TEST REPORT

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Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC2012-0386
2. Customer
   - Name : HYUNDAI MOBIS CO., LTD.
   - Address : 203, Teheran-ro Gangnam-gu, Seoul, South Korea, 135-977
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : DISPLAY CAR SYSTEM / DA330DJAN
   FCC ID : TQ8-DA330DJAN
5. FCC Regulation(s) : FCC Part 15.407
   Test Method Used : KDB789033 D02v02r01, ANSI C 63.10-2013
6. Date of Test : 2020.10.05 ~ 2020.11.23
7. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing
8. Testing Environment : Refer to appended test report.
9. Test Result : Refer to the attached test result.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

Affirmation	Tested by Name : JaeHyeok Bang (Signature)	Reviewed by Name : JaeJin Lee (Signature)

2020 . 12 . 08 .

DT&C Co., Ltd.

Unconnected with KS Q ISO / IEC 17025 and KOLAS accreditation

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description	Revised by	Reviewed by
DRTFCC2012-0386	Dec. 08, 2020	Initial issue	JaeHyeok Bang	JaeJin Lee

CONTENTS

1. EUT DESCRIPTION

Equipment Class	Unlicensed National Information Infrastructure (UNII)
Product	DISPLAY CAR SYSTEM
Model Name(Base model)	DA330DJAN
Add Model Name Note1	DA330DJKN, DA330DLKN, DA330DLAN
Add Model Name Note1	DA331DJAN, DA331DJKN, DA331DLKN, DA331DLAN
Hardware Version	V 1.0
Software Version	V 1.0
Power Supply	DC 14.4 V
Modulation type	OFDM
Antenna Specification	**Antenna type:** PCB Pattern Antenna **Antenna gain** U-NII 1: -0.61 dBi U-NII 2A: -0.18 dBi U-NII 2C: -0.77 dBi U-NII 3: -0.18 dBi

Note 1: Difference between models

	Model Name	Difference
Base model	DA330DJAN	NA
Add models	DA331DJAN, DA331DJKN, DA331DLKN, DA331DLAN	This model contains module approved under Part 22/24/27.(FCC ID: YZP-VL3010)
Add models	DA330DJKN, DA330DLKN, DA330DLAN	Same as base model

5GHz Band	Mode	Frequency range(MHz)	Max power(dBm)
U-NII 1	802.11a	5180 ~ 5240	**7.93**
	802.11n(HT20)	5180 ~ 5240	7.90
	802.11ac(VHT20)	5180 ~ 5240	7.94
	802.11n(HT40)	5190 ~ 5230	4.28
	802.11ac(VHT40)	5190 ~ 5230	4.39
	802.11ac(VHT80)	5210	5.38
U-NII 2A	802.11a	5260 ~ 5320	**7.58**
	802.11n(HT20)	5260 ~ 5320	7.47
	802.11ac(VHT20)	5260 ~ 5320	7.41
	802.11n(HT40)	5270 ~ 5310	6.23
	802.11ac(VHT40)	5270 ~ 5310	6.56
	802.11ac(VHT80)	5290	6.95
U-NII 2C	802.11a	5500 ~ 5720	5.38
	802.11n(HT20)	5500 ~ 5720	**5.57**
	802.11ac(VHT20)	5500 ~ 5720	5.46
	802.11n(HT40)	5510 ~ 5710	5.24
	802.11ac(VHT40)	5510 ~ 5710	5.09
	802.11ac(VHT80)	5530 ~ 5690	5.38
U-NII 3	802.11a	5745 ~ 5825	2.63
	802.11n(HT20)	5745 ~ 5825	2.61
	802.11ac(VHT20)	5745 ~ 5825	**2.73**
	802.11n(HT40)	5755 ~ 5795	2.27
	802.11ac(VHT40)	5755 ~ 5795	2.16
	802.11ac(VHT80)	5775	2.71

2. Information about test items

2.1 Transmitting configuration of EUT

Mode	Data rate
802.11a	6~54Mbps
802.11n(HT20)	MCS 0 ~ 7
802.11ac(VHT20)	MCS 0 ~ 8
802.11n(HT40)	MCS 0 ~ 7
802.11ac(VHT40)	MCS 0 ~ 9
802.11ac(VHT80)	MCS 0 ~ 9

2.2 Tested Channel Information

5GHz Band	802.11a/n(HT20) /802.11ac(VHT20)		802.11n(HT40) /802.11ac(VHT40)		802.11ac(VHT80)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
U-NII 1	36	5180	38	5190	42	5210
	40	5200	-	-	-	-
	48	5240	46	5230	-	-
U-NII 2A	52	5260	54	5270	58	5290
	60	5300	-	-	-	-
	64	5320	62	5310	-	-
U-NII 2C	100	5500	102	5510	106	5530
	116	5580	110	5550	-	-
	144	5720	142	5710	138	5690
U-NII 3	149	5745	151	5755	155	5775
	157	5785	-	-	-	-
	165	5825	159	5795	-	-

2.3 Testing Environment

Temperature	:	20 °C ~ 25 °C
Relative humidity content	:	35 % ~ 45 %
Details of power supply	:	DC 14.4 V

2.4 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

2.5 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C 63.4-2014 and ANSI C 63.10-2013. All measurement uncertainty values are shown with a coverage factor of *k* = 2 to indicate a 95 % level of confidence.

Test items	Measurement uncertainty
Antenna-port conducted emission	0.9 dB (The confidence level is about 95 %, k = 2)
Radiated emission (1 GHz Below)	4.9 dB (The confidence level is about 95 %, k = 2)
Radiated emission (1 GHz ~ 18 GHz)	5.1 dB (The confidence level is about 95 %, k = 2)
Radiated emission (18 GHz Above)	5.3 dB (The confidence level is about 95 %, k = 2)

3. SUMMARY OF TESTS

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
15.407(a)	Emission Bandwidth (26 dB Bandwidth)	N/A	Conducted	C
15.407(e)	Minimum Emission Bandwidth (6 dB Bandwidth)	> 500 kHz in 5725 ~ 5850 MHz		C
15.407(a)	Maximum Conducted Output Power	FCC Part 15.407(a) (Refer to the section 8.3)		C
15.407(a)	Peak Power Spectral Density	FCC Part 15.407(a) (Refer to the section 8.4)		C
15.407(h)	Dynamic Frequency Selection	FCC 15.407(h) (Refer to the DFS test report)		C Note 3
15.205 15.209 15.407(b)	Undesirable Emissions	FCC Part 15.209, 15.407(b) (Refer to the section 8.5)	Radiated	C
15.207	AC Conducted Emissions	FCC 15.207 (Refer to the section 8.6)	AC Line Conducted	NA Note 4
15.203	Antenna Requirements	FCC 15.203 (Refer to the section 4)	-	C

Note 1: **C** = Comply **NC** = Not Comply **NT** = Not Tested **NA** = Not Applicable

Note 2: For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS.

Note 3: Refer to the DFS test report.

Note 4: This device is installed in a car. Therefore the power source is a battery of car.

Note 5: The conducted test item were performed the base model.(MN: DA330DJAN)

The radiated test item were performed both “MN: DA330DJAN” and “MN: DA331DJAN”.

4. TEST METHODOLOGY

The measurement procedures described in the ANSI C63.10-2013 and the guidance provided in KDB 7899033 D02v02r01 were used in measurement of the EUT.
The EUT was tested per the guidance of KDB789033 D02v02r01. And ANSI C63.10-2013 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing.

4.1 EUT configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT exercise

The EUT was operated in the test mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E.

4.3 General test procedures

Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB789033 D02v02r01. So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10-2013.
The EUT is placed on the wooden table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and Average detector.

Radiated Emissions

Basically the radiated tests were performed with KDB789033 D02v02r01. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10-2013 as stated on KDB789033 D02v02r01.
The EUT is placed on a non-conductive table, which is 0.8 m above ground plane. For emission measurements above 1 GHz, the table height is 1.5 m. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 1 m or 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

4.4 Description of test modes

The EUT has been tested with all modes of operating conditions to determine the worst case emission characteristics.
A test program is used to control the EUT for staying in continuous transmitting mode with maximum fixed duty cycle.
The worst case data rate was determined as below test mode according to the power measurements.

Test mode	Mode	Worst case data rate
TM 1	802.11a	6 Mbps
TM 2	802.11ac(VHT20)	MCS 0
TM 3	802.11ac(VHT40)	MCS 0
TM 4	802.11ac(VHT80)	MCS 0

5. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment , which is traceable to recognized national standards.

6. FACILITIES AND ACCREDITATIONS

6.1 Facilities

DT&C Co., Ltd.		
The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042. The test site complies with the requirements of § 2.948 according to ANSI C63.4-2014. **- FCC & ISED MRA Designation No. : KR0034** **- ISED#: 5740A**		
www.dtnc.net		
Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

6.2 Equipment

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, loop, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements.
Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements. All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

7. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203:

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 antenna is printed on the PCB.
Therefore this E.U.T Complies with the requirement of §15.203

8. TEST RESULT

8.1 Emission Bandwidth (26 dB Bandwidth)

▣ Test Requirements

- Emission Bandwidth (26 dB Bandwidth)

The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

The 26 dB bandwidth is used to determine the conducted output power limit.

▣ Test Configuration

Refer to the APPENDIX I.

▣ Test Procedure

- Emission Bandwidth (26 dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **KDB789033 D02v02r01**.

1. Set resolution bandwidth (RBW) = approximately **1 %** of the EBW.
2. Set the video bandwidth **(VBW) > RBW**.
3. Detector = **Peak**.
4. Trace mode = **max hold**.

Measure the maximum width of the emission that is 26 dB down from the peak 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 %.

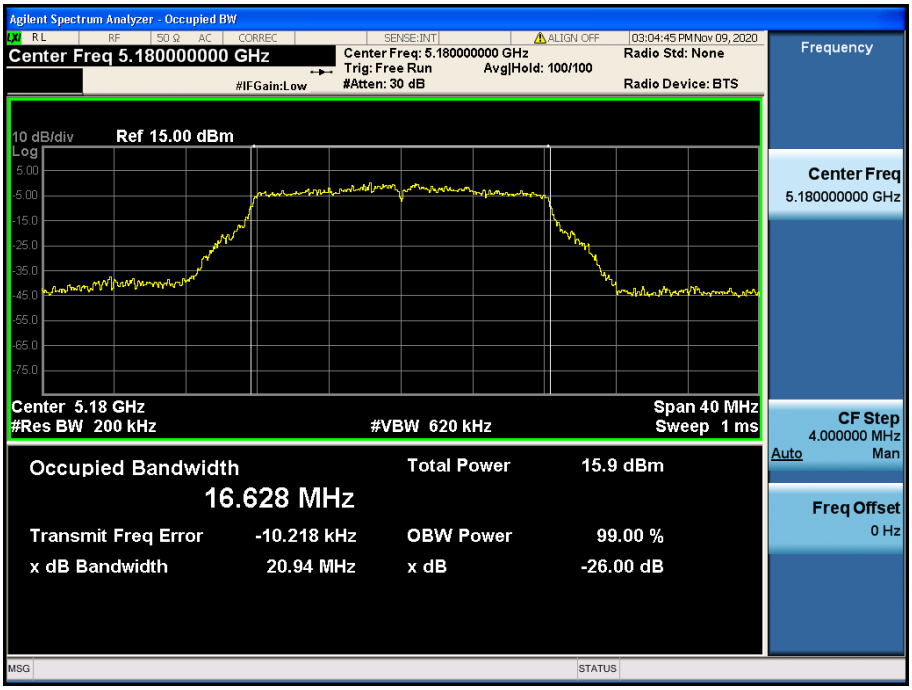
▣ **Test Results: Comply**

Mode	Band	Channel	Frequency [MHz]	Test Result 26 dB BW [MHz]
TM 1	U-NII 1	36	5 180	20.94
		40	5 200	21.00
		48	5 240	20.96
	U-NII 2A	52	5 260	20.76
		60	5 300	21.01
		64	5 320	20.64
	U-NII 2C	100	5 500	20.73
		116	5 580	20.86
		144	5 720	21.15
TM 2	U-NII 1	36	5 180	21.15
		40	5 200	21.29
		48	5 240	20.93
	U-NII 2A	52	5 260	21.24
		60	5 300	21.32
		64	5 320	21.14
	U-NII 2C	100	5 500	21.24
		116	5 580	21.29
		144	5 720	21.16
TM 3	U-NII 1	38	5 190	39.62
		46	5 230	39.23
	U-NII 2A	54	5 270	39.52
		62	5 310	39.32
	U-NII 2C	102	5 510	39.51
		110	5 550	39.25
		142	5 710	39.47
TM 4	U-NII 1	42	5 210	80.77
	U-NII 2A	58	5 290	81.25
	U-NII 2C	106	5 530	80.80
		-	-	-
		138	5 690	81.04

