FCC Test Report

Report No.: AGC04983200901FE06

FCC ID	:	2AQTVSMARTLOCKX
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Altro Smart Lock
BRAND NAME	:	Altro Smart
MODEL NAME	:	ModelX
APPLICANT	:	ALTRO SMART INC
DATE OF ISSUE	:	Sep. 17, 2020
STANDARD(S) **TEST PROCEDURE(S)**	:	FCC Part 15.407 KDB 789033 D02 v02r01
REPORT VERSION	:	V1.0

Attestation of ***G***lobal ***C***ompliance (Shenzhen) Co., Ltd

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Sep. 17, 2020	Valid	Initial Release

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1. VERIFICATION OF CONFORMITY

Applicant	ALTRO SMART INC
Address	1551 McCarthy Blvd, Suite 212, Milpitas, CA 95035
Manufacturer	ALTRO SMART INC.
Address	1551 McCarthy Blvd, Suite 212, Milpitas, CA 95035
Factory	VINROX TECHNOLOGIES PVT LTD
Address	336/22, GIDC, MAKARPURA, VADODARA-390010, GUJARAT, INDIA
Product Designation	Altro Smart Lock
Brand Name	Altro Smart
Test Model	ModelX
Date of test	Sep. 08, 2020 to Sep. 17, 2020
Deviation	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BGN/RF

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with requirement of FCC Part 15 Rules requirement.

Prepared By	Sky Dong (Project Engineer)	Sep. 17, 2020
Reviewed By	Max Zhang (Reviewer)	Sep. 17, 2020
Approved By	Forrest Lei (Authorized Officer)	Sep. 17, 2020

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as “Altro Smart Lock”. It is designed by way of utilizing the OFDM technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	5150 MHz ~ 5250MHz; 5260 MHz ~ 5320MHz, 5500 MHz ~ 5700MHz, 5725 MHz ~ 5850MHz
Output Power	IEEE 802.11a20:18.51dBm
Modulation	OFDM
Number of channels	24
Hardware Version	A
Software Version	A
Antenna Designation	Integral Antenna(Comply with requirements of the FCC part 15.203)
Number of transmit chain	1
Antenna Gain	4.0dBi
Power Supply	DC 3.6V by battery

Note: 1. The EUT is designed as client without radar detection.
2. The device do not support TPC.

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2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency	Frequency Band	Channel Number	Frequency
5150 MHz ~ 5250MHz	36	5180 MHz	5500 MHz ~ 5700MHz	120	5600 MHz
	40	5200 MHz		124	5620 MHz
	44	5220 MHz		128	5640 MHz
	48	5240 MHz		132	5660 MHz
5260 MHz ~ 5320MHz	52	5260 MHz		136	5680 MHz
	56	5280 MHz		140	5700 MHz
	60	5300 MHz	5725 MHz ~ 5850MHz	149	5745 MHz
	64	5320 MHz		153	5765 MHz
5500 MHz ~ 5700MHz	100	5500 MHz		157	5785 MHz
	104	5520 MHz		161	5805 MHz
	108	5540 MHz		165	5825MHz
	112	5560 MHz			
	116	5580 MHz			

Note: For 20MHZ bandwidth system use Channel 36,40,44,48,52,56,60,64,100,104,108,112,116,120,124,128,132,136,140,149,153,157,161,165.

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2.3. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: 2AQTVSMARTLOCKX** filing to comply with the FCC Part 15 requirements.

2.4. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013).
Radiated testing was performed at an antenna to EUT distance 3 meters.
Others testing (listed at item 5.3) was performed according to the procedures in FCC Part 15.407 rules KDB 789033 D02

2.5. SPECIAL ACCESSORIES

Refer to section 5.2.

2.6. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.7. ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.

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3. MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in measurement” (GUM) published by CISPR and ANSI.

- Uncertainty of Conducted Emission, Uc = ±3.2 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±3.9 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB

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4. DESCRIPTION OF TEST MODES

Mode	Available channel	Tested channel	Modulation	Date rate(Mbps)
802.11a	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165	36, 40, 48, 52, 60, 64, 100, 120, 140, 149, 157, 165	OFDM	6Mbps

Note:

1. The EUT has been set to operate continuously on tested channel individually, and the EUT is operating at its maximum duty cycle>or equal 98%
2. All modes under which configure applicable have been tested and the worst mode test data recording in the test report, if no other mode data.
3. The test software is the CC3xxxRadioTool-1.0.3.15 which can set the EUT into the individual test modes.
4. For battery operated equipment, the battery is full charged during test.

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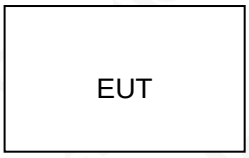
5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Configure 1:



5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	Altro Smart Lock	ModelX	2AQTVSMARTLOCKX	EUT

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.407	6dB Bandwidth	Compliant
§15.407	Emission Bandwidth	Compliant
§15.203	ANTENNA REQUIREMENT	Compliant
§15.407	Maximum conducted output power	Compliant
§15.407	Conducted Spurious Emission	Compliant
§15.407	Maximum Conducted Output Power Density	Compliant
§15.209	Radiated Emission	Compliant
§15.407	Band Edges	Compliant
§15.207	Line Conduction Emission	N/A

Note: The conducted emission tests at AC port are not required for devices which only employ battery power for operation.

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6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	May 15, 2020	May 14, 2021
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 12, 2019	Dec. 11, 2020
Power sensor	Aglient	U2021XA	MY54110007	Sep. 10, 2019	Sep. 09, 2020
5GHz Fliter	Micro-tronics	N/A	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Sep. 03, 2020	Sep. 02 2022
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep.21, 2019	Sep. 20, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 22, 2020	May 21, 2022
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May. 17, 2019	May. 16, 2021
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 15, 2019	Oct. 16, 2020
ANTENNA	SCHWARZBECK	VULB9168	D69250	Sep. 20, 2019	Sep. 19, 2021
Test software	FARA	EZ_EMC (Ver.RA-03A)	N/A	N/A	N/A

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7. MAXIMUM CONDUCTED OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

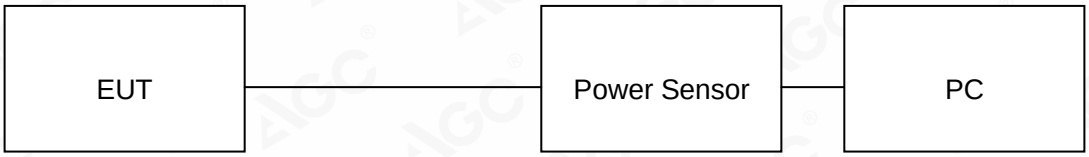
For average power test:

1. Connect EUT RF output port to power sensor through an RF attenuator.
2. Connect the power sensor to the PC.
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Record the maximum power from the software.

Note：The EUT was tested according to KDB 789033 for compliance to FCC 47CFR 15.407 requirements.

7.2. TEST SET-UP

AVERAGE POWER SETUP



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7.3. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT FOR 802.11A20 MODULATION			
Frequency (MHz)	Average Power (dBm)	Applicable Limits (dBm)	Pass or Fail
5180	17.82	23.98	Pass
5200	17.55	23.98	Pass
5240	18.17	23.98	Pass
5260	17.74	23.98	Pass
5300	17.86	23.98	Pass
5320	18.51	23.98	Pass
5500	17.58	23.90	Pass
5600	17.42	23.96	Pass
5700	16.47	23.95	Pass
5745	14.59	30	Pass
5785	15.26	30	Pass
5825	15.27	30	Pass

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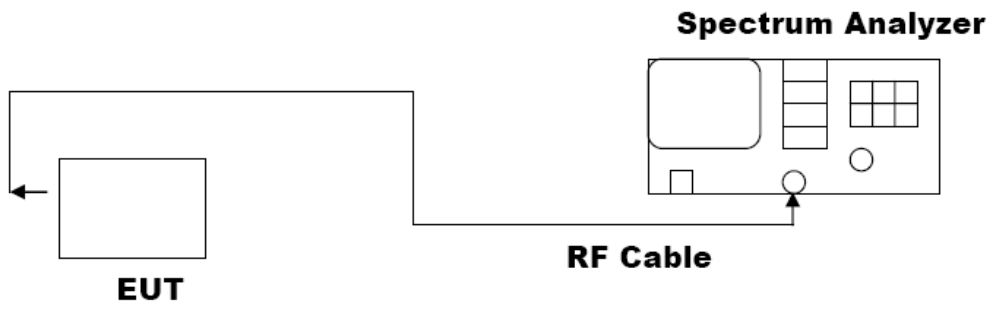
8. 6dB BANDWIDTH

8.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on operation frequency individually.
3. Set RBW = 100kHz.
4. Set the VBW ⩾3*RBW. Detector = Peak. Trace mode = max hold.
5. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.

Note: The EUT was tested according to KDB 789033 for compliance to FCC 47CFR 15.407 requirements.

8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



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8.3. LIMITS AND MEASUREMENT RESULTS

LIMITS AND MEASUREMENT RESULT FOR 802.11A20 MODULATION			
Applicable Limits	Applicable Limits		
	Test Data (MHz)		Criteria
	Frequency (MHz)	-6dB Bandwidth	
>500KHZ	5745MHz	16.33	PASS
	5785MHz	16.34	PASS
	5825MHz	16.33	PASS

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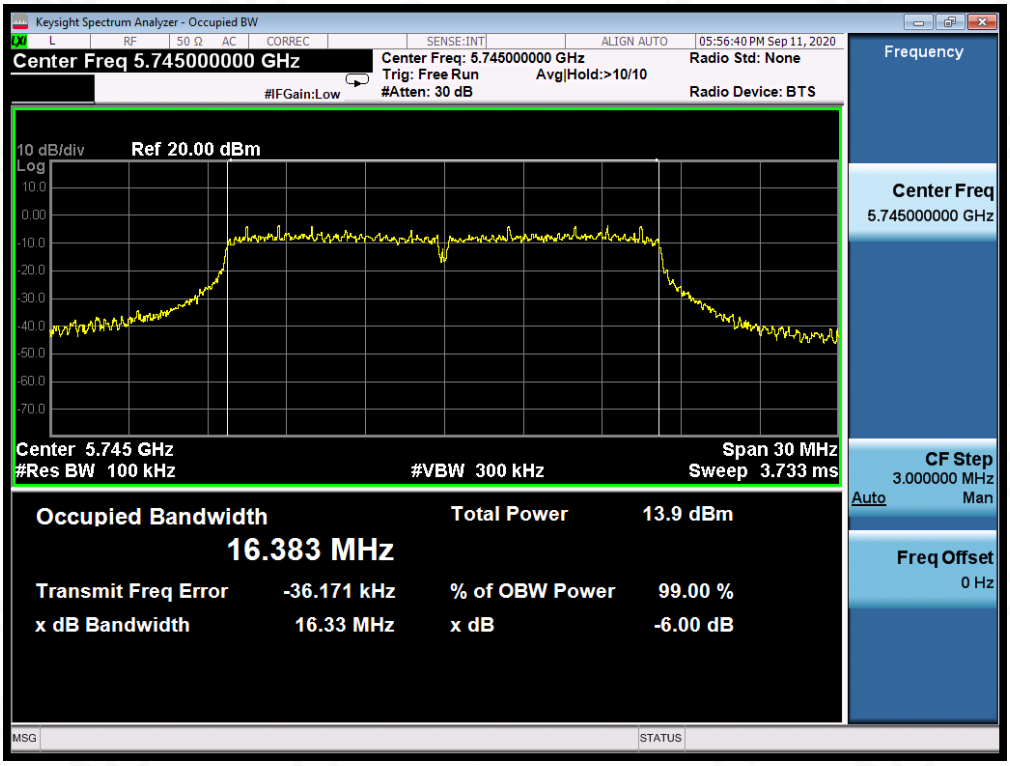
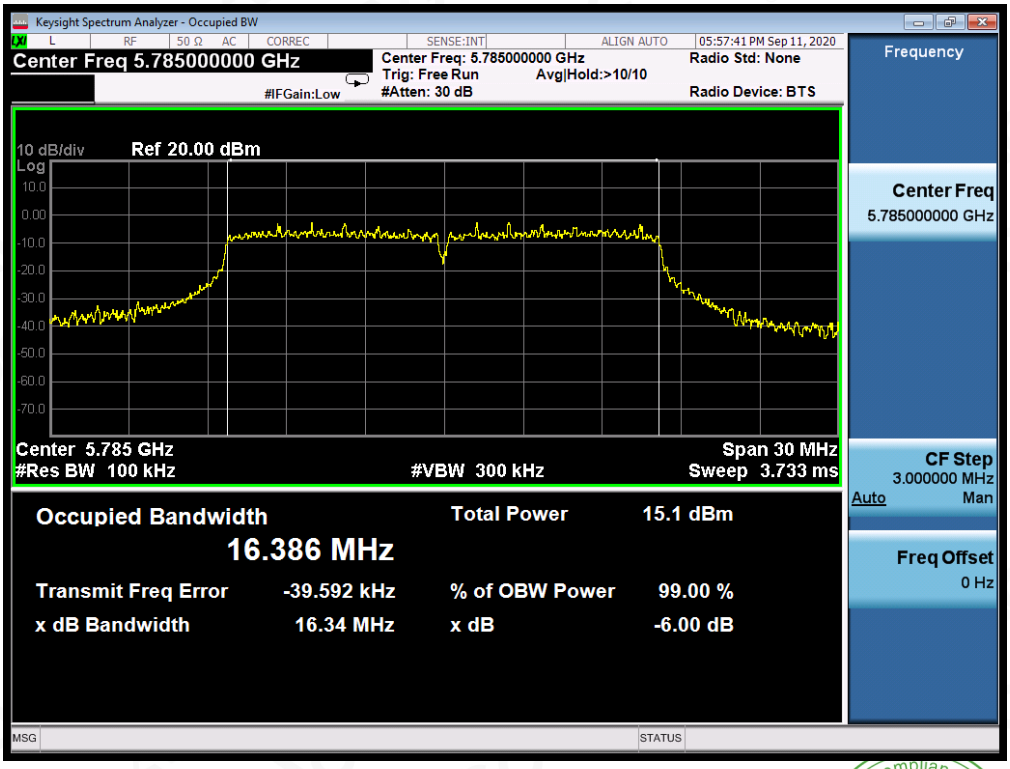
802.11a20 TEST RESULT

