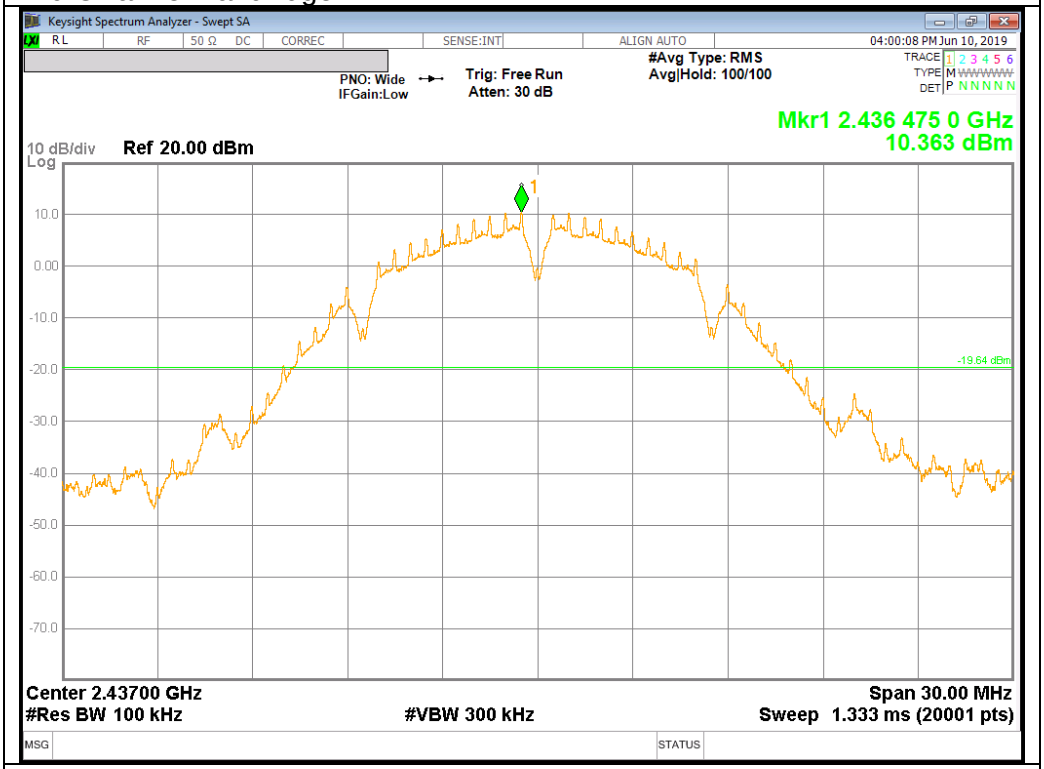


Low CHannel Spurious



ANT2

Mid CHannel BandEdge



Mid CHannel Spurious