▣ Result Plots

26 dB Bandwidth

Test Mode: TM 1 & Ch.36



26 dB Bandwidth

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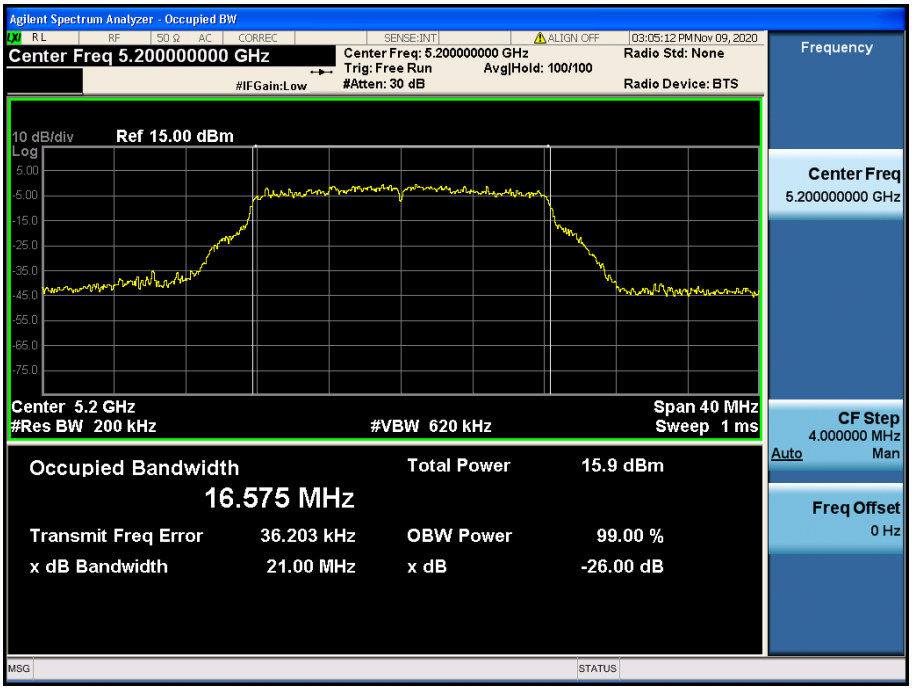
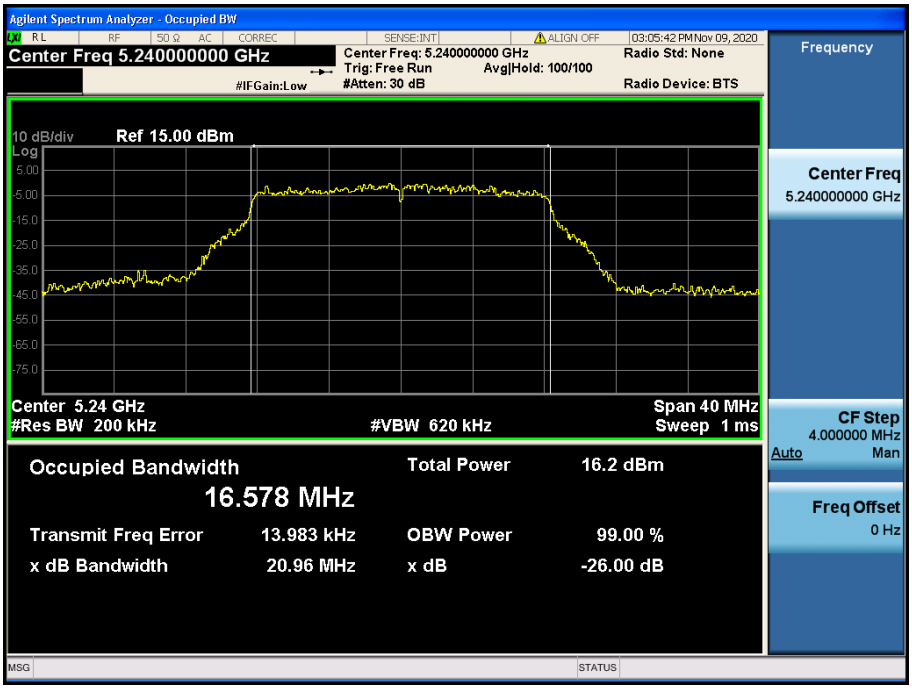