TEST PLOT OF BANDWIDTH FOR 5745MHz



TEST PLOT OF BANDWIDTH FOR 5785MHz



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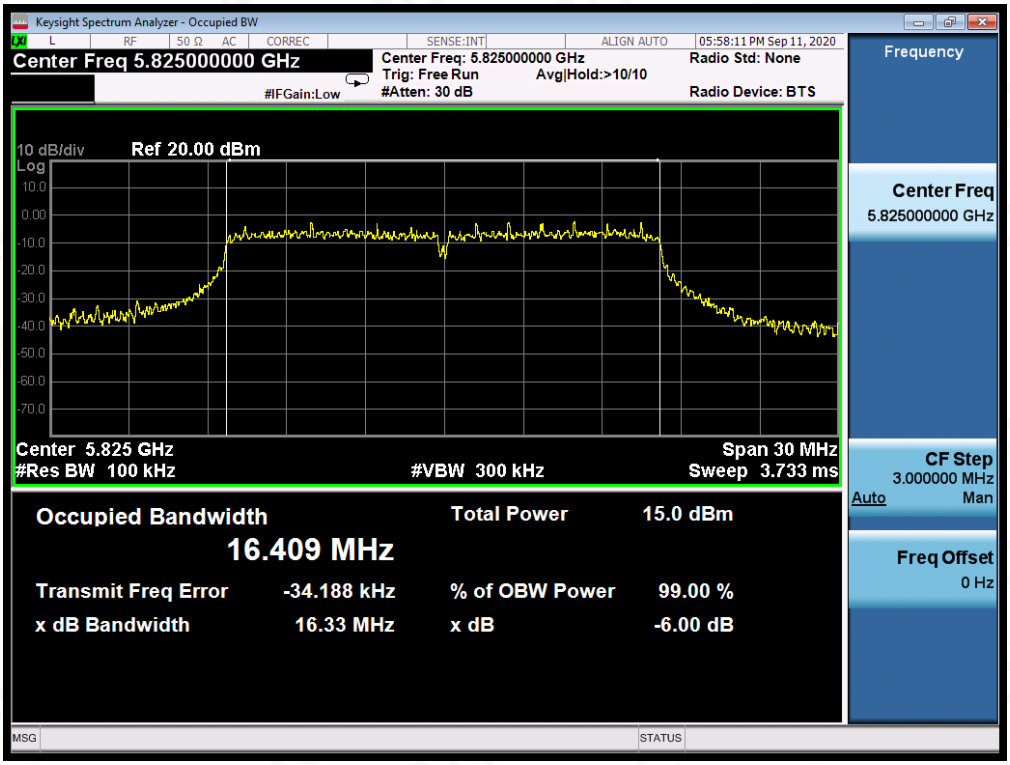
TEST PLOT OF BANDWIDTH FOR 5825MHz



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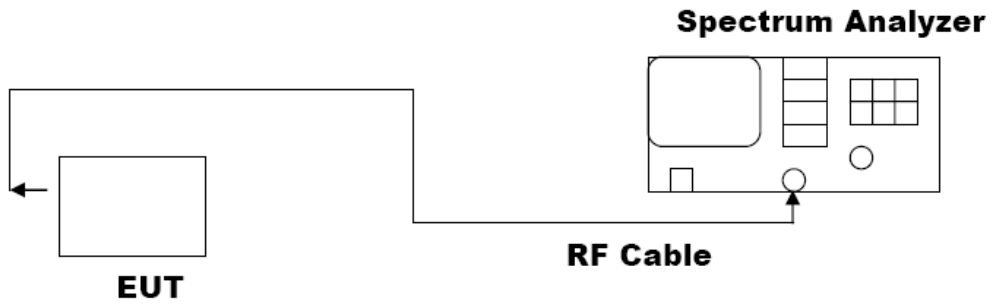
9. EMISSION BANDWIDTH

9.1. MEASUREMENT PROCEDURE

a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Note: The EUT was tested according to KDB 789033 for compliance to FCC 47CFR 15.407 requirements.

9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



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9.3. LIMITS AND MEASUREMENT RESULTS

LIMITS AND MEASUREMENT RESULT FOR 802.11A20 MODULATION				
Applicable Limits	Applicable Limits			
	Test Data (MHz)			Criteria
	Frequency (MHz)	-26dB Bandwidth	99.00% Occupied Bandwidth	
Within the Band	5180MHz	20.35	16.470	PASS
	5200MHz	20.08	16.462	PASS
	5240MHz	20.31	16.462	PASS
	5260MHz	20.64	16.457	PASS
	5300MHz	20.75	16.461	PASS
	5320MHz	20.32	16.464	PASS
	5500MHz	19.52	16.423	PASS
	5600MHz	19.78	16.452	PASS
	5700MHz	19.74	16.480	PASS

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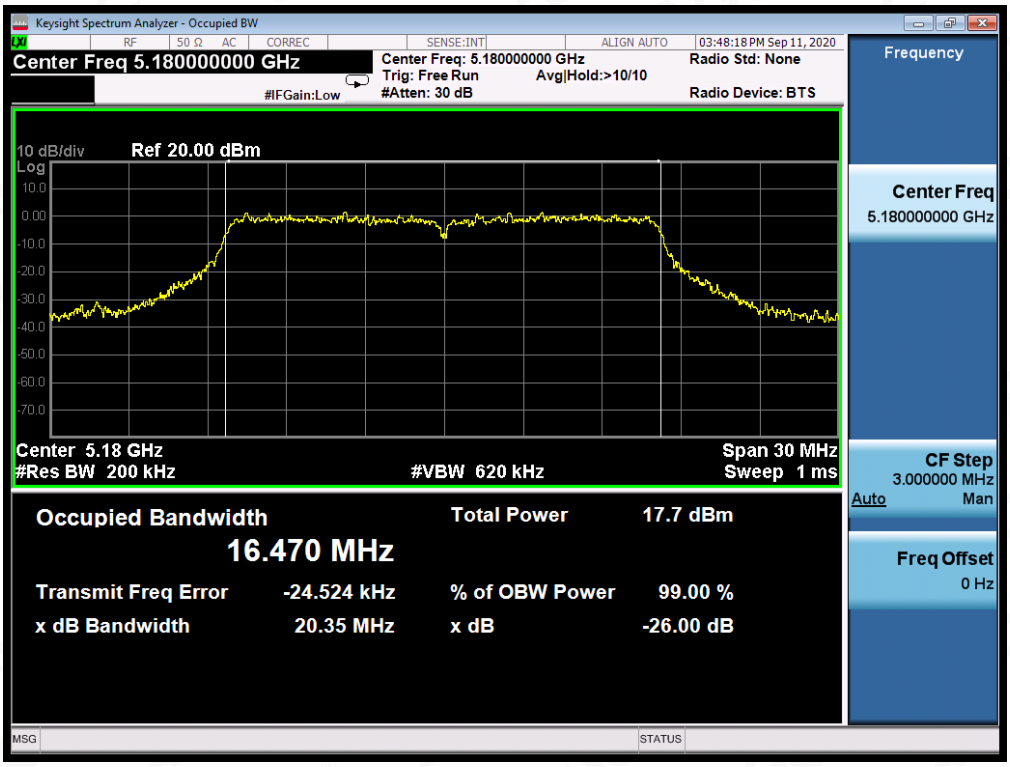
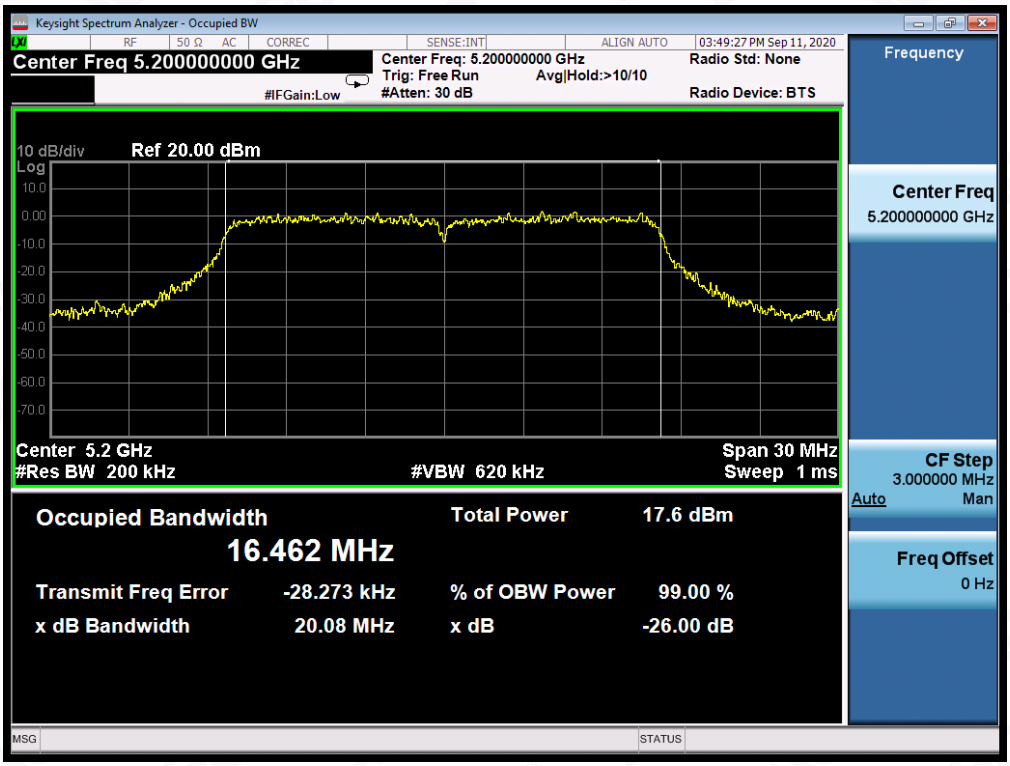
802.11a20 TEST RESULT