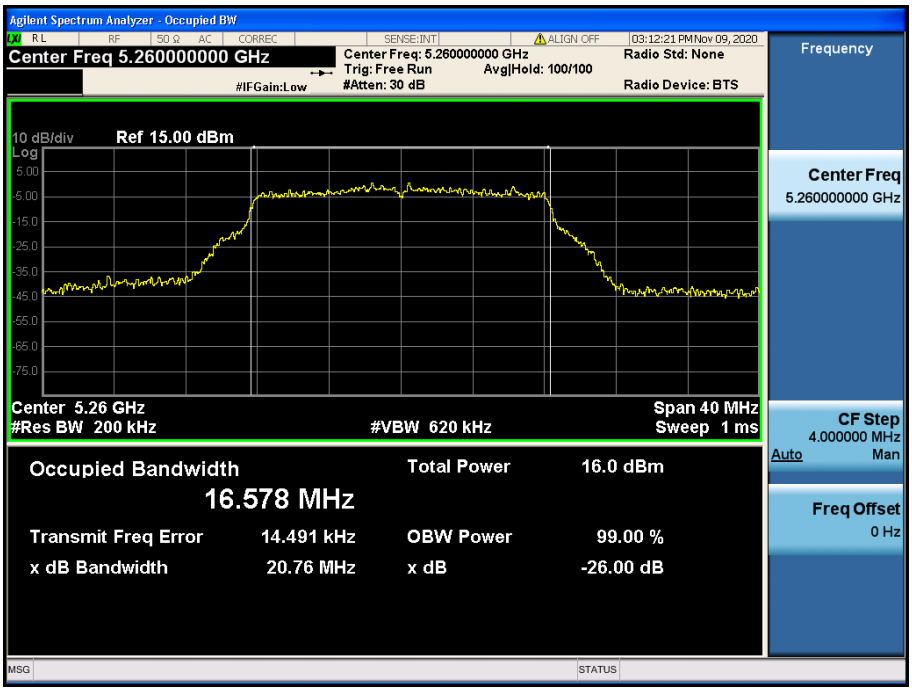
26 dB Bandwidth

Test Mode: TM 1 & Ch.48



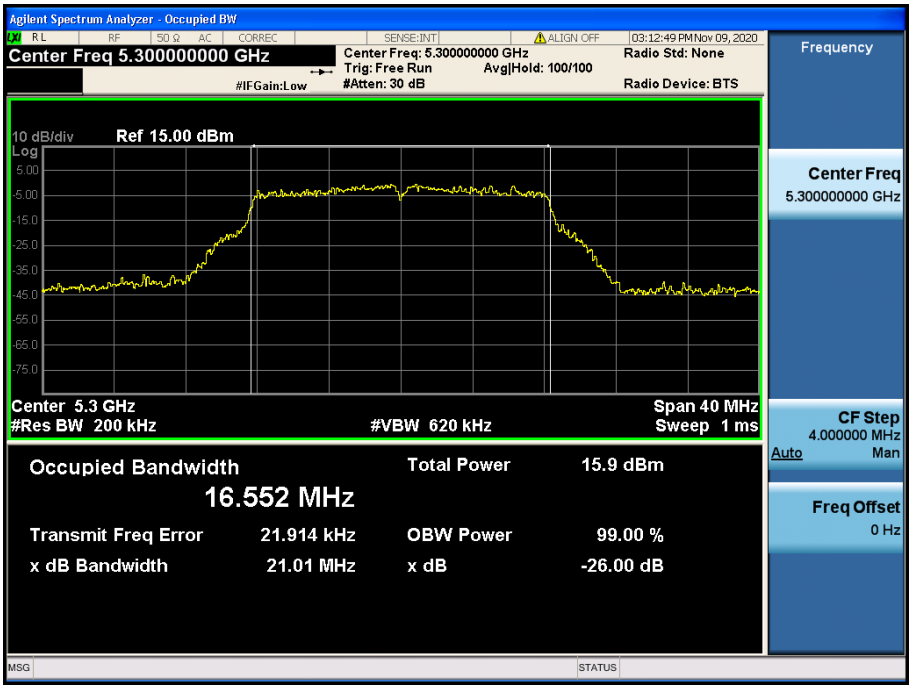
26 dB Bandwidth

Test Mode: TM 1 & Ch.52



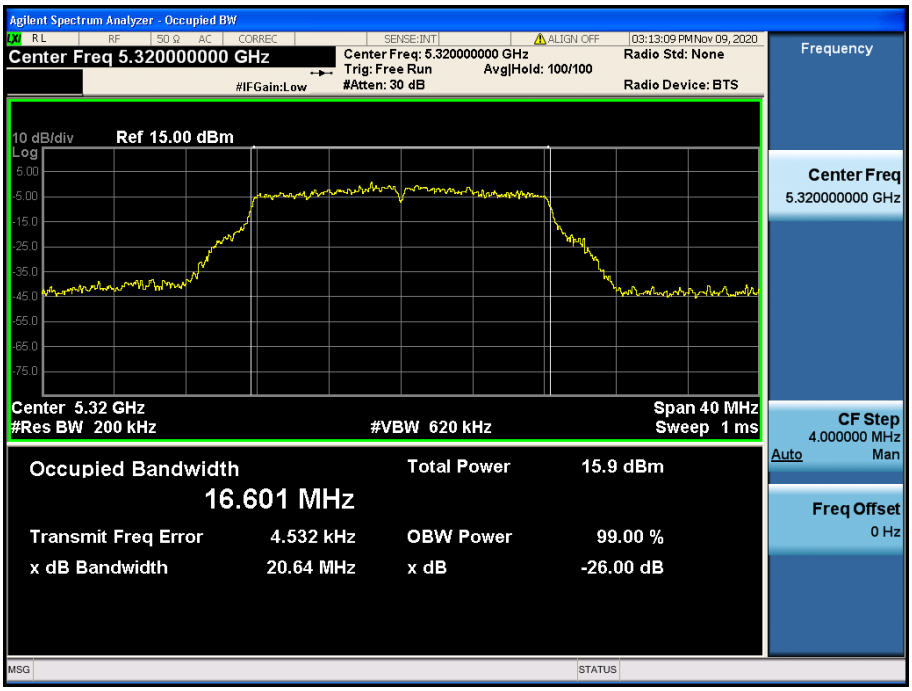
26 dB Bandwidth

Test Mode: TM 1 & Ch.60



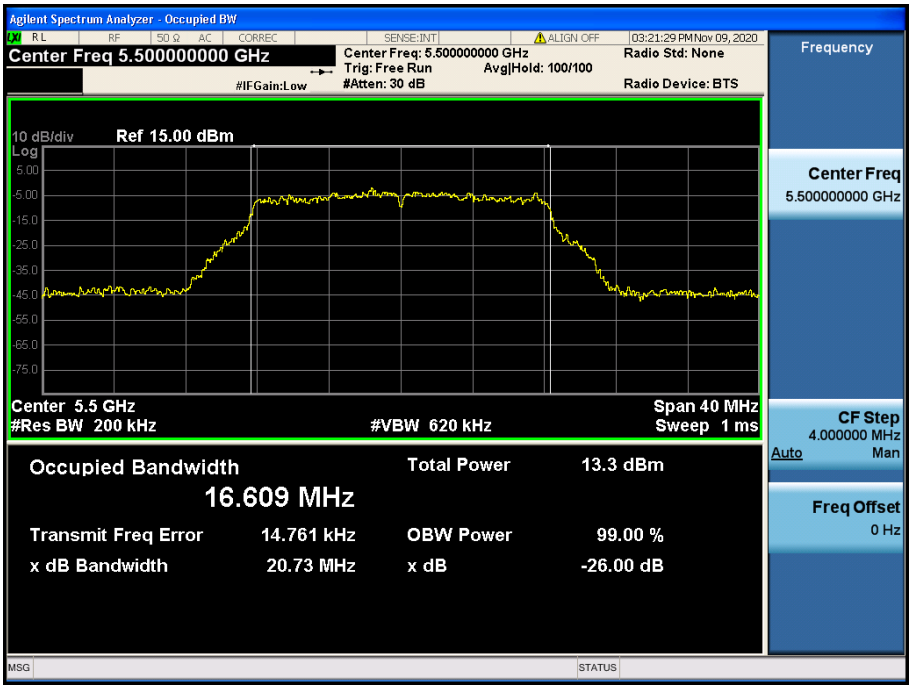
26 dB Bandwidth

Test Mode: TM 1 & Ch.64



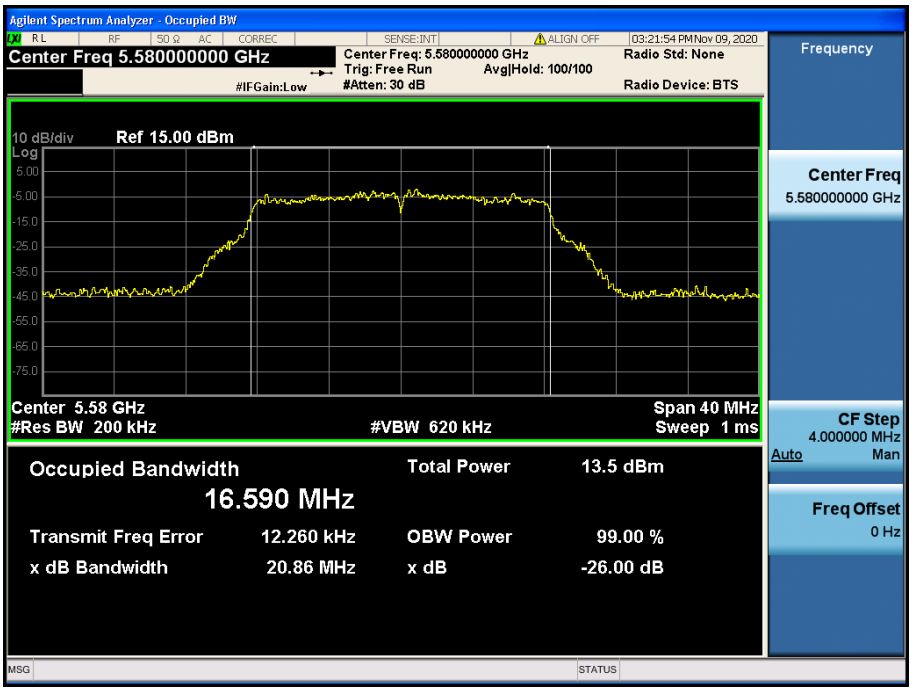
26 dB Bandwidth

Test Mode: TM 1 & Ch.100



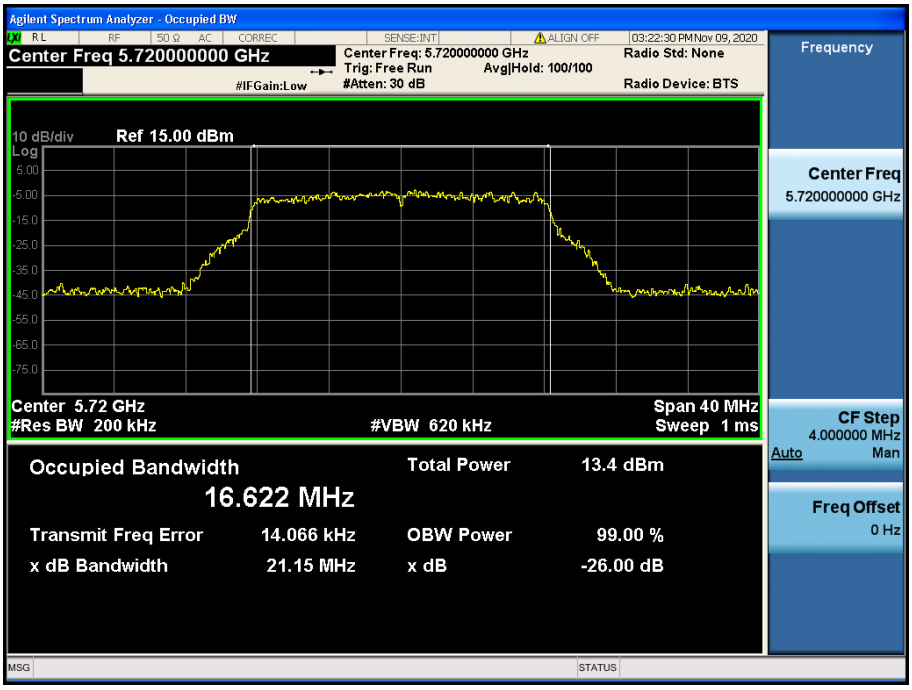
26 dB Bandwidth

Test Mode: TM 1 & Ch.116



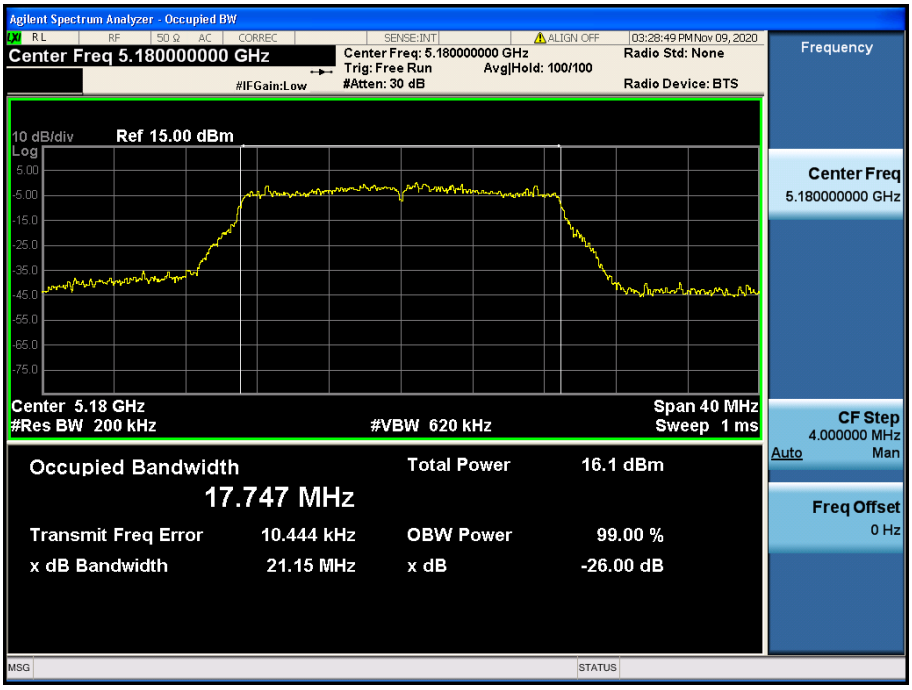
26 dB Bandwidth

Test Mode: TM 1 & Ch.144



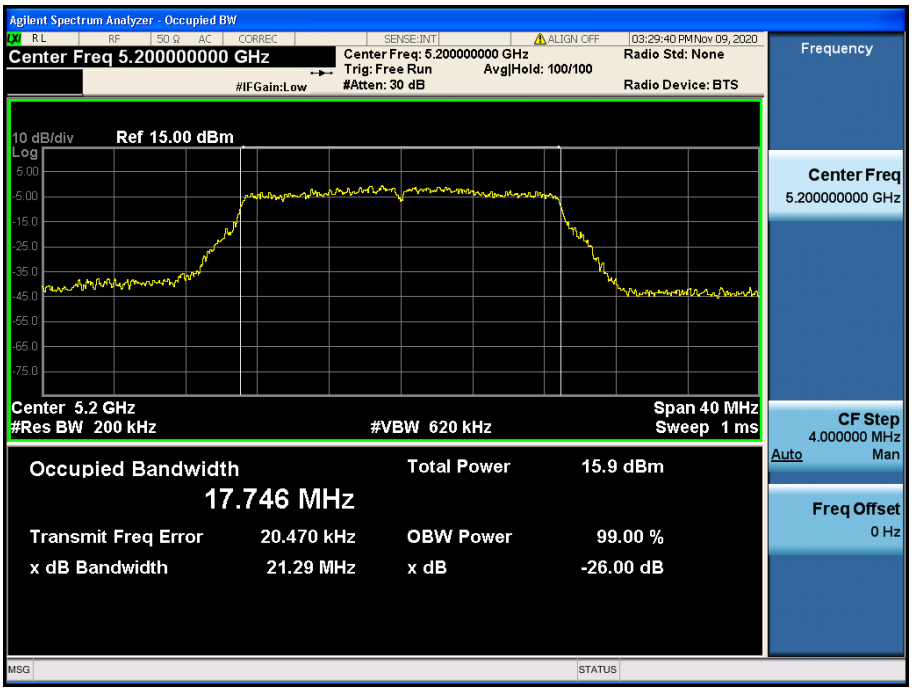
26 dB Bandwidth

Test Mode: TM 2 & Ch.36



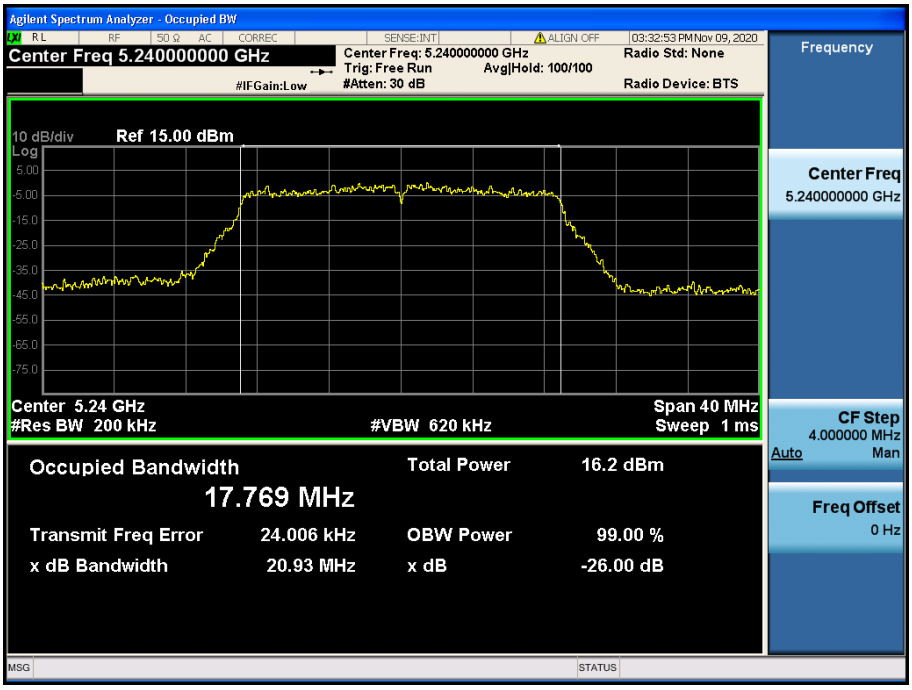
26 dB Bandwidth

Test Mode: TM 2 & Ch.40



26 dB Bandwidth

Test Mode: TM 2 & Ch.48



26 dB Bandwidth

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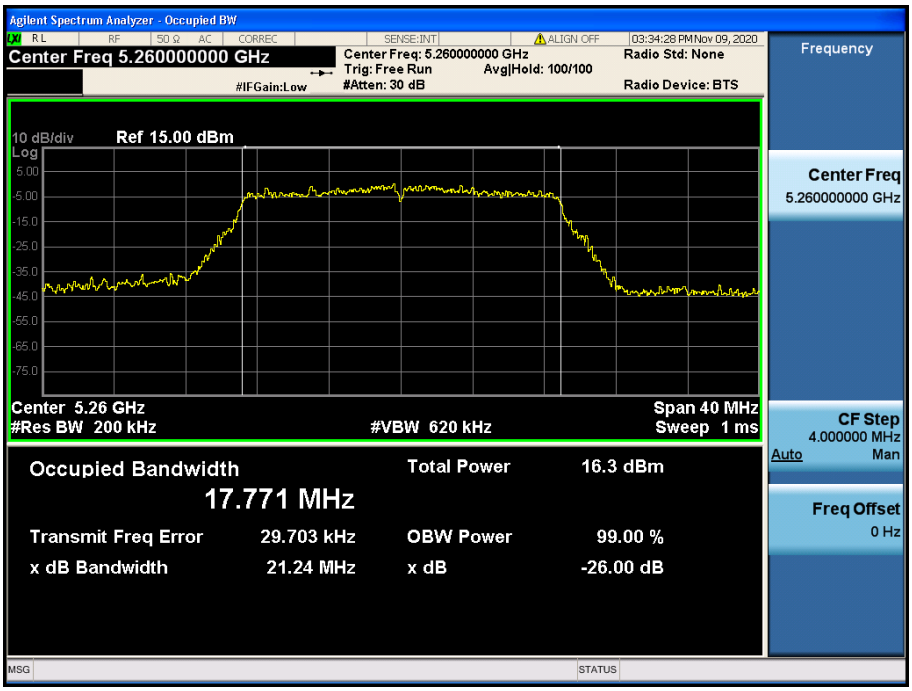
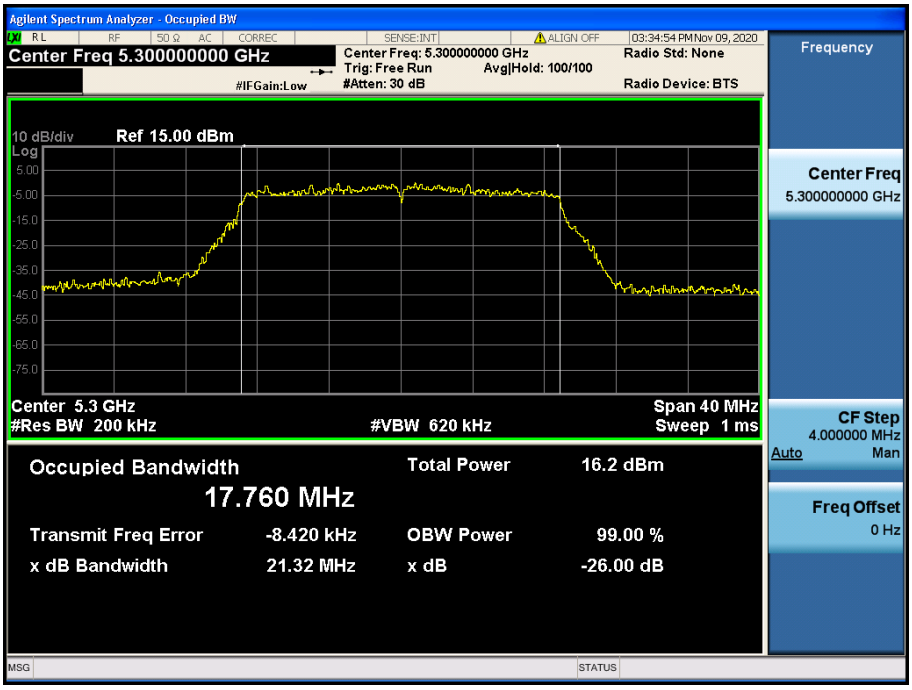


26 dB Bandwidth

Test Mode: TM 2 & Ch.60



26 dB Bandwidth

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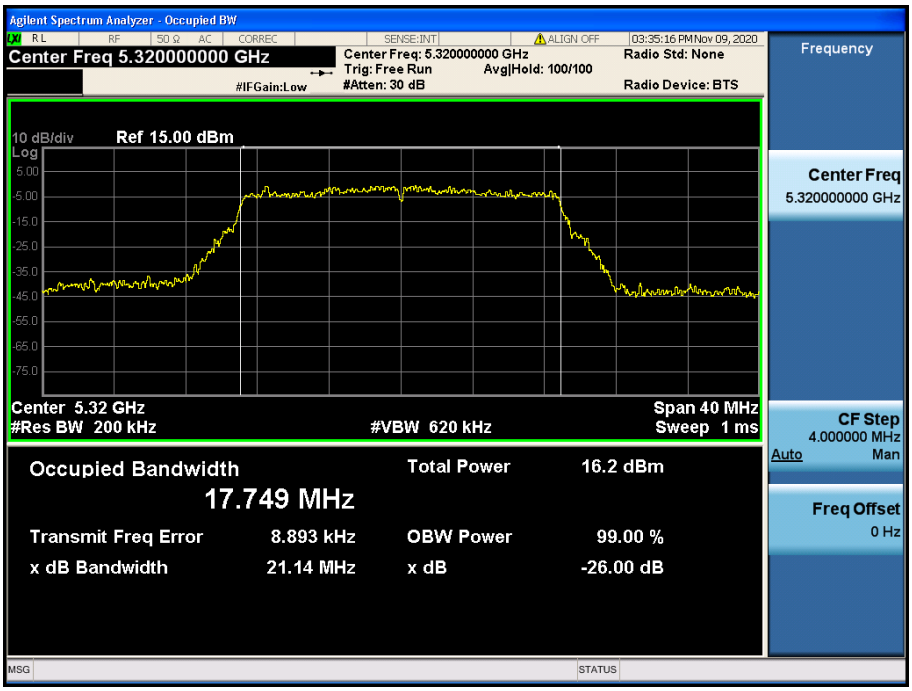

26 dB Bandwidth

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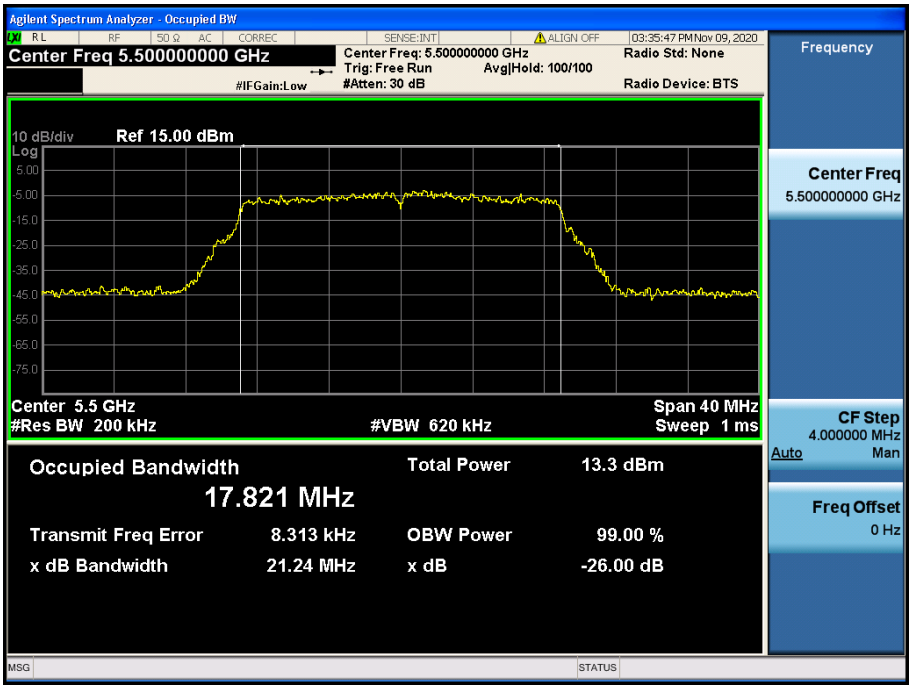

26 dB Bandwidth

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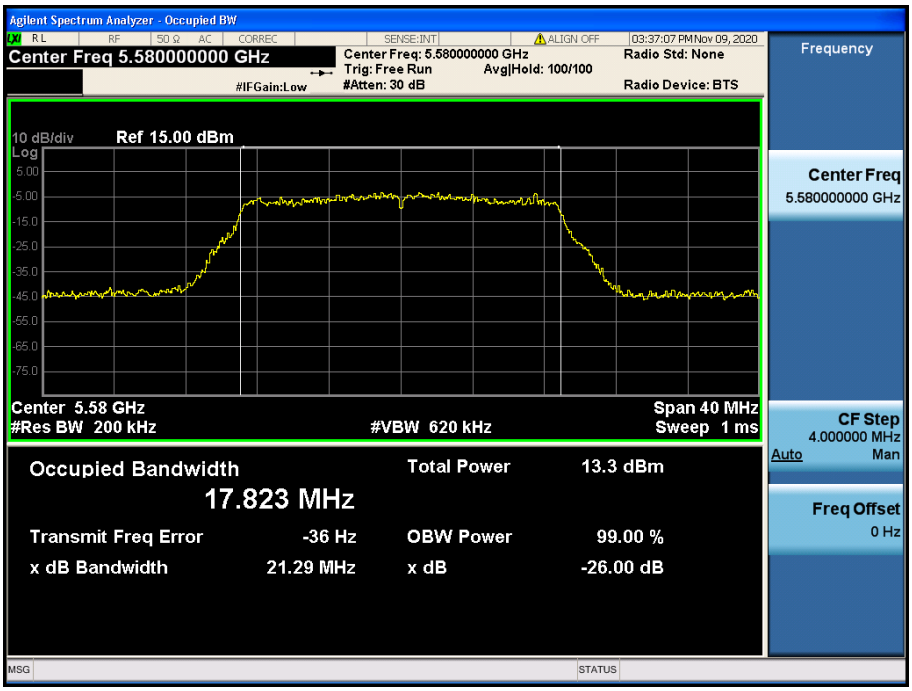

26 dB Bandwidth

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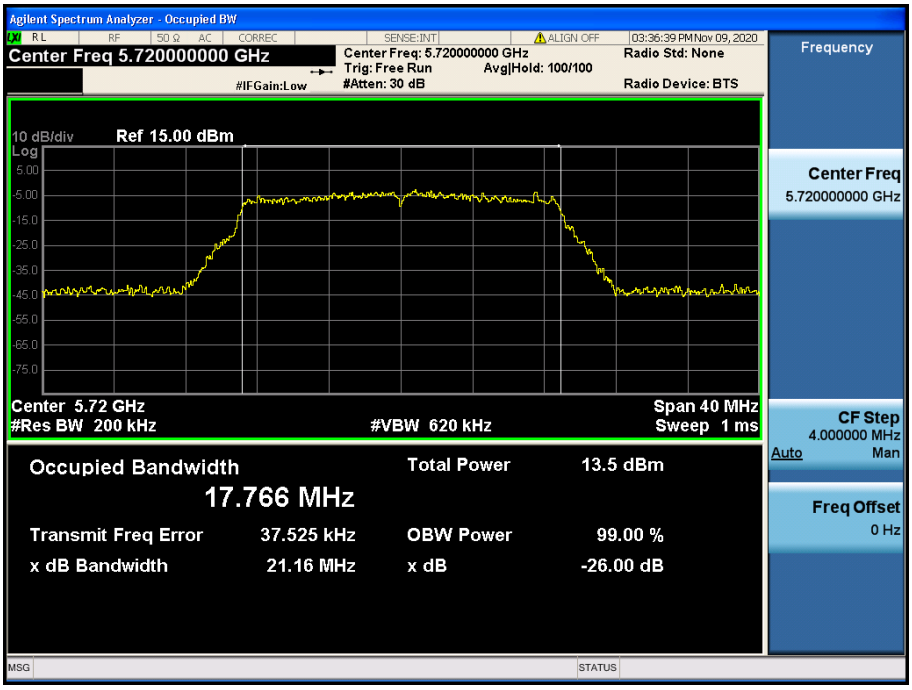

26 dB Bandwidth

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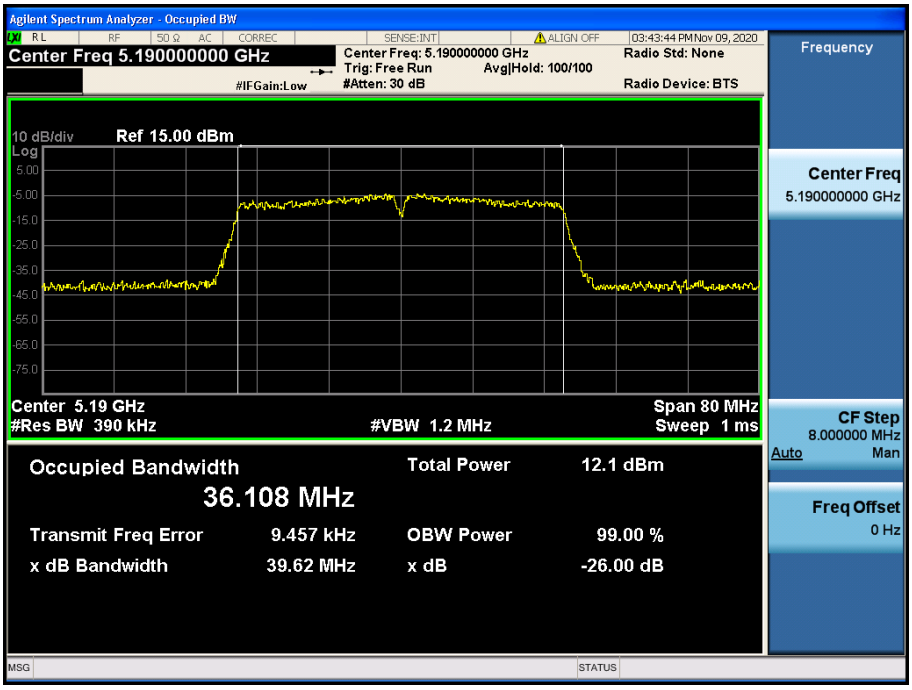

26 dB Bandwidth

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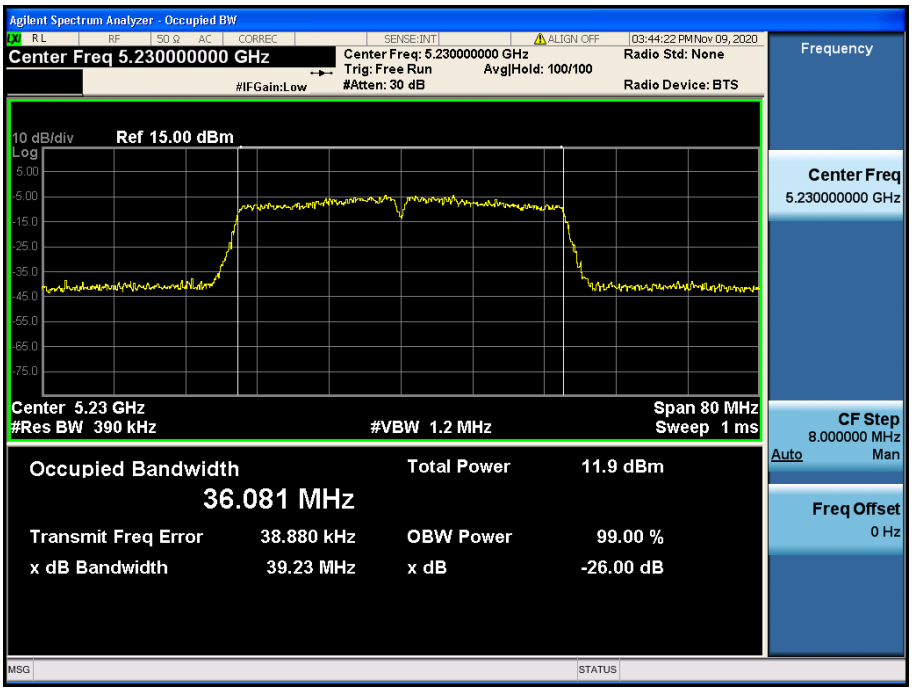

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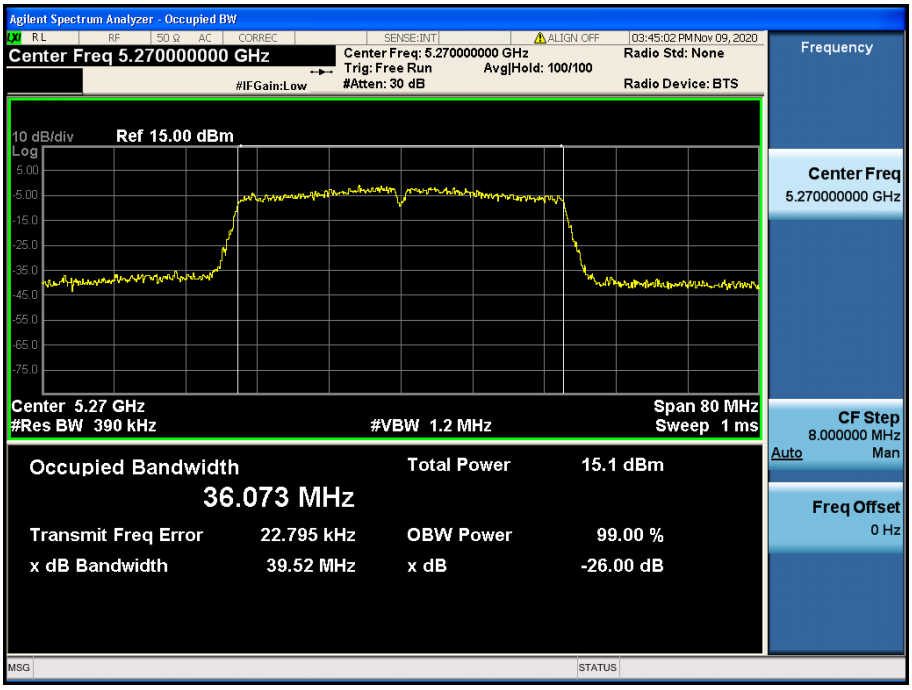