TEST PLOT OF BANDWIDTH FOR 5180MHz



TEST PLOT OF BANDWIDTH FOR 5200MHz



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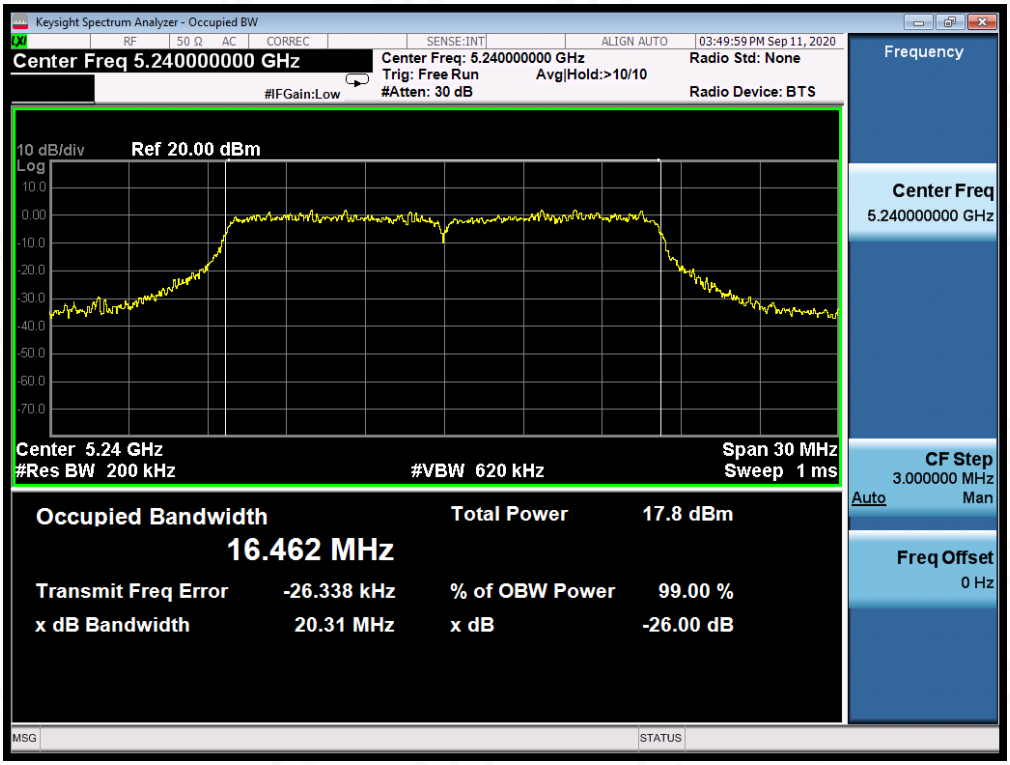
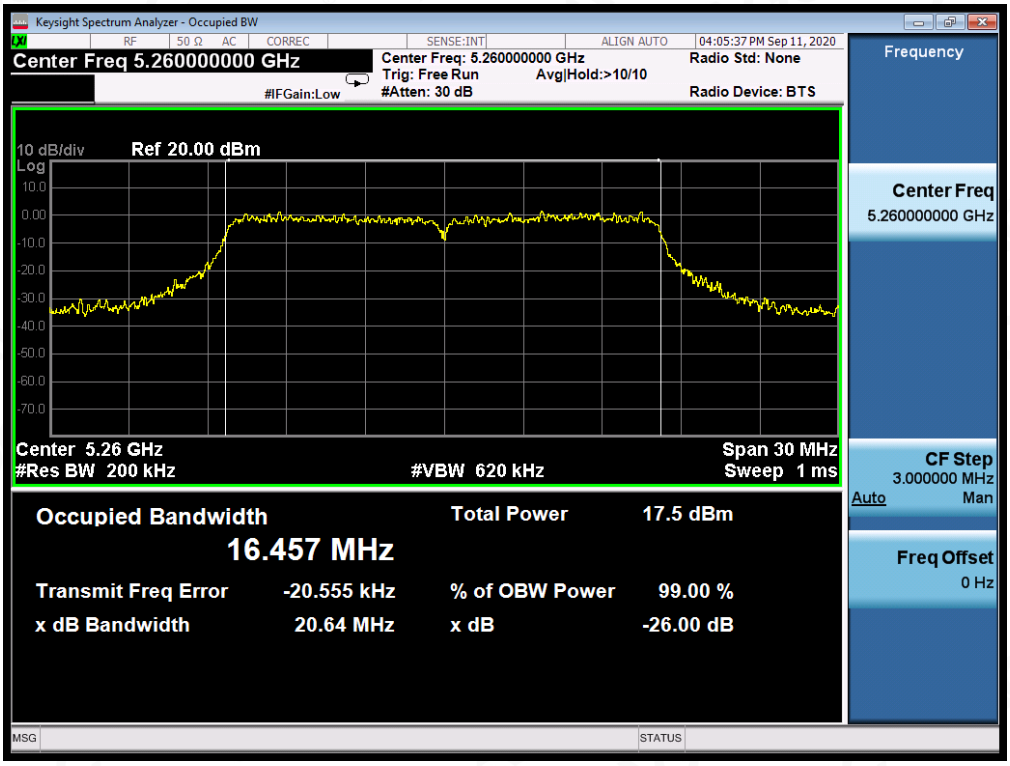
TEST PLOT OF BANDWIDTH FOR 5240MHz



TEST PLOT OF BANDWIDTH FOR 5260MHz



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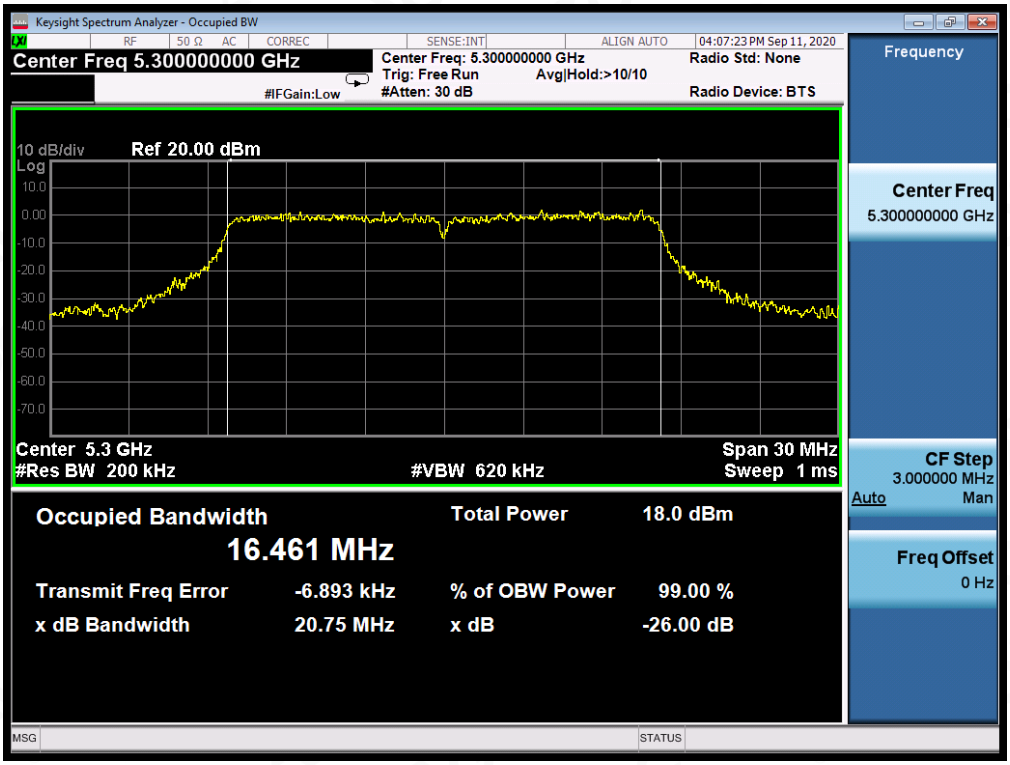
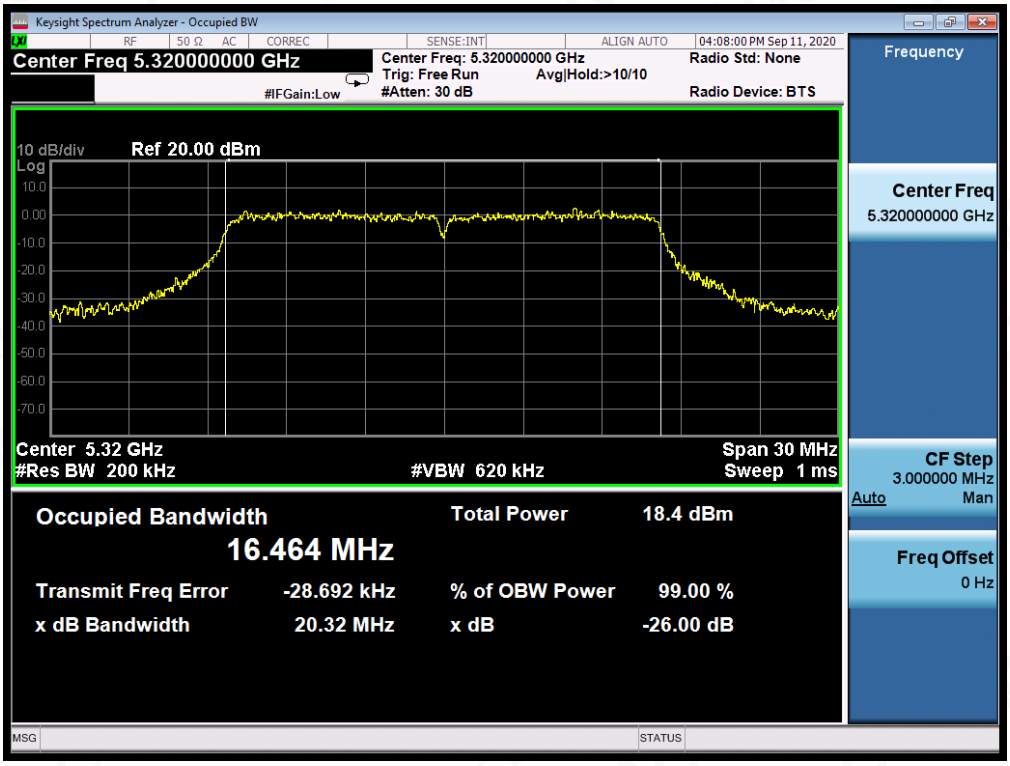
TEST PLOT OF BANDWIDTH FOR 5300MHz



TEST PLOT OF BANDWIDTH FOR 5320MHz



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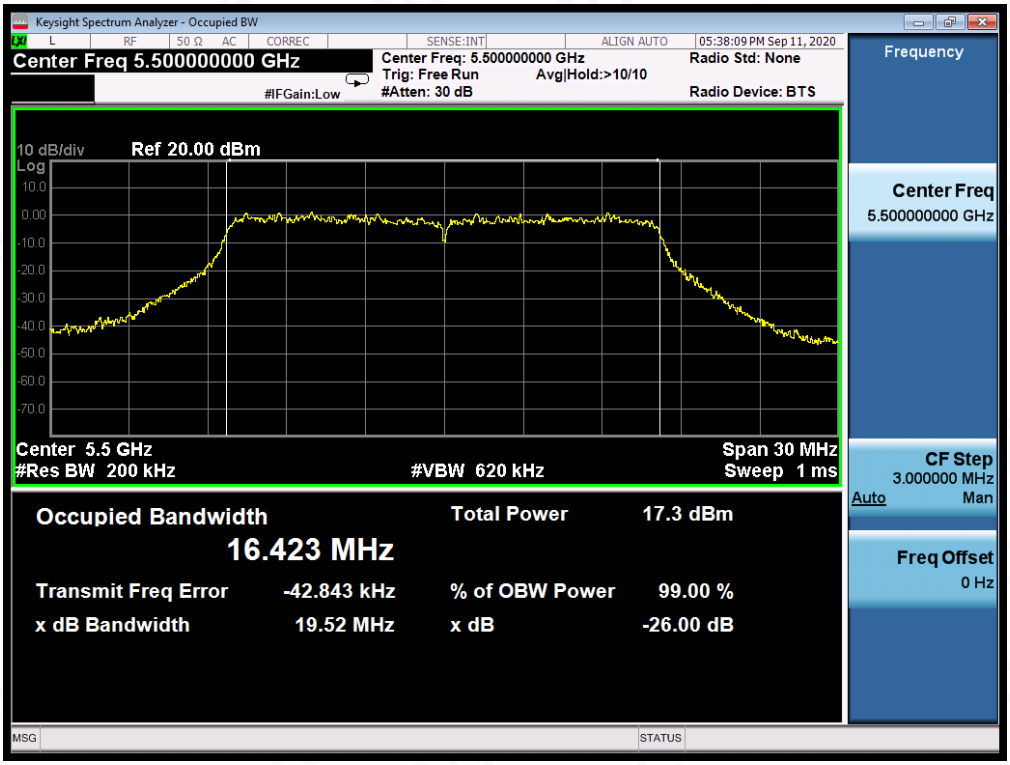
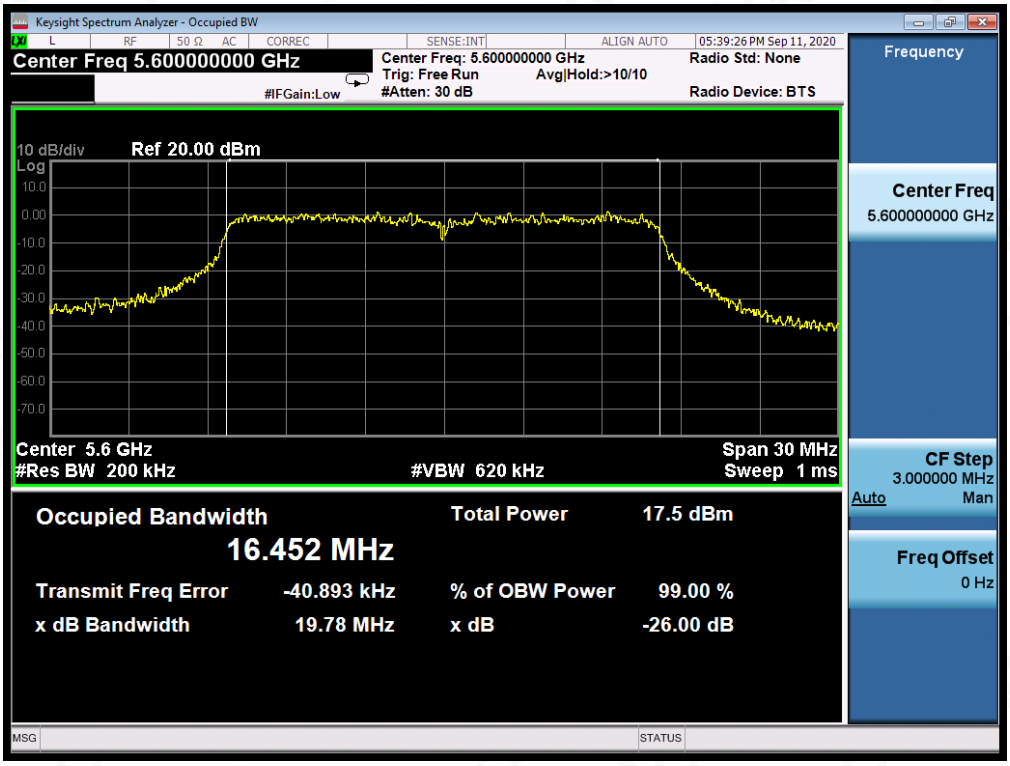
TEST PLOT OF BANDWIDTH FOR 5500MHz



TEST PLOT OF BANDWIDTH FOR 5600MHz



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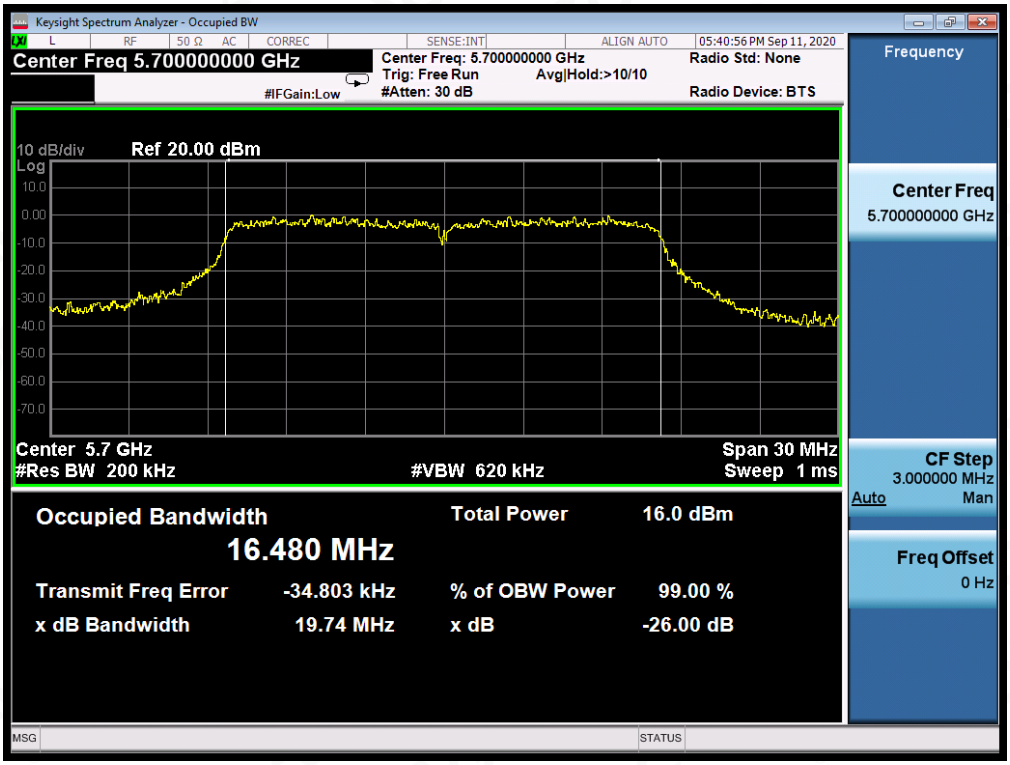
TEST PLOT OF BANDWIDTH FOR 5700MHz



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10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

10.1 MEASUREMENT PROCEDURE

Refer to KDB 789033 section F

10.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

Refer To Section 8.2.

10.3 MEASUREMENT EQUIPMENT USED

Refer To Section 6.

10.4 LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT FOR 802.11A20 MODULATION			
Frequency (MHz)	**Power density (dBm/MHz)**	**Applicable Limits (dBm)**	**Pass or Fail**
5180	1.262	11	Pass
5200	1.003	11	Pass
5240	1.090	11	Pass
5260	0.983	11	Pass
5300	1.266	11	Pass
5320	1.934	11	Pass
5500	0.381	11	Pass
5600	0.610	11	Pass
5700	0.130	11	Pass
Frequency (MHz)	**Power density (dBm/MHz)**	**Applicable Limits (dBm)**	**Pass or Fail**
5745	-3.560	30	Pass
5785	-4.374	30	Pass
5825	-4.140	30	Pass

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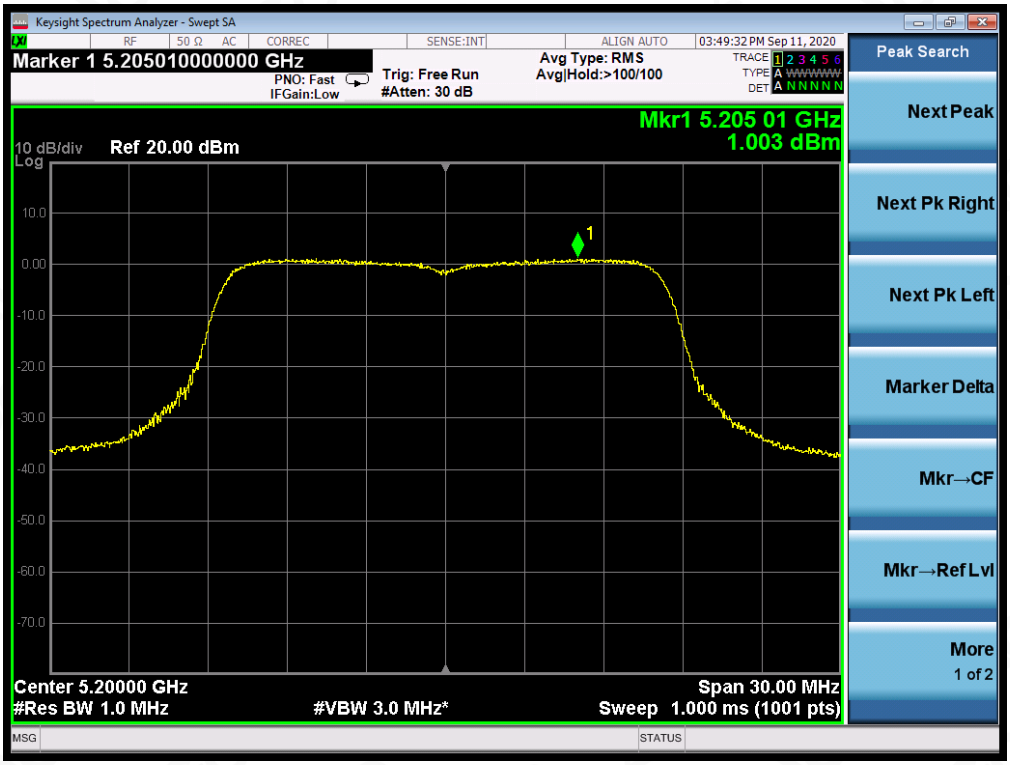
802.11a20 TEST RESULT

TEST PLOT OF SPECTRAL DENSITY FOR 5180MHz

TEST PLOT OF SPECTRAL DENSITY FOR 5200MHz



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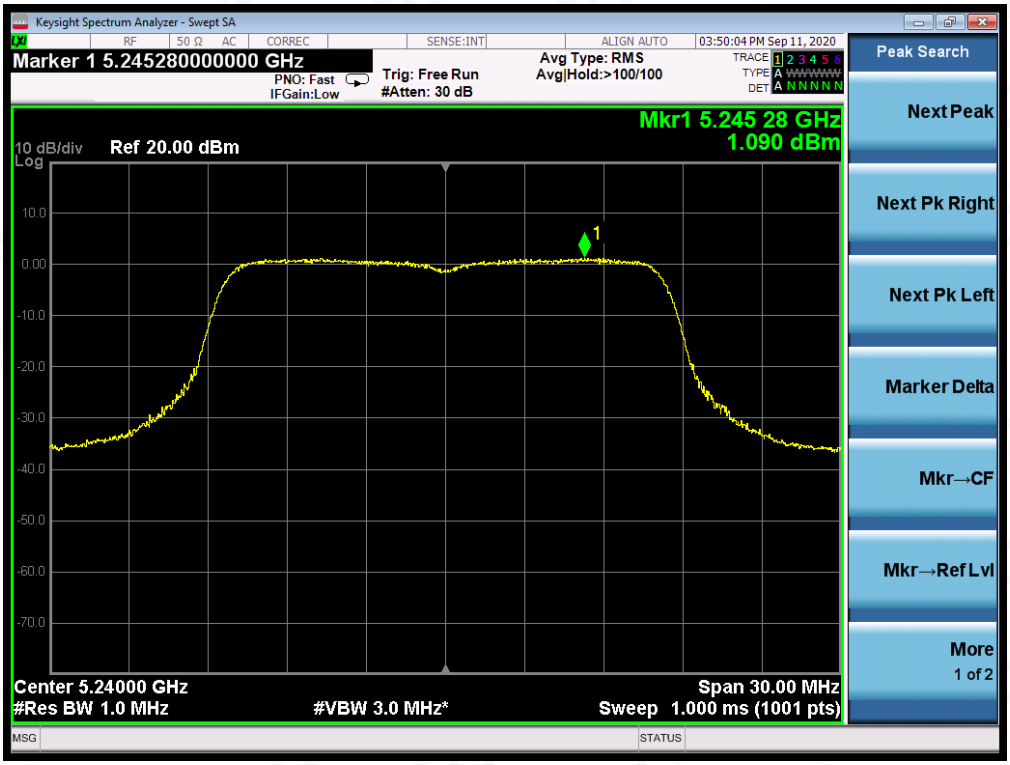
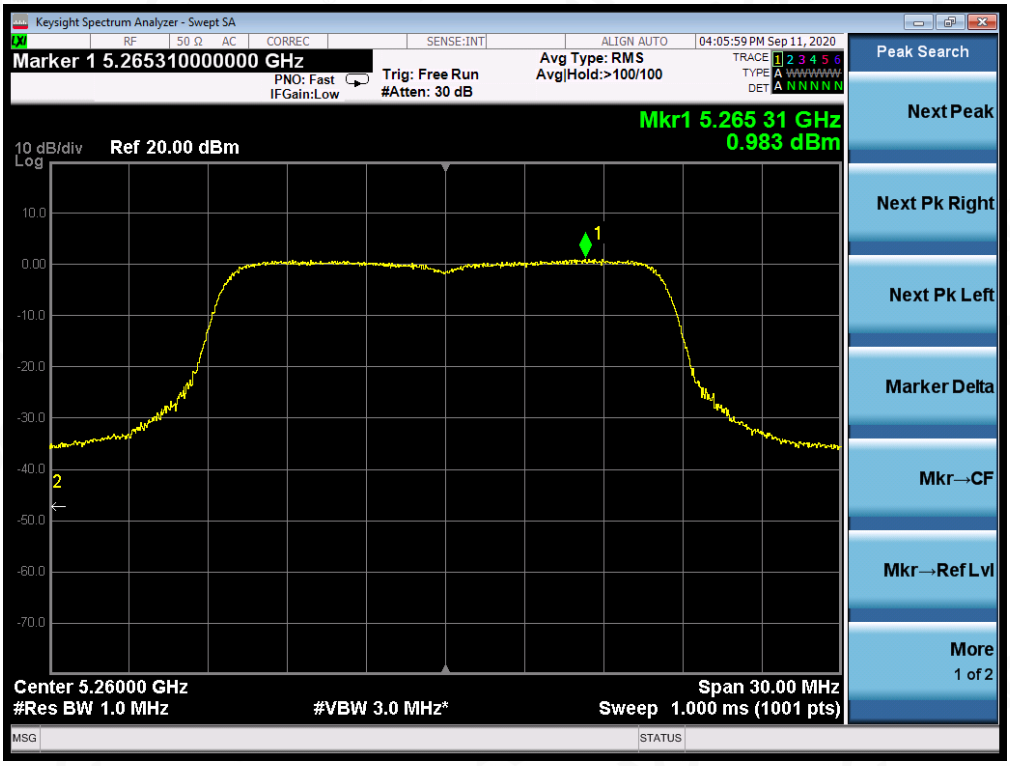
TEST PLOT OF SPECTRAL DENSITY FOR 5240MHz