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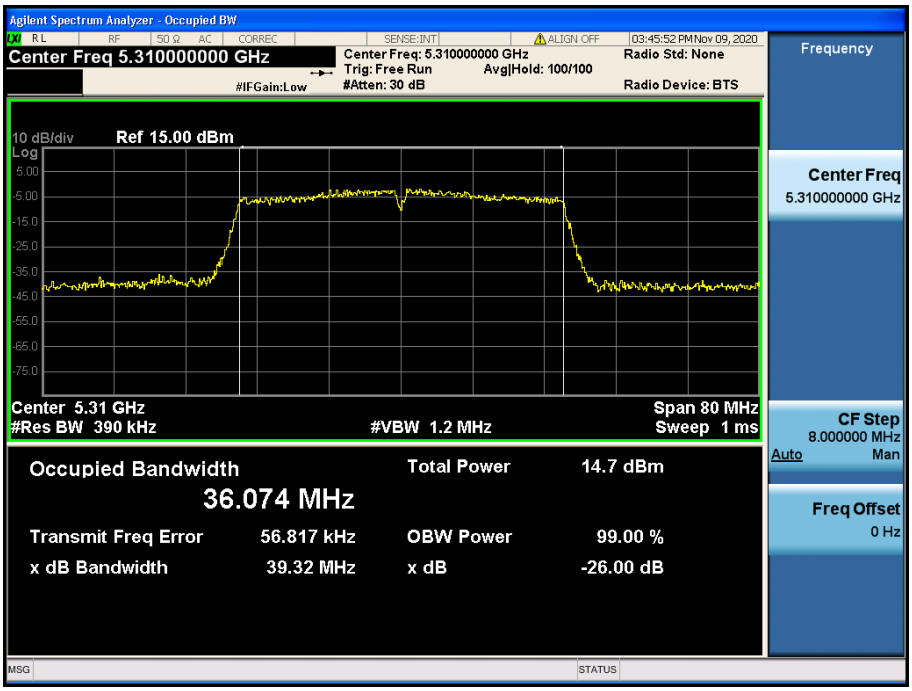

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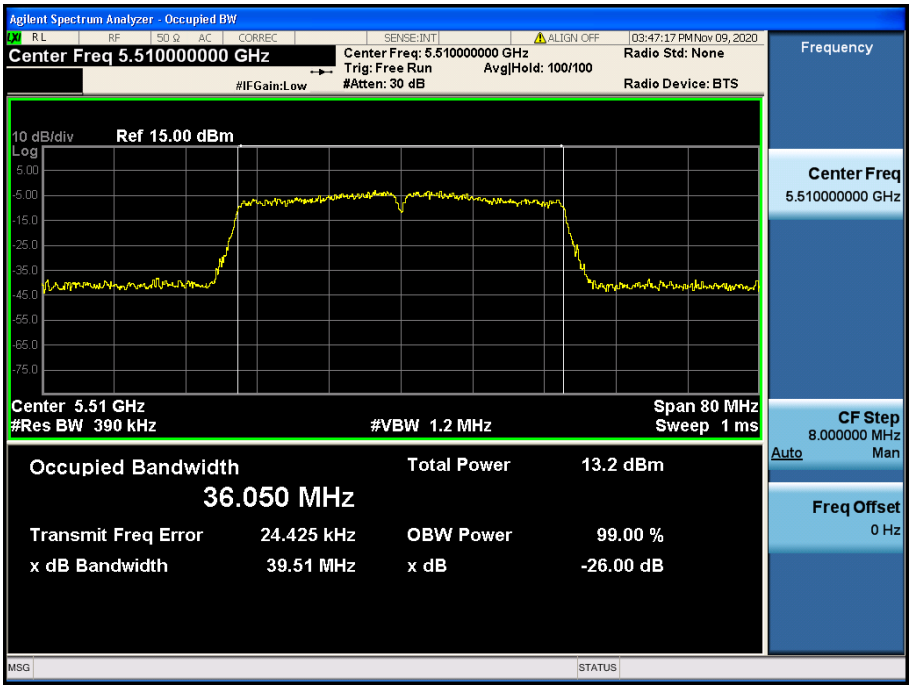

26 dB Bandwidth

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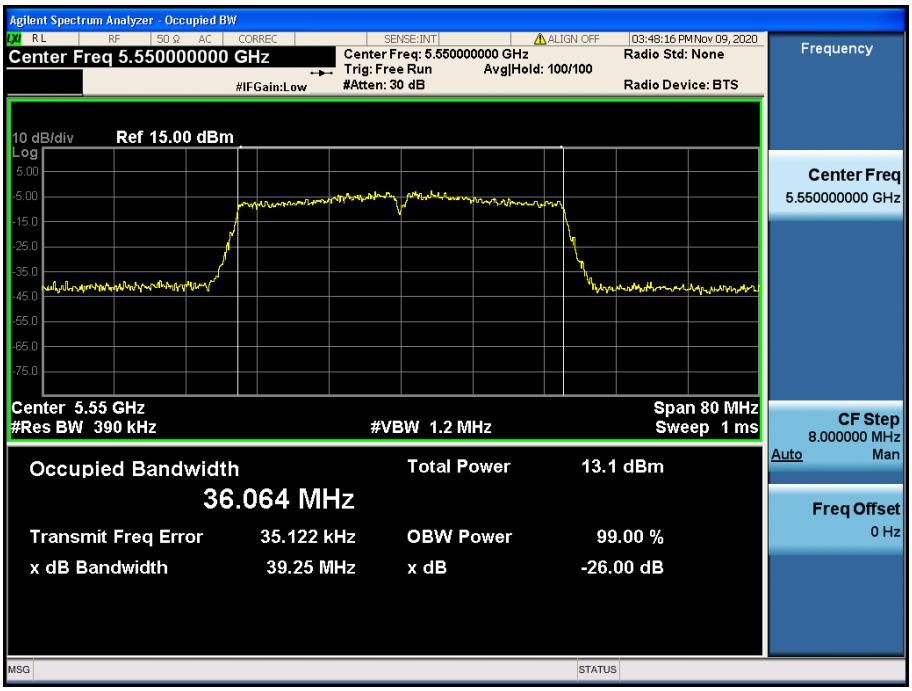

26 dB Bandwidth

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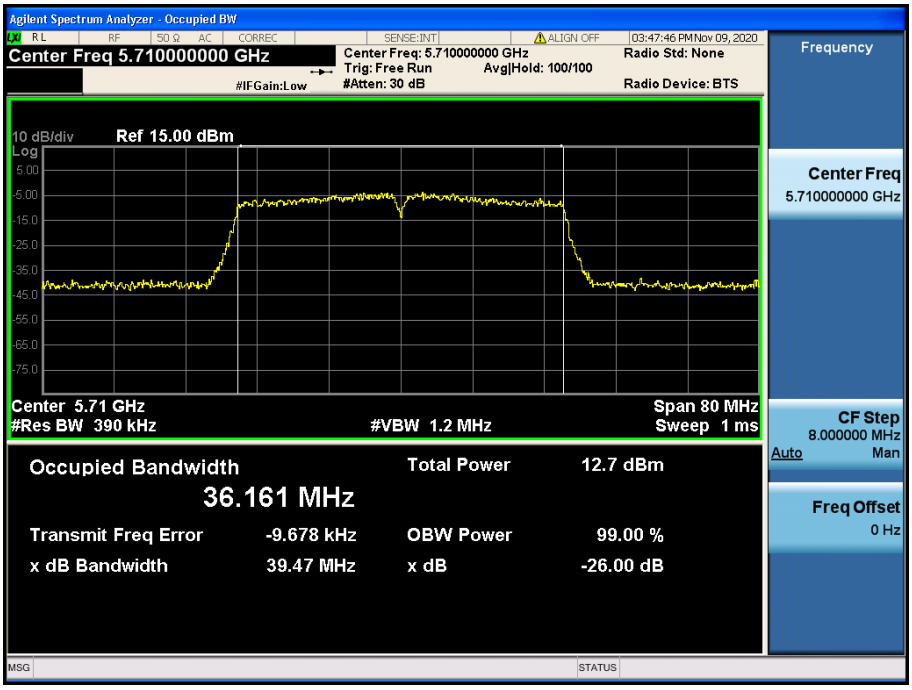
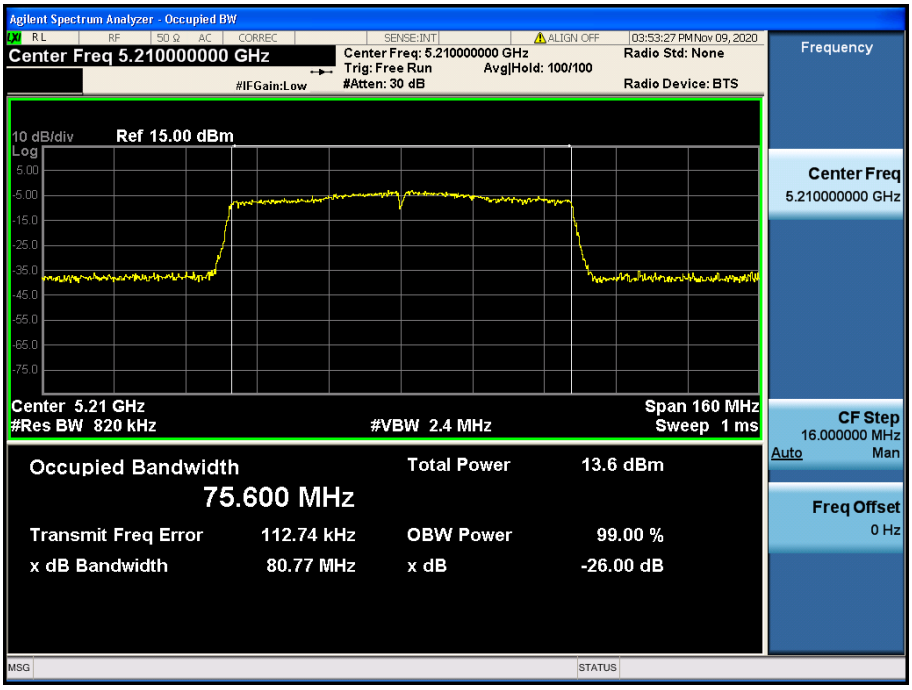


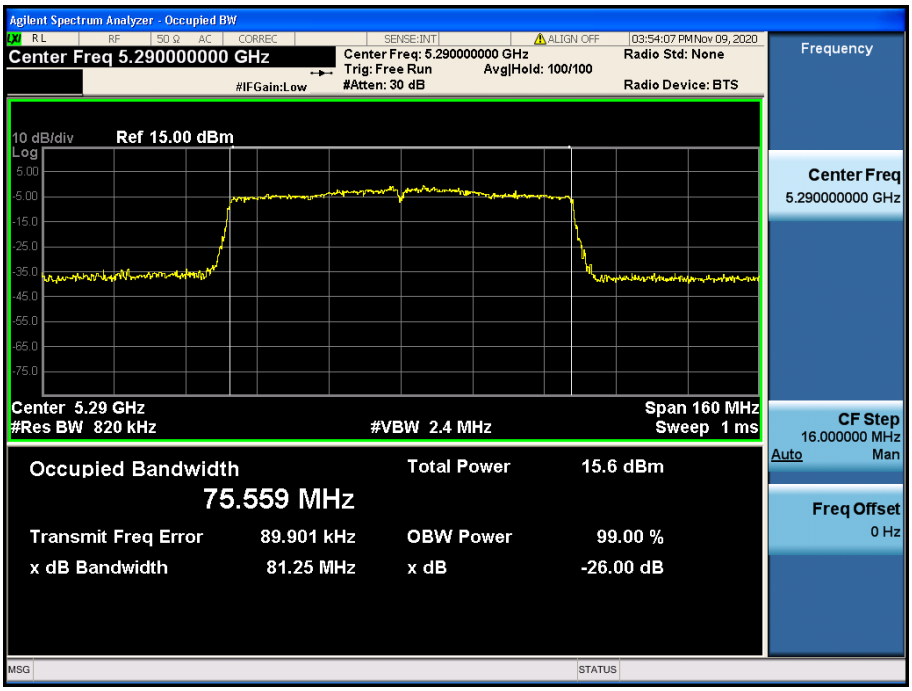
26 dB Bandwidth

Test Mode: TM 4 & Ch.42



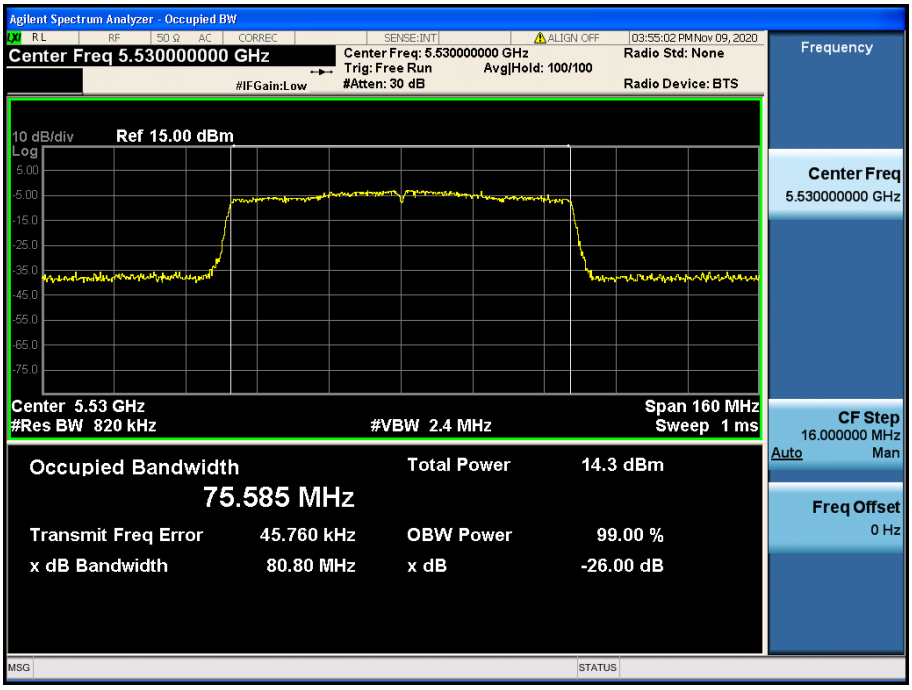
26 dB Bandwidth

Test Mode: TM 4 & Ch.58



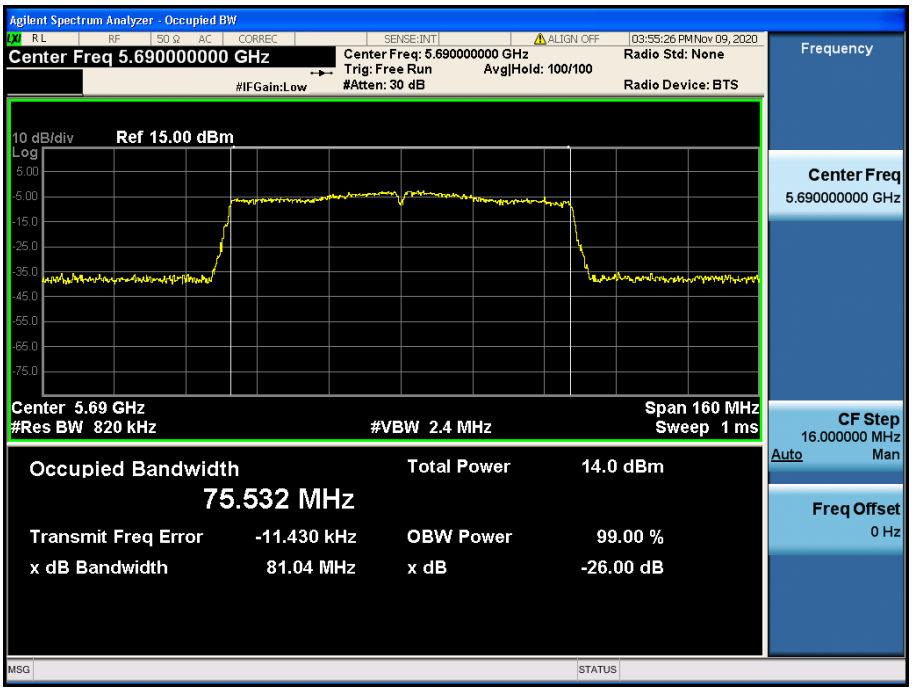
26 dB Bandwidth

Test Mode: TM 4 & Ch.106



26 dB Bandwidth

Test Mode: TM 4 & Ch.138



8.2 Minimum Emission Bandwidth (6 dB Bandwidth)

▣ Test Requirements

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

▣ Test Configuration

Refer to the APPENDIX I.