TEST PLOT OF SPECTRAL DENSITY FOR 5260MHz



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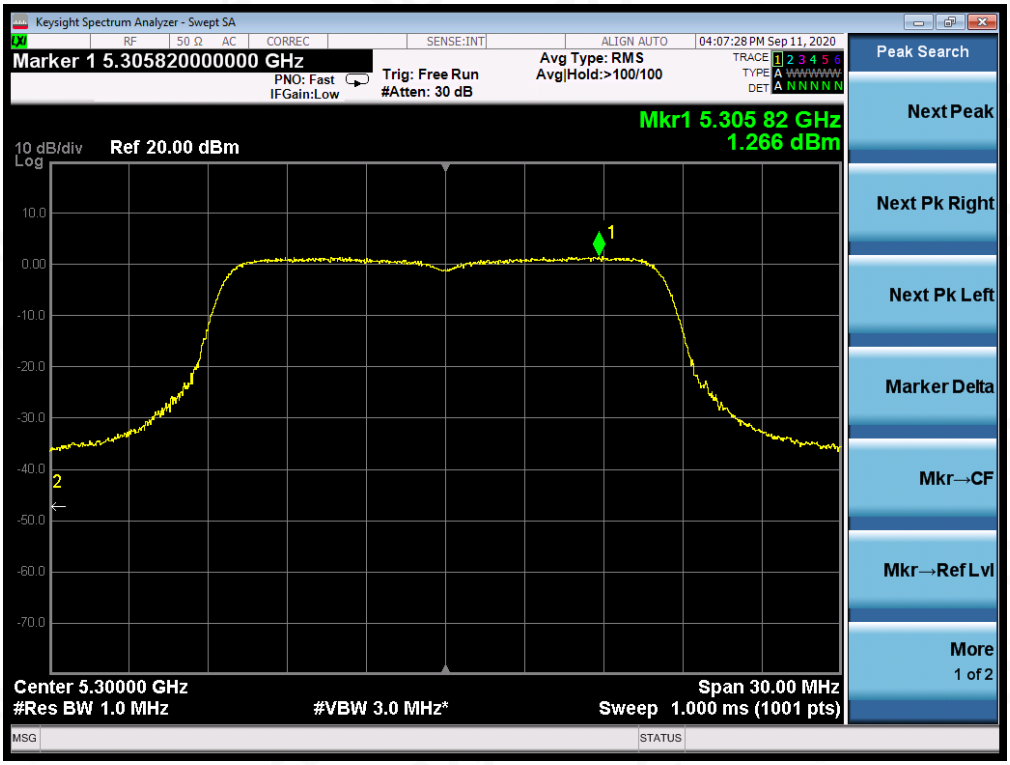
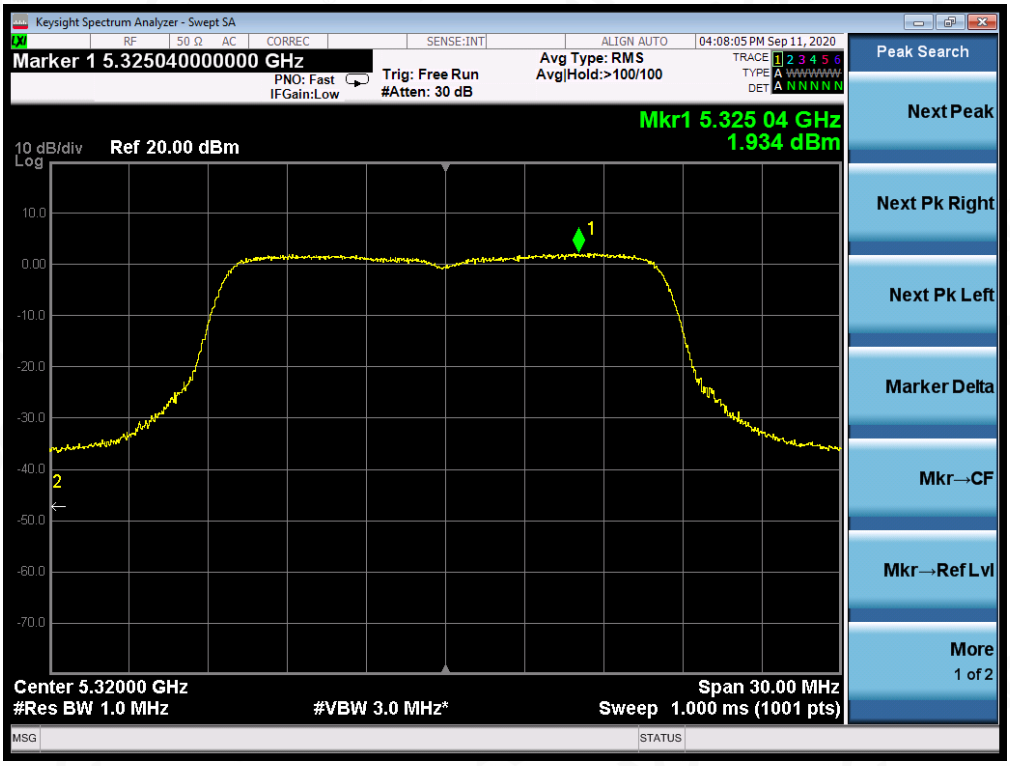
TEST PLOT OF SPECTRAL DENSITY FOR 5300MHz



TEST PLOT OF SPECTRAL DENSITY FOR 5320MHz



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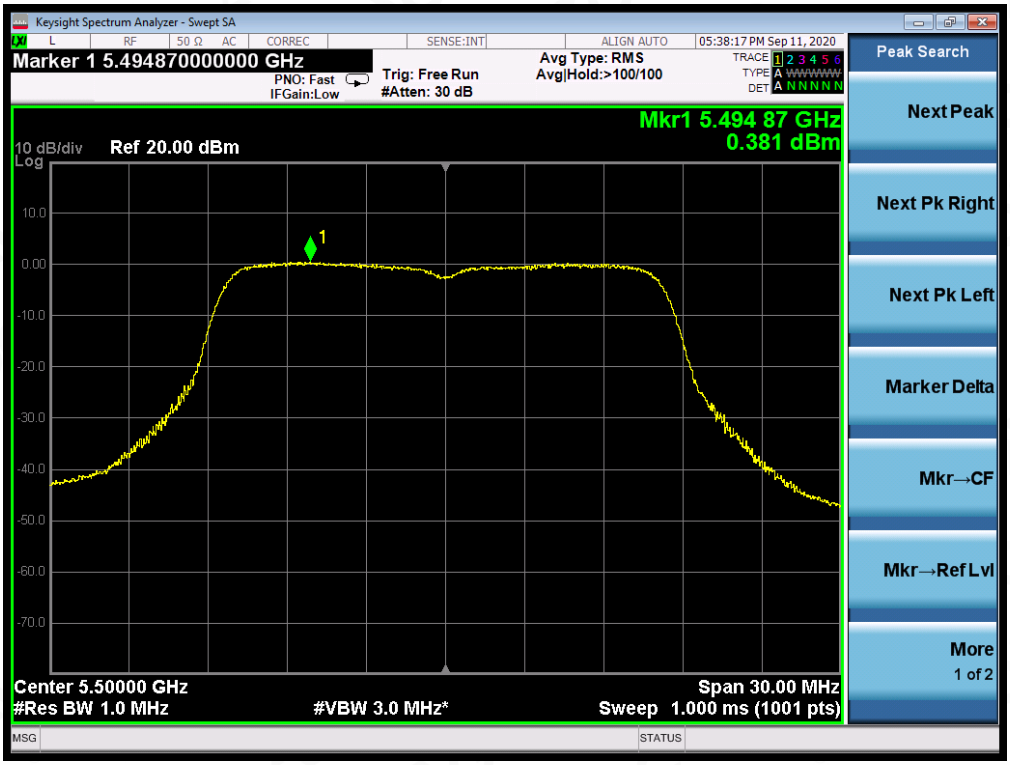
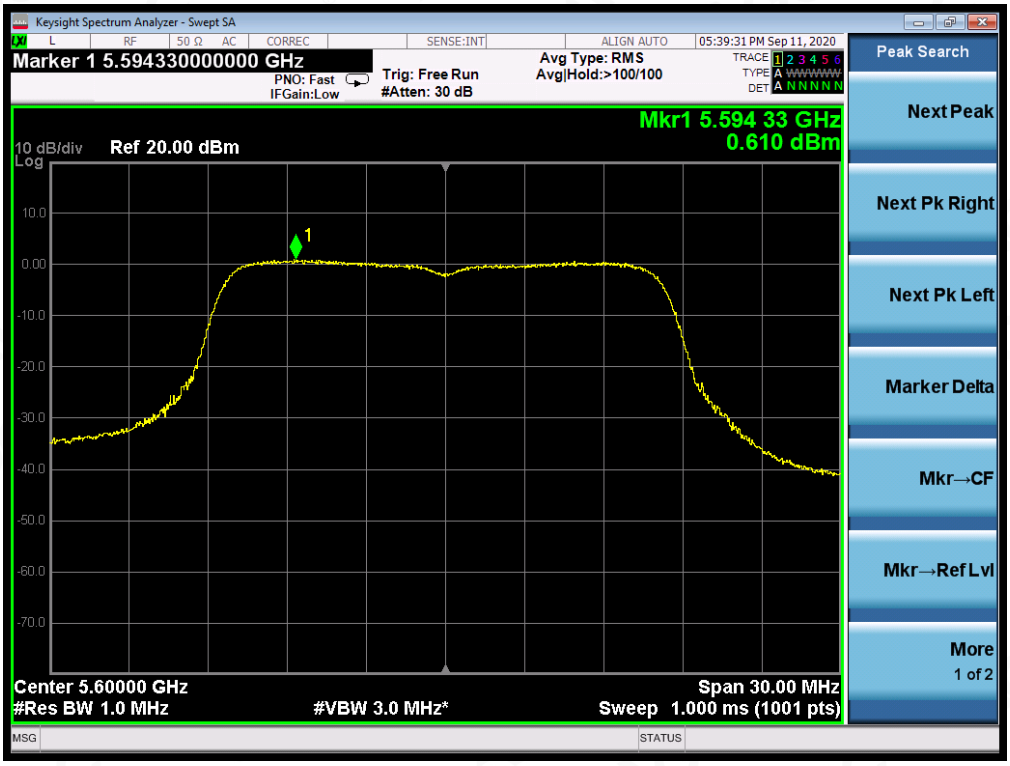
TEST PLOT OF SPECTRAL DENSITY FOR 5500MHz



TEST PLOT OF SPECTRAL DENSITY FOR 5600MHz



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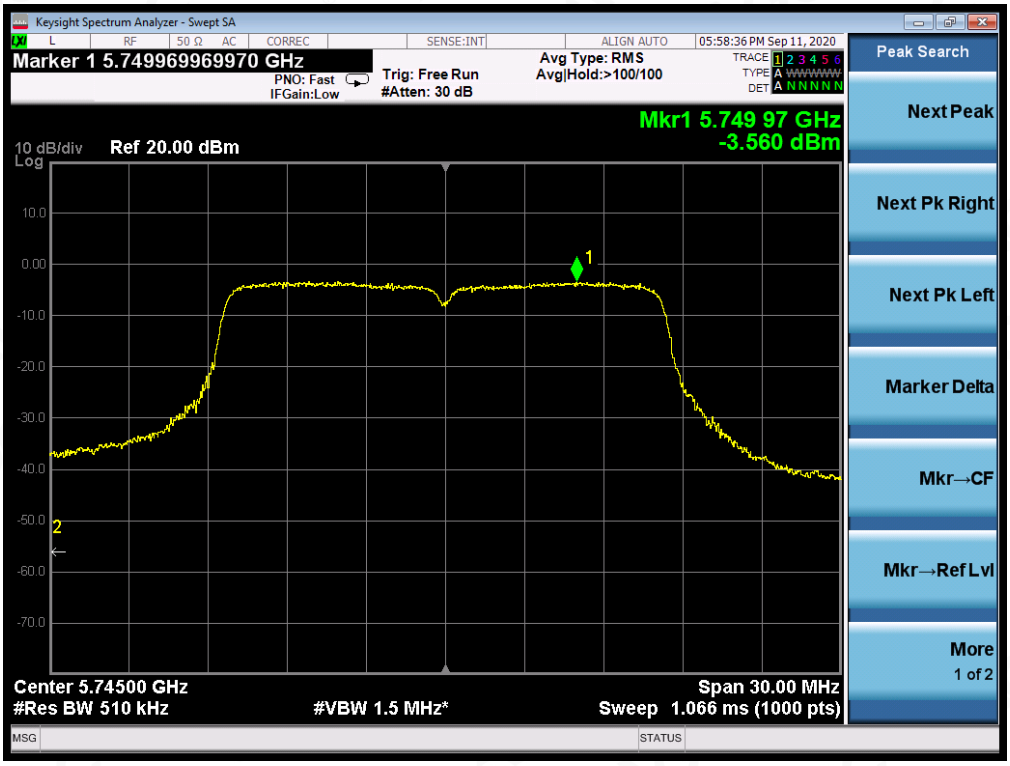
TEST PLOT OF SPECTRAL DENSITY FOR 5700MH

TEST PLOT OF SPECTRAL DENSITY FOR 5745MHz



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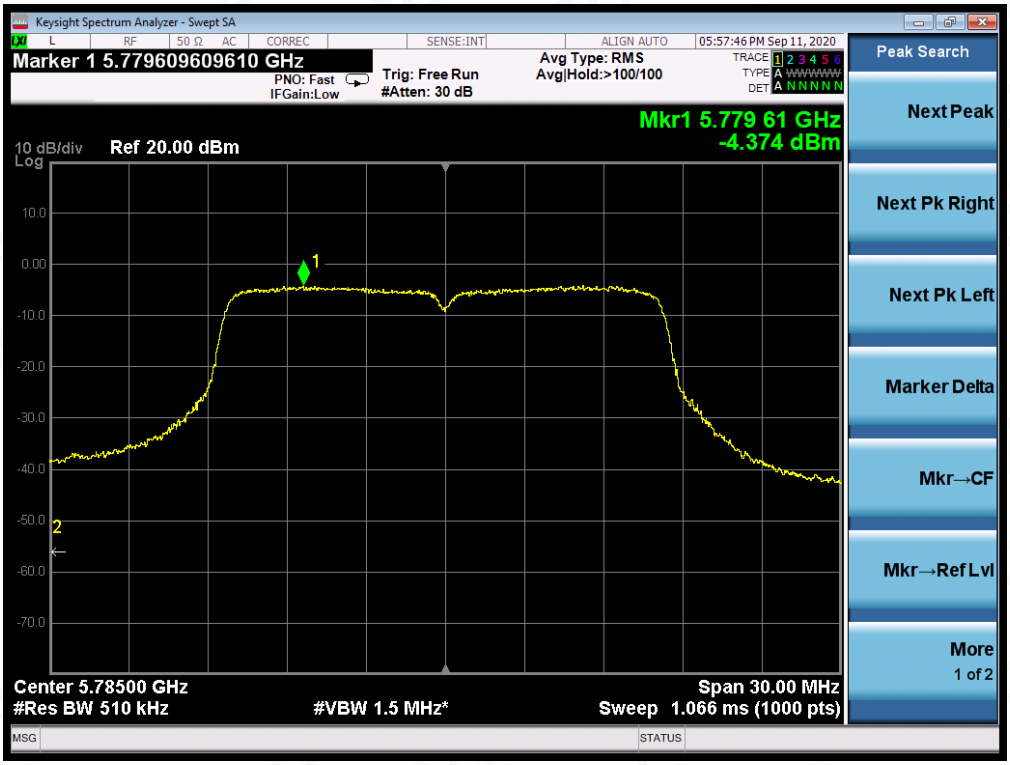
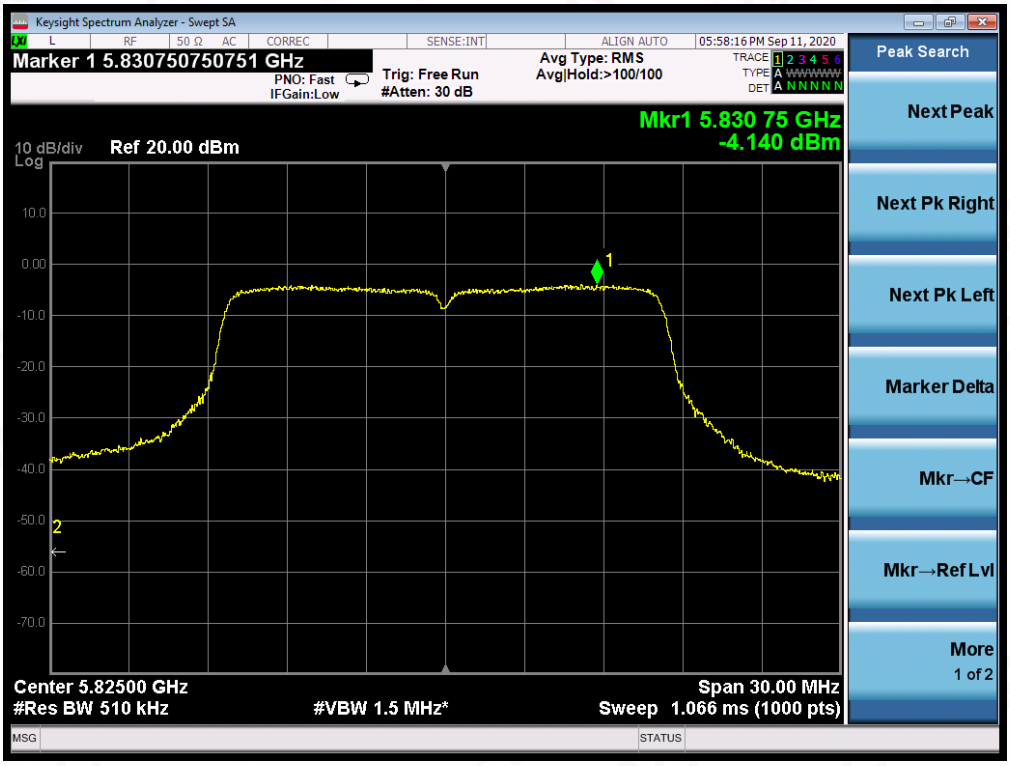
TEST PLOT OF SPECTRAL DENSITY FOR 5785MHz



TEST PLOT OF SPECTRAL DENSITY FOR 5825MHz



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11. CONDUCTED SPURIOUS EMISSION

11.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to KDB 789033 for compliance to FCC 47CFR 15.407 requirements.

11.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 8.2.

11.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.

11.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	Measurement Result	
	Test channel	Criteria
-27dBm/MHz	5150MHz-5250MHz	PASS
-27dBm/MHz	5250MHz-5350MHz	PASS
-27dBm/MHz	5470MHz-5725MHz	PASS
All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edgeincreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.	5725MHz-5850MHz	PASS

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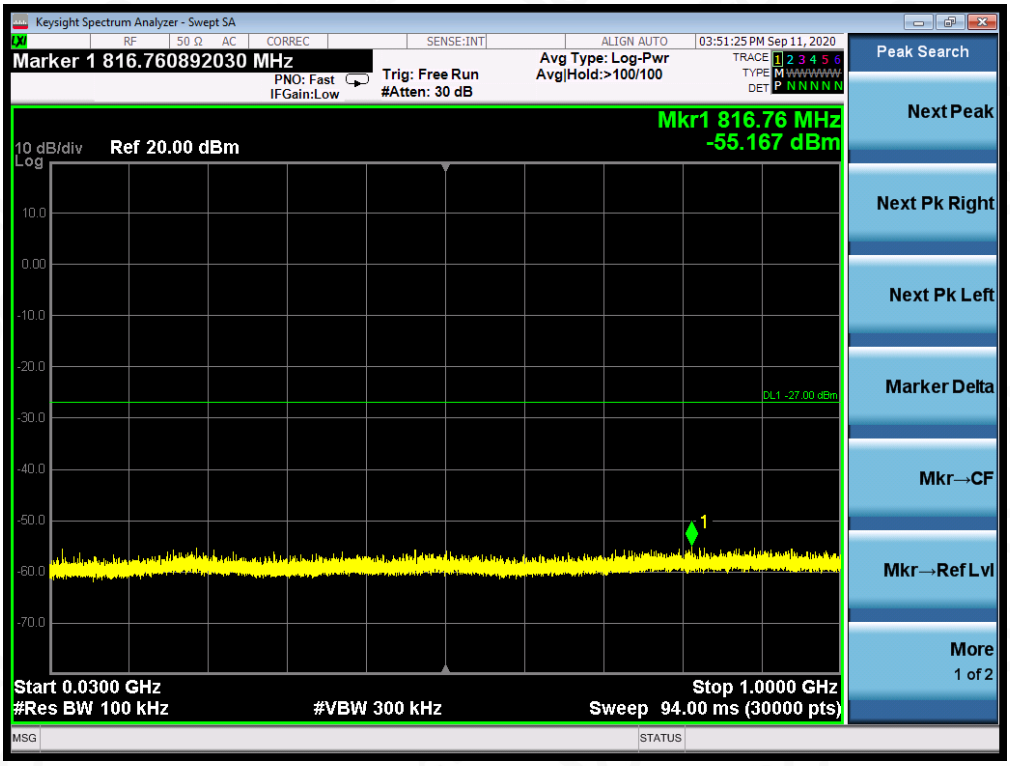
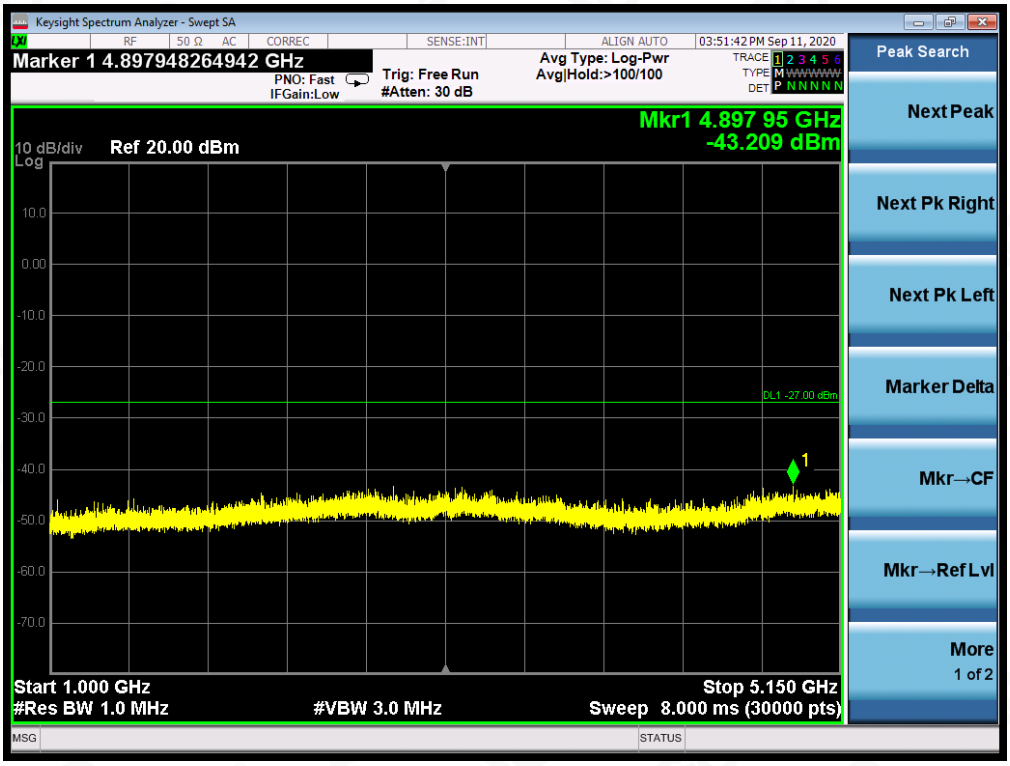
FOR 802.11A20 MODULATION