▣ Test Procedure

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **KDB789033 D02v02r01**.

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth **≥ 3 x RBW**.
3. Detector = **Peak**.
4. Trace mode = **max hold**.

   Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

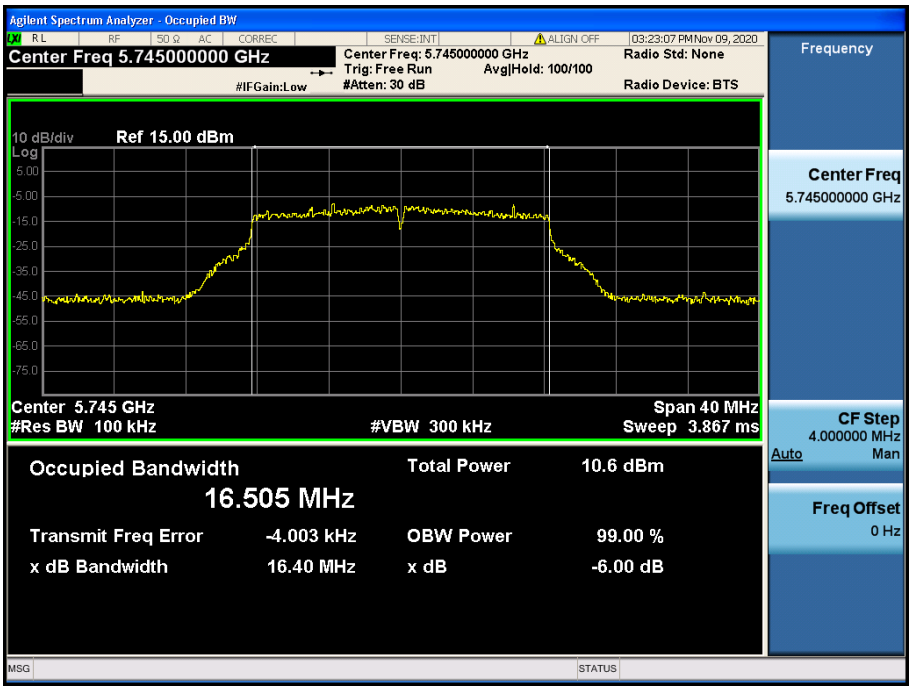
▣ Test Results: Comply

Mode	Band	Channel	Frequency [MHz]	Test Result 6 dB BW [MHz]
TM 1	U-NII 3	149	5745	16.40
		157	5785	16.37
		165	5825	16.34
TM 2		149	5745	17.56
		157	5785	17.59
		165	5825	17.63
TM 3		151	5755	35.64
		159	5795	35.50
TM 4		155	5775	75.46