TEST PLOT OF OUT OF BAND EMISSIONS FOR MODULATION IN 5180MHz





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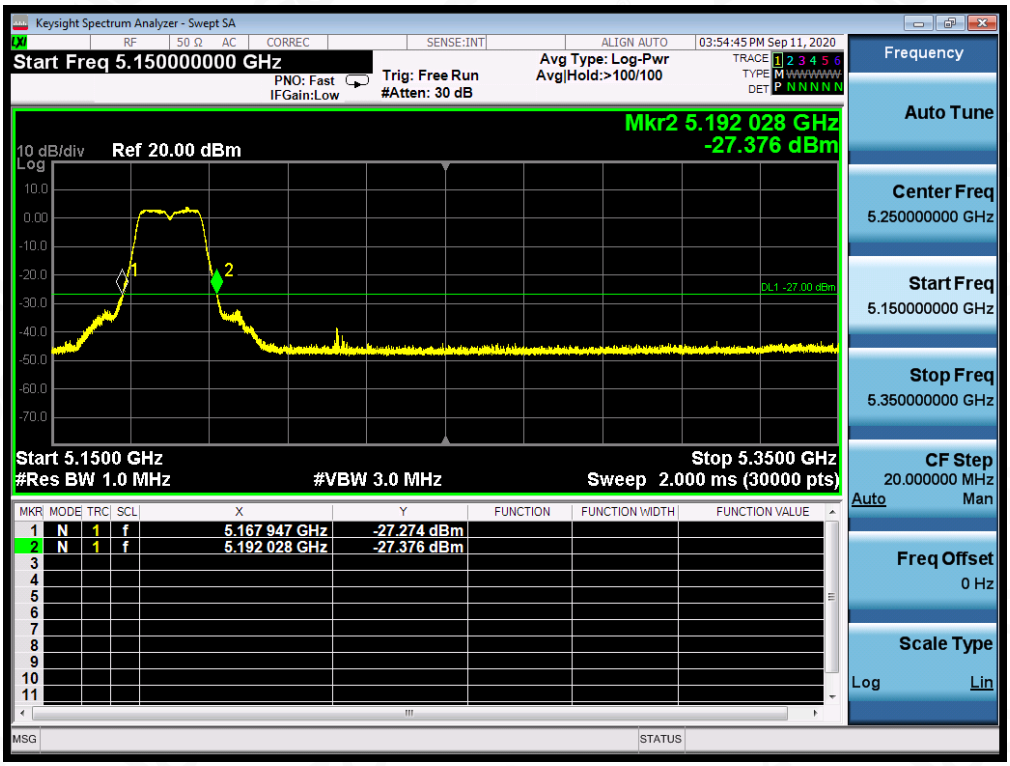

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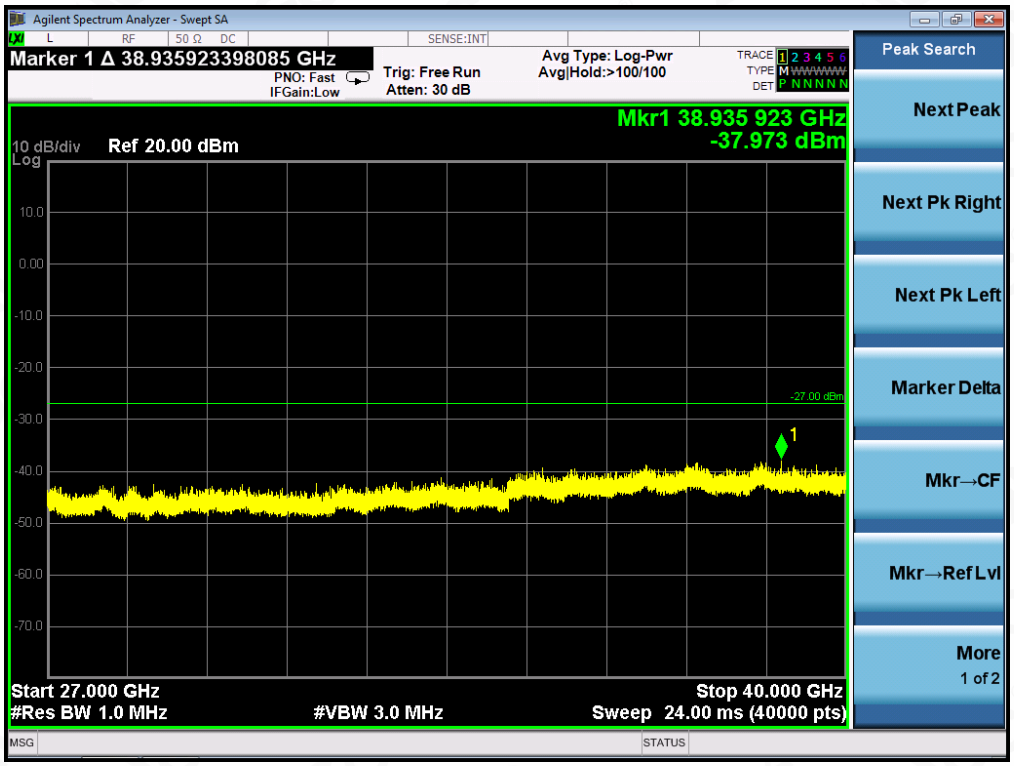
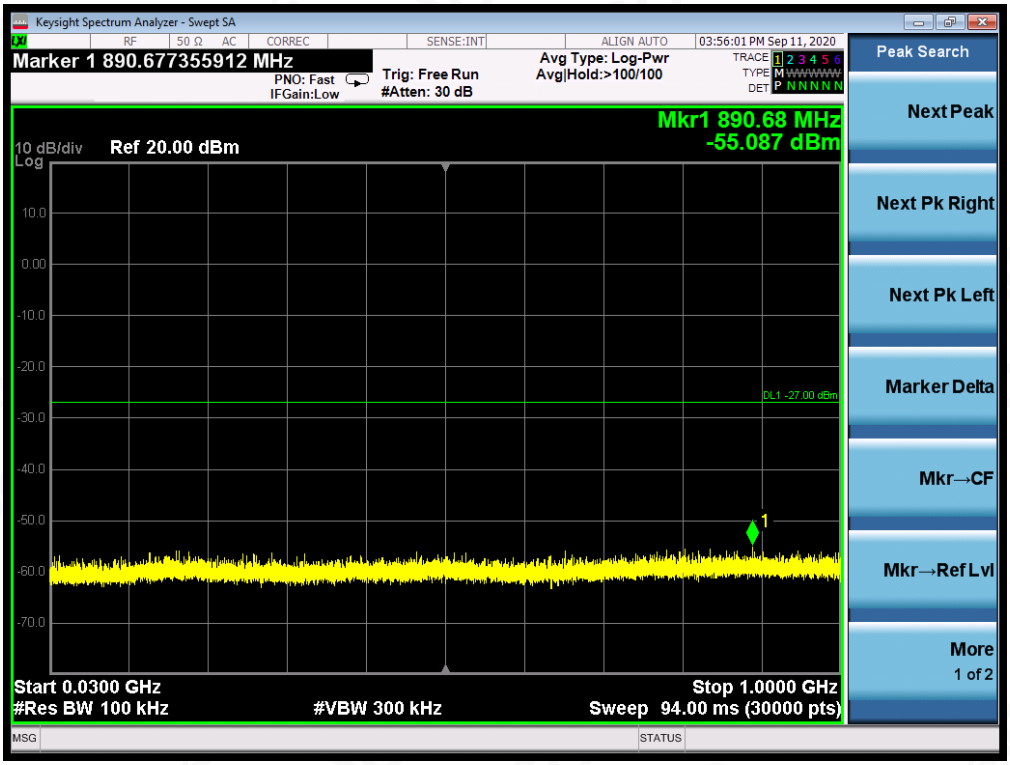


TEST PLOT OF OUT OF BAND EMISSIONS FOR MODULATION IN 5240MHz



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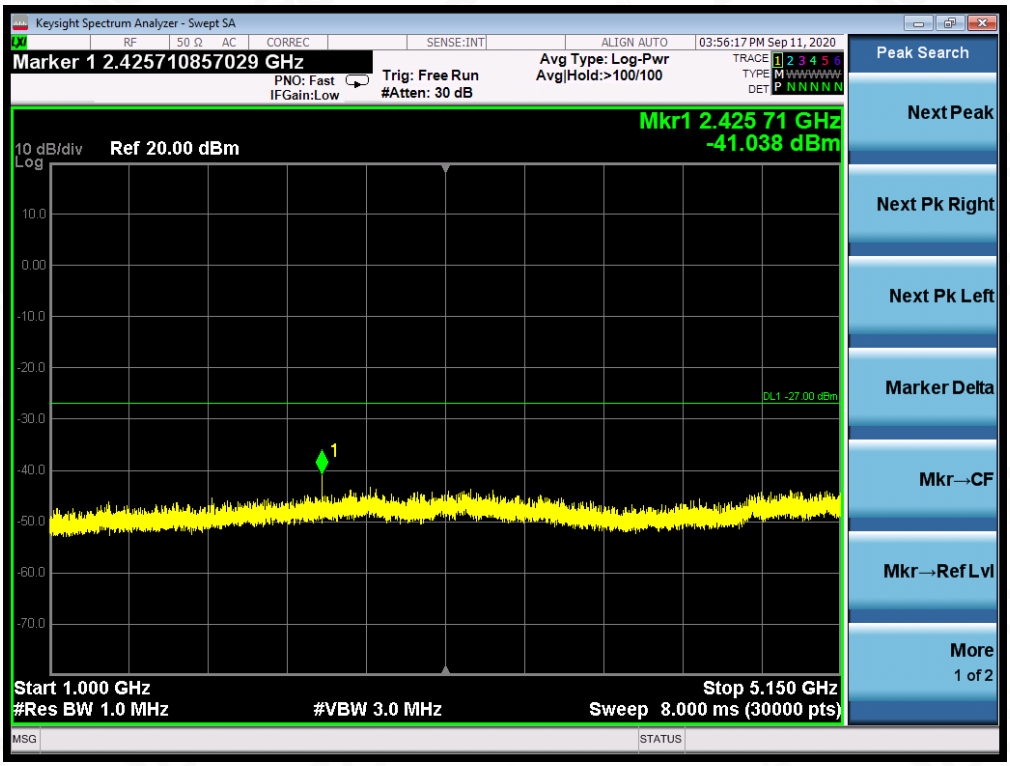