▣ Result Plots

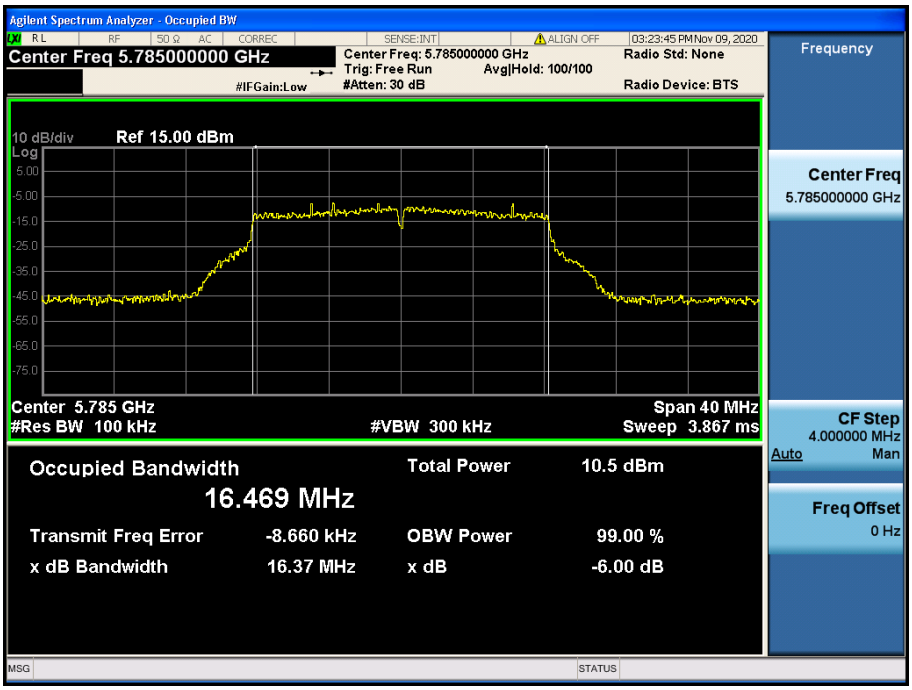
6 dB Bandwidth

Test Mode: TM 1 & Ch.149



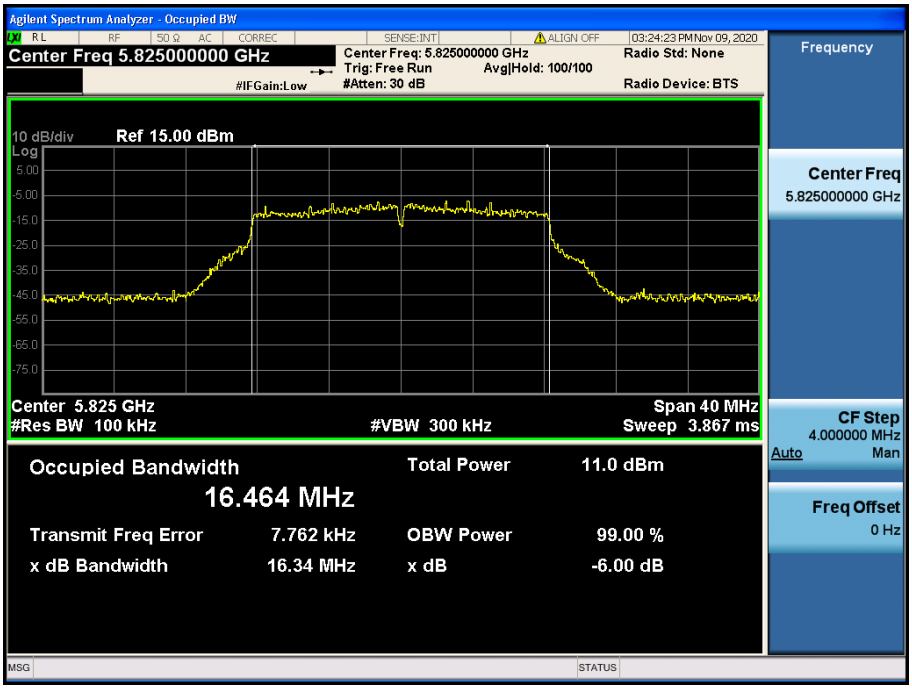
6 dB Bandwidth

Test Mode: TM 1 & Ch.157



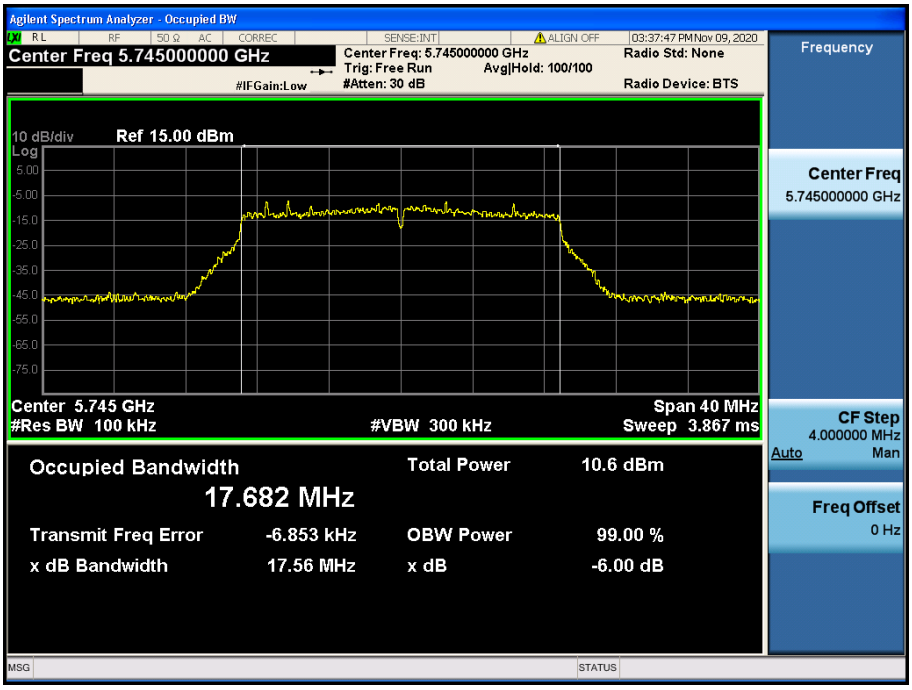
6 dB Bandwidth

Test Mode: TM 1 & Ch.165



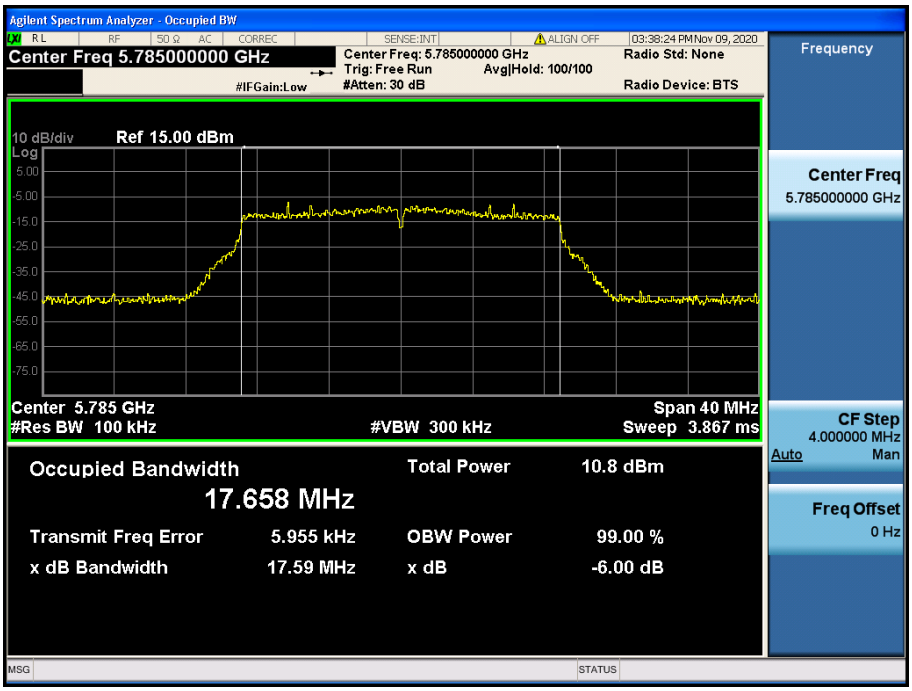
6 dB Bandwidth

Test Mode: TM 2 & Ch.149



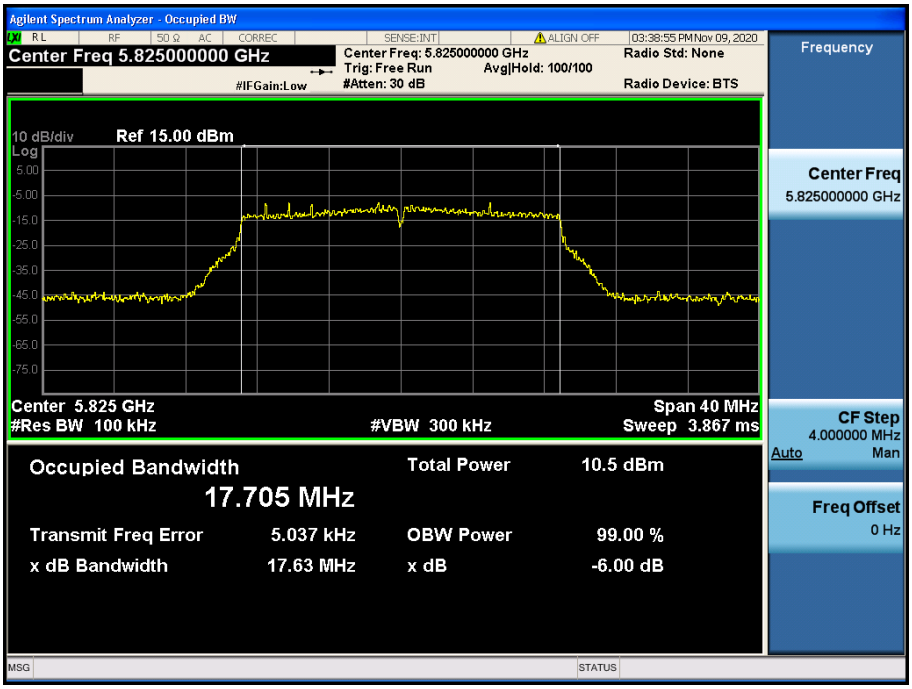
6 dB Bandwidth

Test Mode: TM 2 & Ch.157



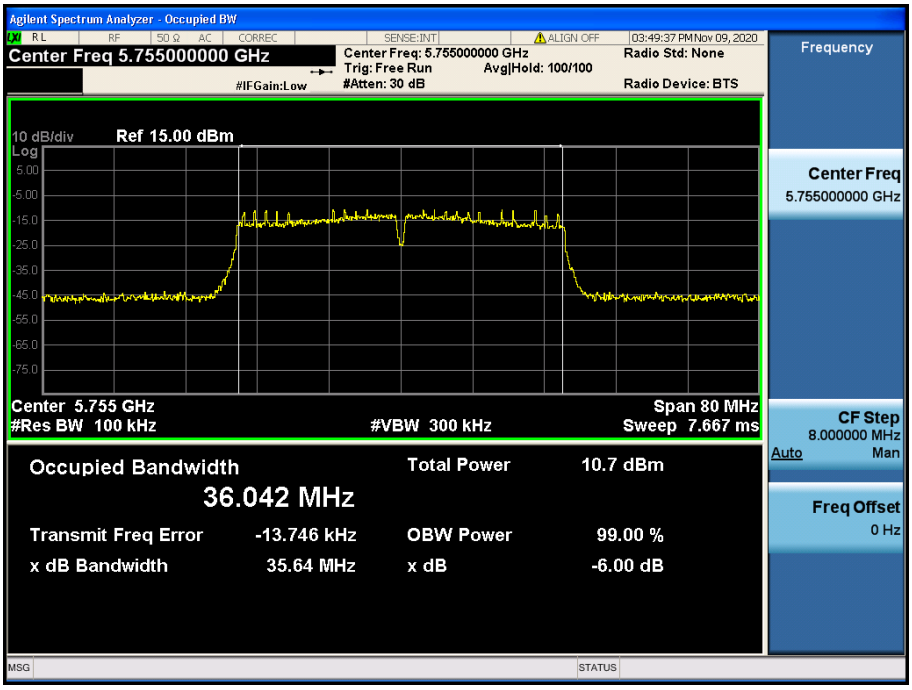
6 dB Bandwidth

Test Mode: TM 2 & Ch.165



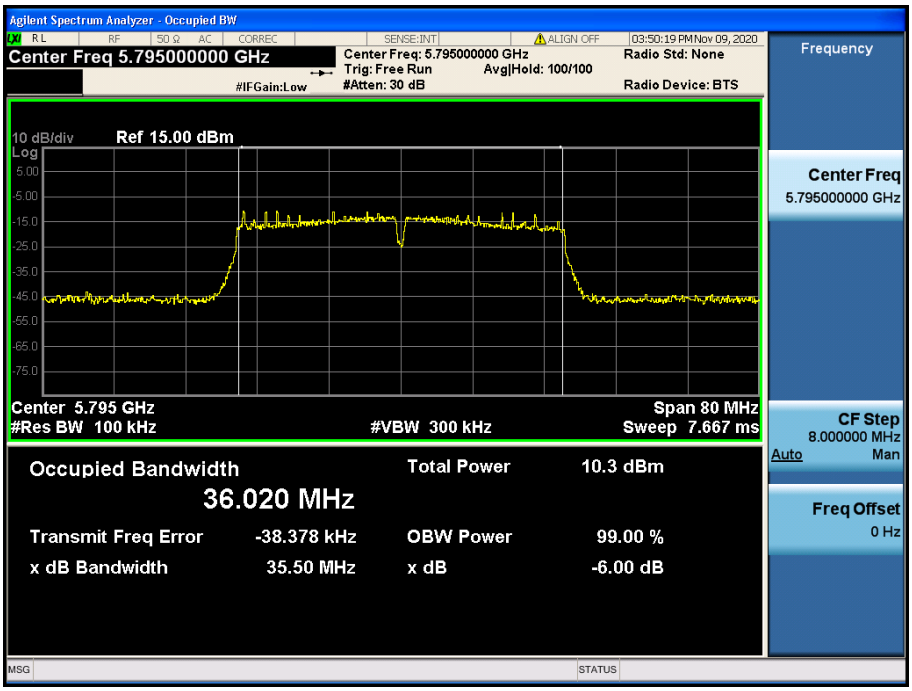
6 dB Bandwidth

Test Mode: TM 3 & Ch.151



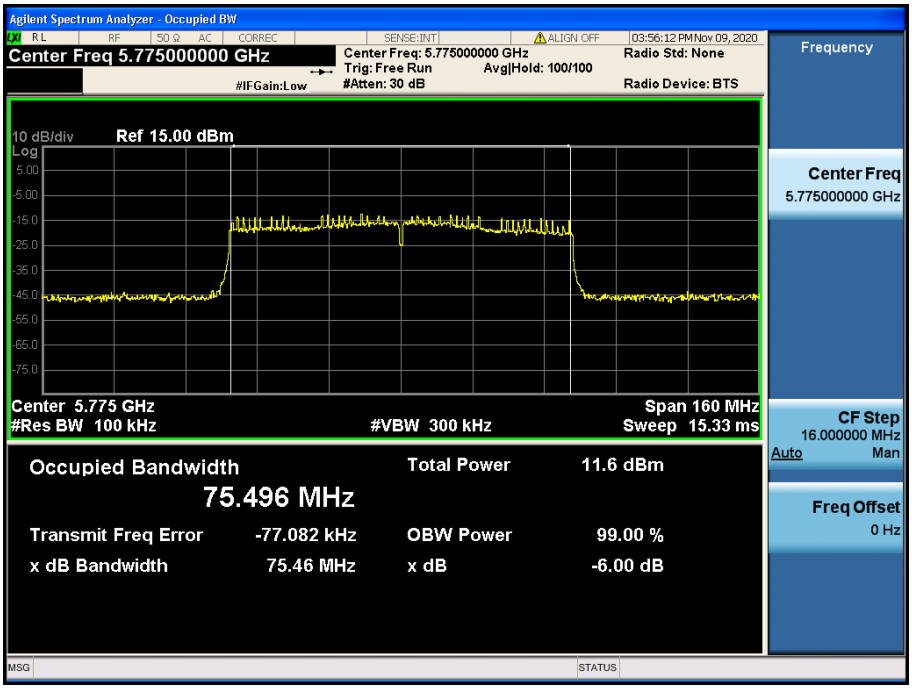
6 dB Bandwidth

Test Mode: TM 3 & Ch.159



6 dB Bandwidth

Test Mode: TM 4 & Ch.155



8.3 Maximum Conducted Output Power

▣ Test Requirements

Part. 15.407(a)

(1) For the band 5.150 GHz - 5.250 GHz.

(i) For an outdoor access point operating in the band 5.150 GHz - 5.250 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.150 GHz - 5.250 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.150 GHz - 5.250 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.150 GHz - 5.250 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.250 GHz - 5.350 GHz
(3) and 5.470 GHz - 5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(4) For the band 5.725 GHz - 5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

- Output power Limit Calculation

Band	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case) [dBi]	Determined Limit [dBm]
U-NII 1	250	23.97	-0.61	**23.97**

Band	Power Limit [mW] / Least 26 dBc BW [MHz]	Calculated Limit [dBm]	Antenna Gain (Worst case) [dBi]	Determined Limit [dBm]
U-NII 2A	250	23.97	-0.18	**23.97**
	20.64	24.14		
U-NII 2C	250	23.97	-0.77	**23.97**
	20.73	24.16		

Band	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain [dBi]	Determined Limit [dBm]
U-NII 3	1000	30.00	-0.18	**30.00**

▣ Test Configuration

Method PM-G

▣ Test Procedure

Method PM-G of KDB789033 D02

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

▣ **Test Results: Comply**

- Output Power

Mode	CH	Freq.[MHz]	Test Result [dBm]
802.11a	36	5 180	7.74
	40	5 200	7.93
	48	5 240	7.40
	52	5 260	7.58
	60	5 300	7.19
	64	5 320	7.27
	100	5 500	5.12
	116	5 580	5.23
	144	5 720	5.38
	149	5 745	2.62
	157	5 785	2.63
	165	5 825	2.44

Mode	CH	Freq.[MHz]	Test Result [dBm]
802.11n (HT20)	36	5 180	7.90
	40	5 200	7.89
	48	5 240	7.72
	52	5 260	7.36
	60	5 300	7.42
	64	5 320	7.47
	100	5 500	5.43
	116	5 580	5.57
	144	5 720	5.11
	149	5 745	2.61
	157	5 785	2.37
	165	5 825	2.32

Mode	CH	Freq.[MHz]	Test Result[dBm]
802.11n(HT40)	38	5 190	4.28
	46	5 230	3.60
	54	5 270	6.18
	62	5 310	6.23
	102	5 510	5.24
	110	5 550	5.07
	142	5 710	4.84
	151	5 755	2.23
	159	5 795	2.27

Mode	CH	Freq.[MHz]	Test Result[dBm]
802.11ac(VHT20)	36	5 180	7.94
	40	5 200	7.68
	48	5 240	7.56
	52	5 260	7.35
	60	5 300	7.32
	64	5 320	7.41
	100	5 500	5.37
	116	5 580	5.46
	144	5 720	5.11
	149	5 745	2.62
	157	5 785	2.45
	165	5 825	2.73

Mode	CH	Freq.[MHz]	Test Result[dBm]
802.11ac(VHT40)	38	5 190	4.39
	46	5 230	3.62
	54	5 270	6.56
	62	5 310	6.01
	102	5 510	5.09
	110	5 550	4.91
	142	5 710	4.96
	151	5 755	1.96
	159	5 795	2.16

Mode	CH	Freq.[MHz]	Test Result[dBm]
802.11ac(VHT80)	42	5 210	5.38
	58	5 290	6.95
	106	5 530	5.28
	138	5 690	5.38
	155	5 775	2.71

8.4 Maximum Power Spectral Density

▣ Test requirements

Part. 15.407(a)

(1) For the band 5.150 GHz - 5.250 GHz.

(i) For an outdoor access point operating in the band 5.150 GHz - 5.250 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band. note1

(ii) For an indoor access point operating in the band 5.150 GHz - 5.250 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band. note1

(iii) For fixed point-to-point access points operating in the band 5.150 GHz - 5.250 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

(iv) For mobile and portable client devices in the 5.150 GHz - 5.250 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. note1

(2) For the 5.250 GHz - 5.350 GHz and 5.470 GHz - 5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. note1

(3) For the band 5.725 GHz - 5.850 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500 kHz band. note1,note2

Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note2: Fixed point - to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

- Peak Power Spectral Density Limit Calculation

Band	Limit [dBm]	Antenna Gain (Worst case) [dBi]	Determined Limit [dBm]
U-NII 1	11	-0.61	11
U-NII 2A	11	-0.18	11
U-NII 2C	11	-0.77	11
U-NII 3	30	-0.18	30

▣ Test Configuration

Refer to the APPENDIX I.

▣ **Test procedure**

Maximum Power Spectral Density is measured using Measurement Procedure **of KDB789033 D02v02r01**

1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA - 1, SA - 2, SA - 3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power…". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)

2) Use the peak search function on the instrument to find the peak of the spectrum and record its value.

3) Make the following adjustments to the peak value of the spectrum, if applicable:

a) If Method SA - 2 or SA - 2 Alternative was used, add 10 log(1 / x), where x is the duty cycle, to the peak of the spectrum.

b) If Method SA - 3 Alternative was used and the linear mode was used in step II.E.2.g (viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.

4) The result is the Maximum PSD over 1 MHz reference bandwidth.

5) For devices operating in the bands 5.15 GHz - 5.25 GHz, 5.25 GHz - 5.35 GHz, and 5.47 GHz - 5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in §15.407(a)(5). For devices operating in the band 5.725 GHz - 5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1 / T, where T is defined in section II.B.1.a). (Refer to Appendix II)

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log(500 kHz / RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log(1 MHz / RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since RBW = 100 kHz is available on nearly all spectrum analyzers.