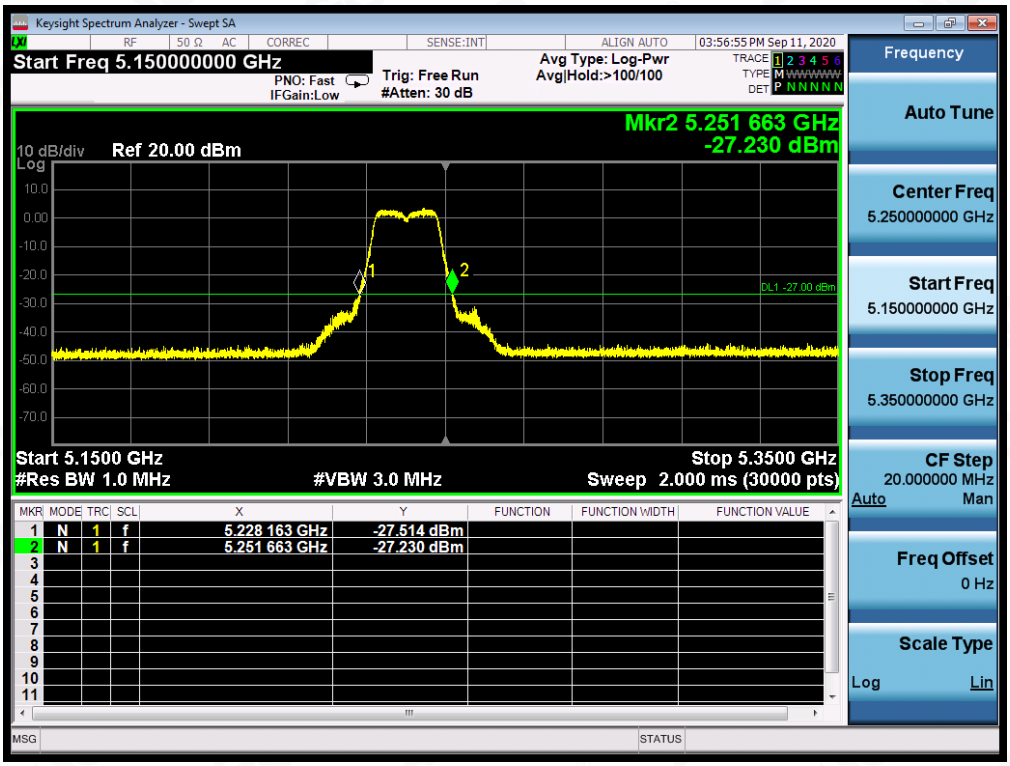

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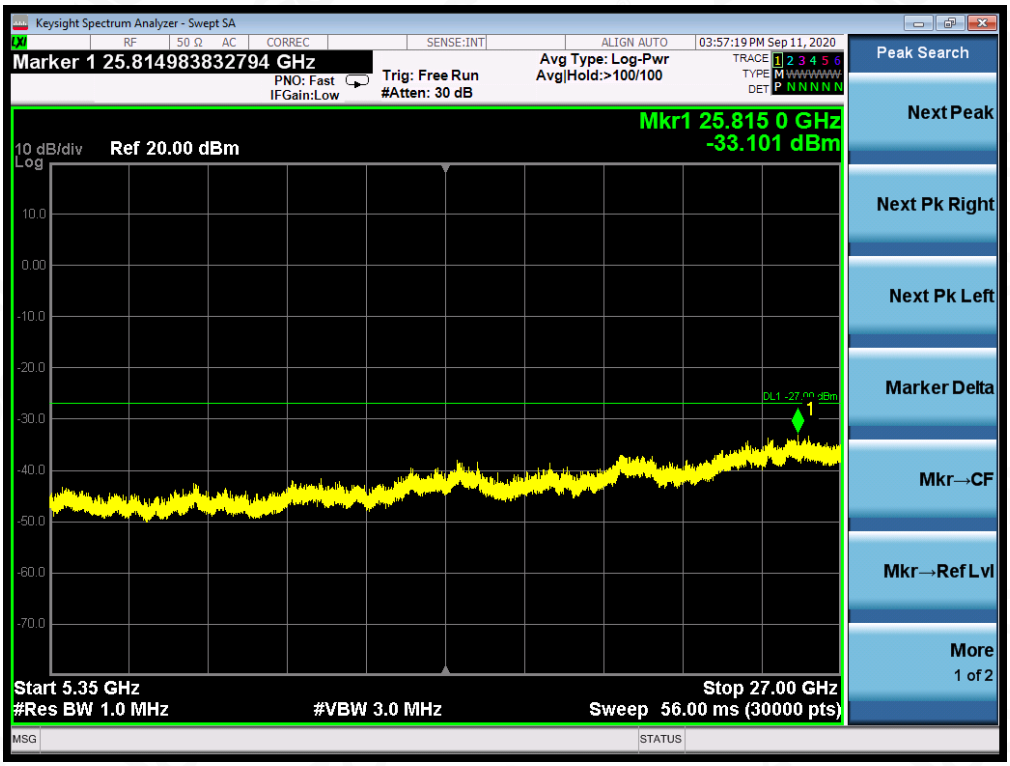

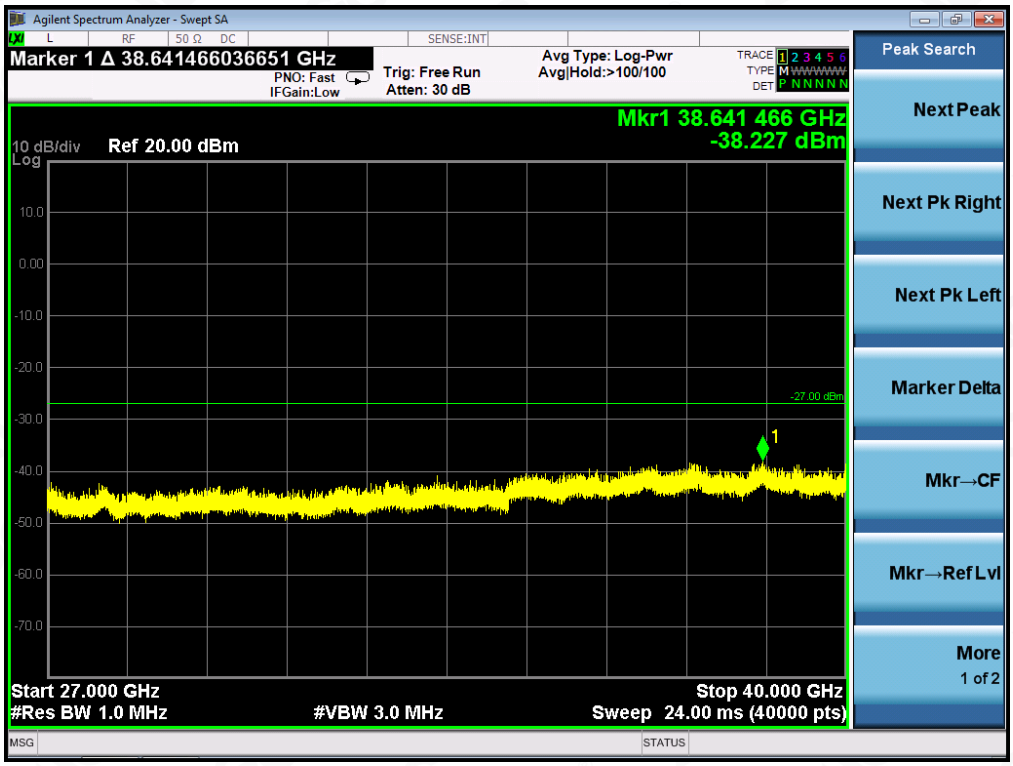

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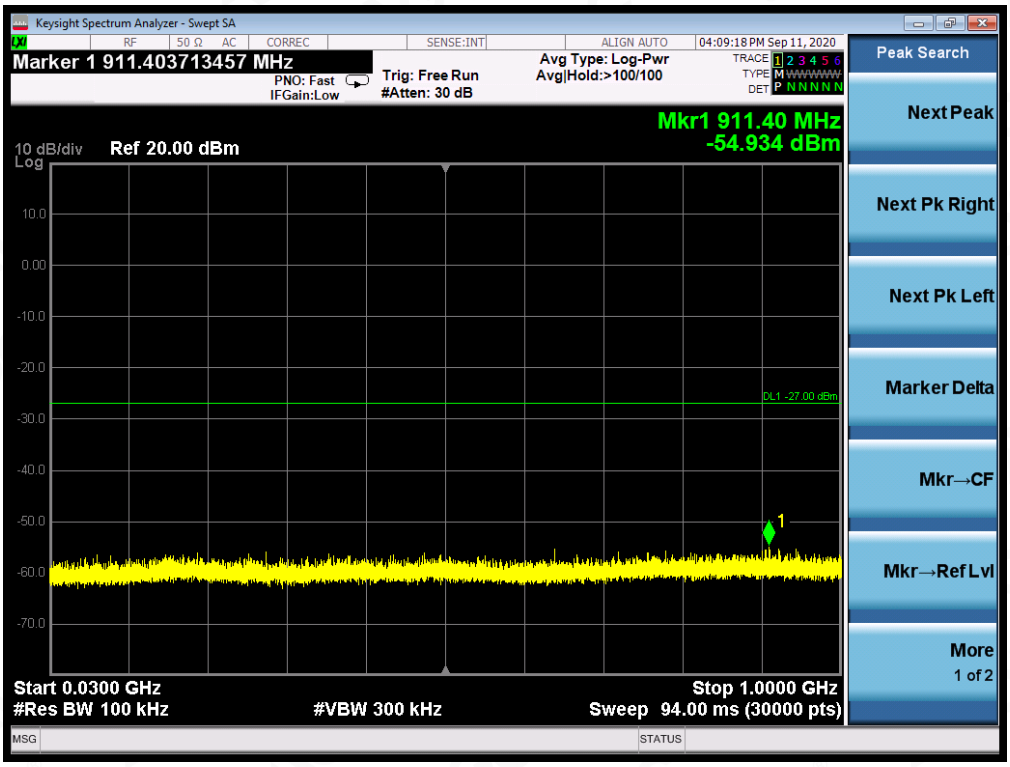
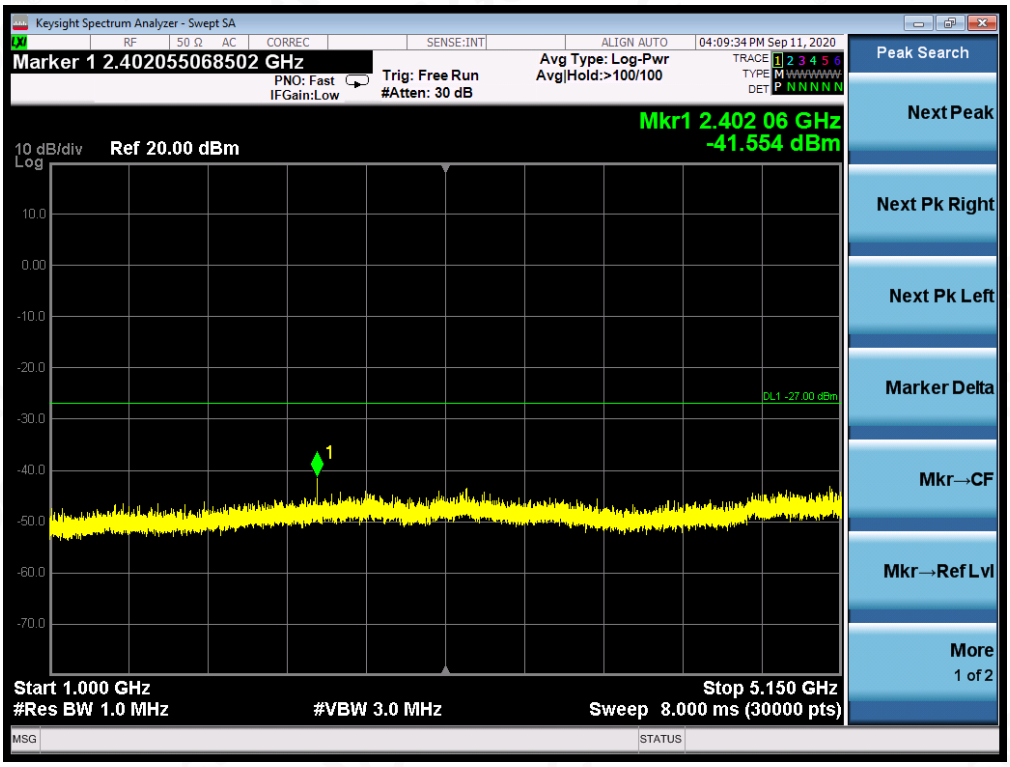
TEST PLOT OF OUT OF BAND EMISSIONS FOR MODULATION IN 5260MHz





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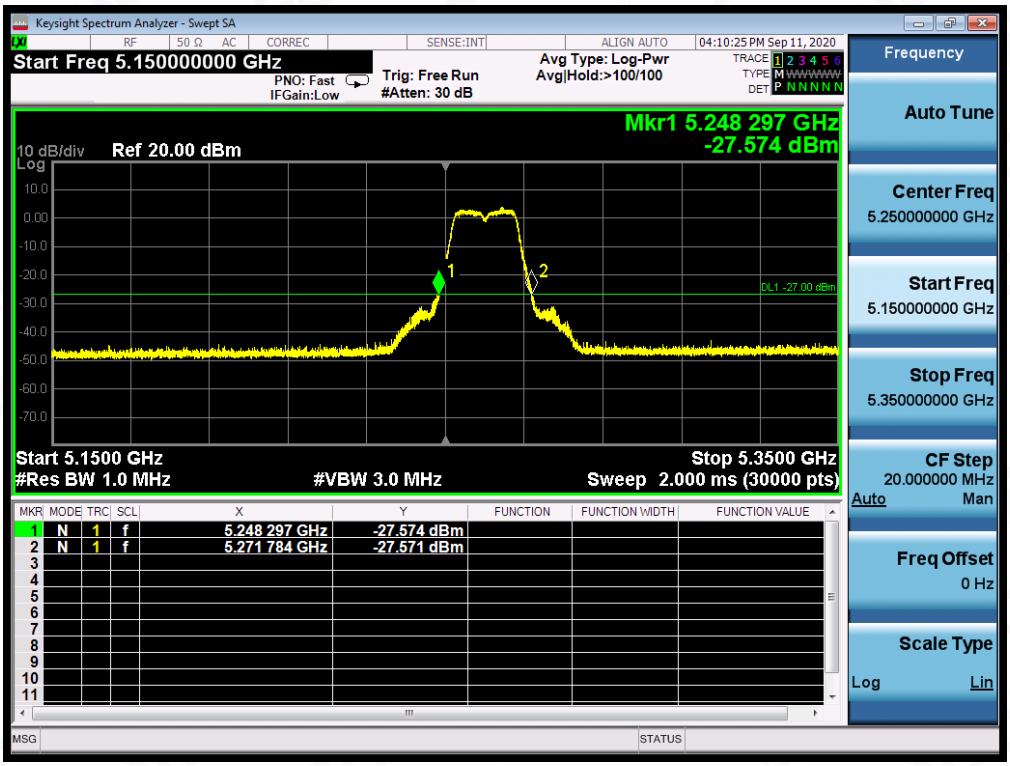

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