▣ **Test results: Comply**

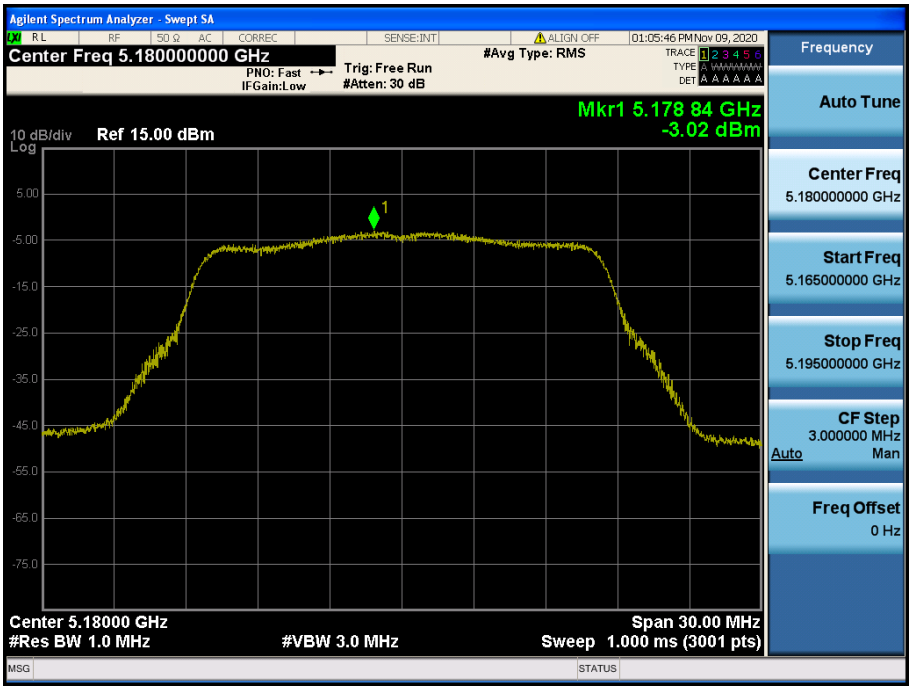
Mode	Channel	Frequency [MHz]	Reading [dBm]	T.F Note 1 [dB]	Test Result [dBm]
TM 1	36	5 180	-3.02	0.20	-2.82
	40	5 200	-2.91		-2.71
	48	5 240	-3.28		-3.08
	52	5 260	-3.24		-3.04
	60	5 300	-3.34		-3.14
	64	5 320	-3.03		-2.83
	100	5 500	-5.74		-5.54
	116	5 580	-5.76		-5.56
	144	5 720	-6.23		-6.03
	149	5 745	-17.69	7.19	-10.50
	157	5 785	-18.05		-10.86
	165	5 825	-18.05		-10.86
TM 2	36	5 180	-3.66	0.25	-3.41
	40	5 200	-3.72		-3.47
	48	5 240	-3.44		-3.19
	52	5 260	-3.67		-3.42
	60	5 300	-3.29		-3.04
	64	5 320	-3.74		-3.49
	100	5 500	-5.97		-5.72
	116	5 580	-6.47		-6.22
	144	5 720	-6.88		-6.63
	149	5 745	-18.56	7.24	-11.32
	157	5 785	-18.34		-11.10
	165	5 825	-18.09		-10.85
TM 3	38	5 190	-10.85	0.46	-10.39
	46	5 230	-10.63		-10.17
	54	5 270	-7.83		-7.37
	62	5 310	-8.38		-7.92
	102	5 510	-9.37		-8.91
	110	5 550	-9.95		-9.49
	142	5 710	-9.84		-9.38
	151	5 755	-22.58	7.45	-15.13
	159	5 795	-22.13		-14.68
TM 4	42	5 210	-12.96	0.87	-12.09
	58	5 290	-10.89		-10.02
	106	5 530	-13.07		-12.20
	138	5 690	-13.20		-12.33
	155	5 775	-24.75	7.86	-16.89

Note 1: "U-NII 3 [T.F] = 10*LOG(500 kHz / 100 kHz) + DCCF" = 6.99 dB + DCCF
For DCCF(Duty Cycle Correction Factor) please refer to appendix II.
Note 2: Test Result = Measurement Data + T.F

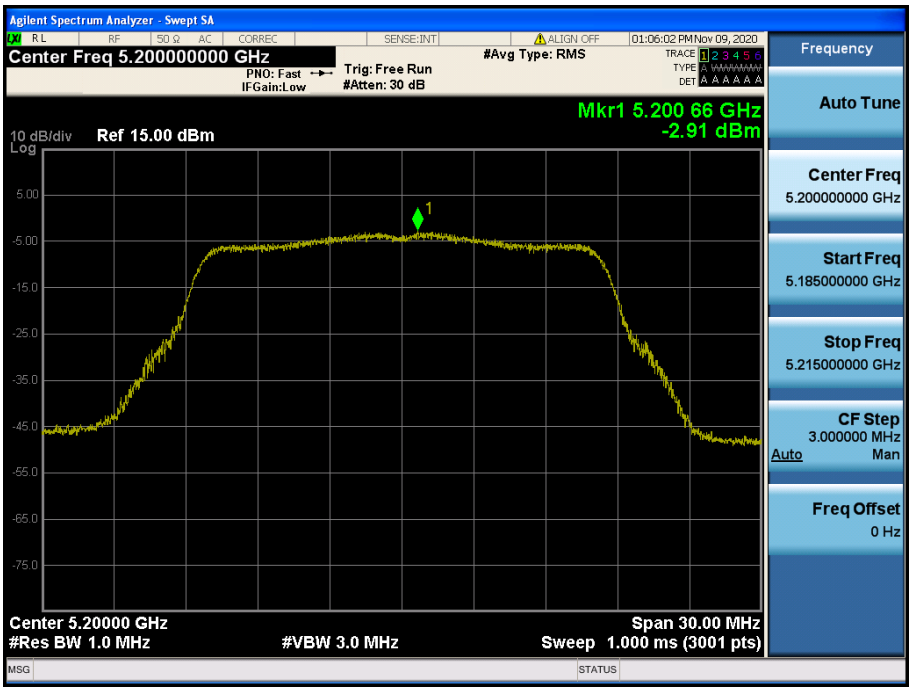
▣ RESULT PLOTS

- Power spectral density

Maximum Power Spectral Density Test Mode: TM 1 & Ch.36

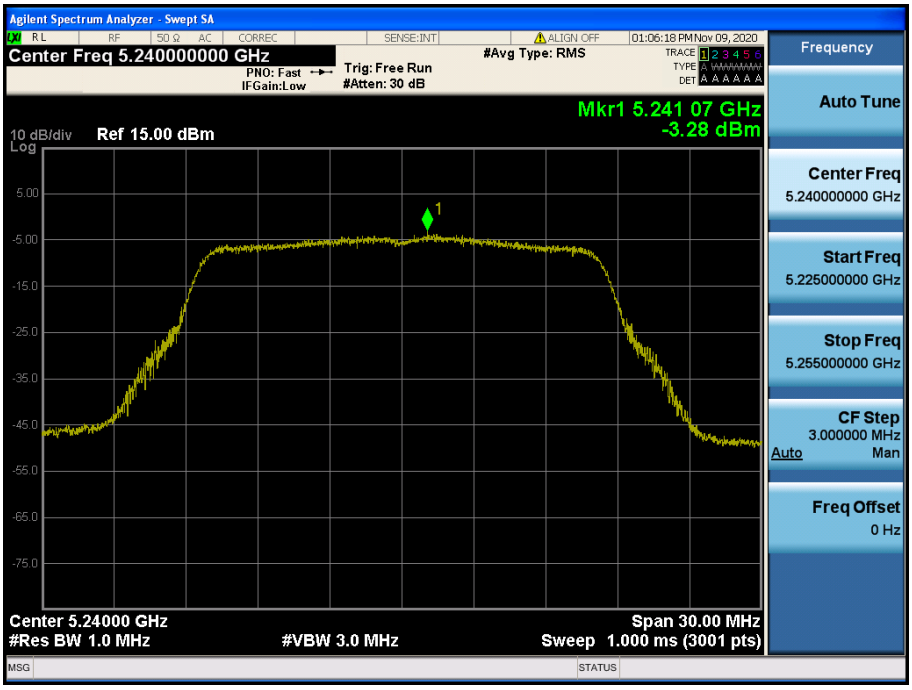


Maximum Power Spectral Density Test Mode: TM 1 & Ch.40



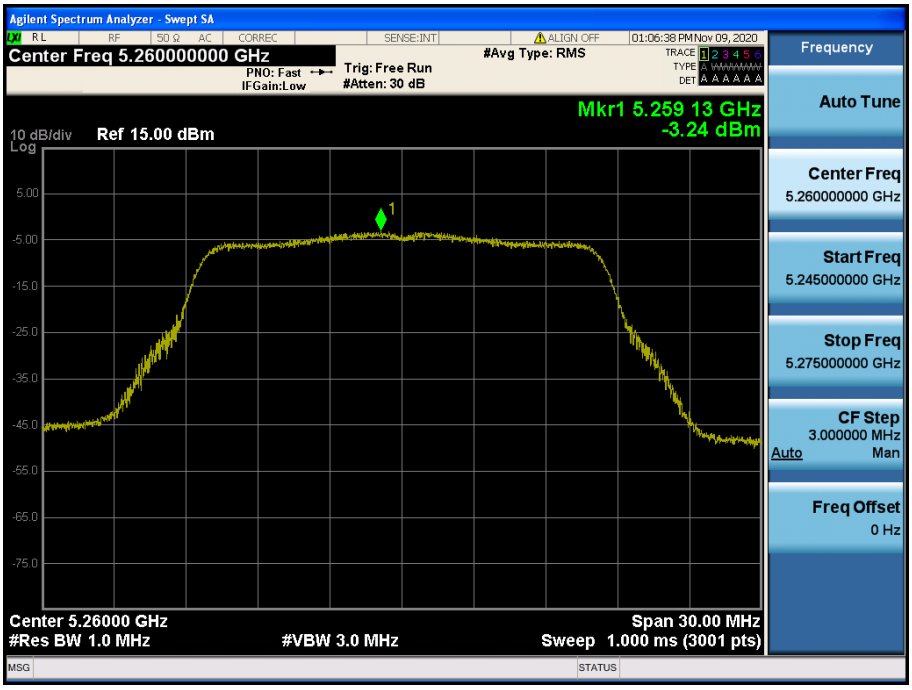
Maximum Power Spectral Density

Test Mode: TM 1 & Ch.48



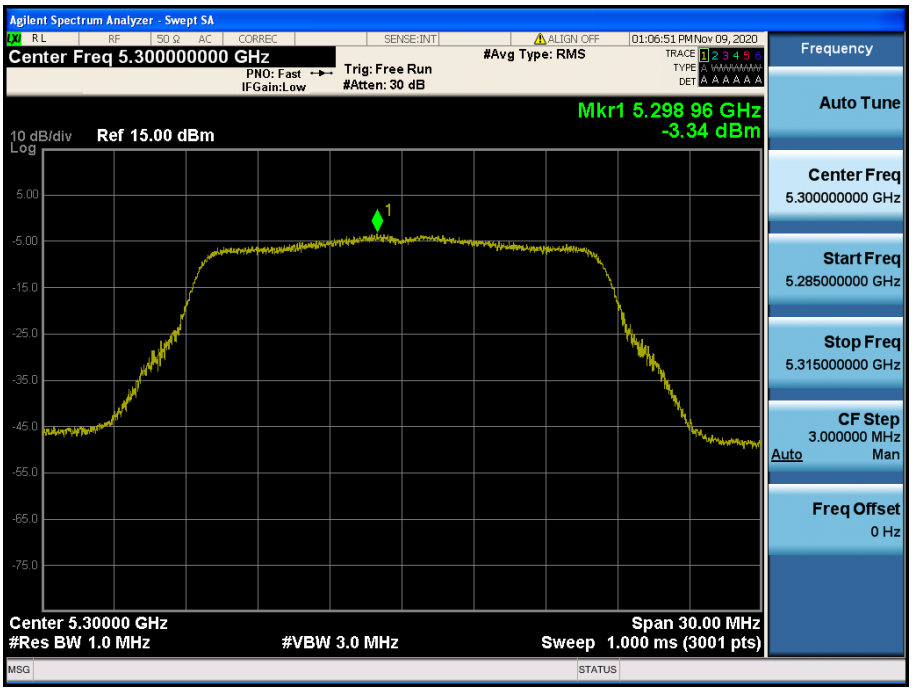
Maximum Power Spectral Density

Test Mode: TM 1 & Ch.52



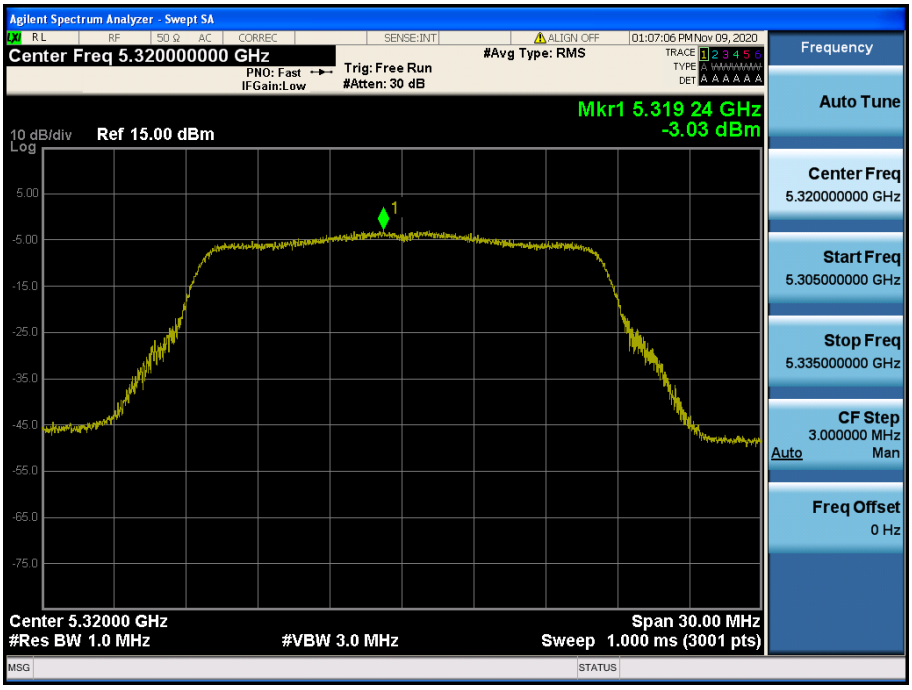
Maximum Power Spectral Density

Test Mode: TM 1 & Ch.60



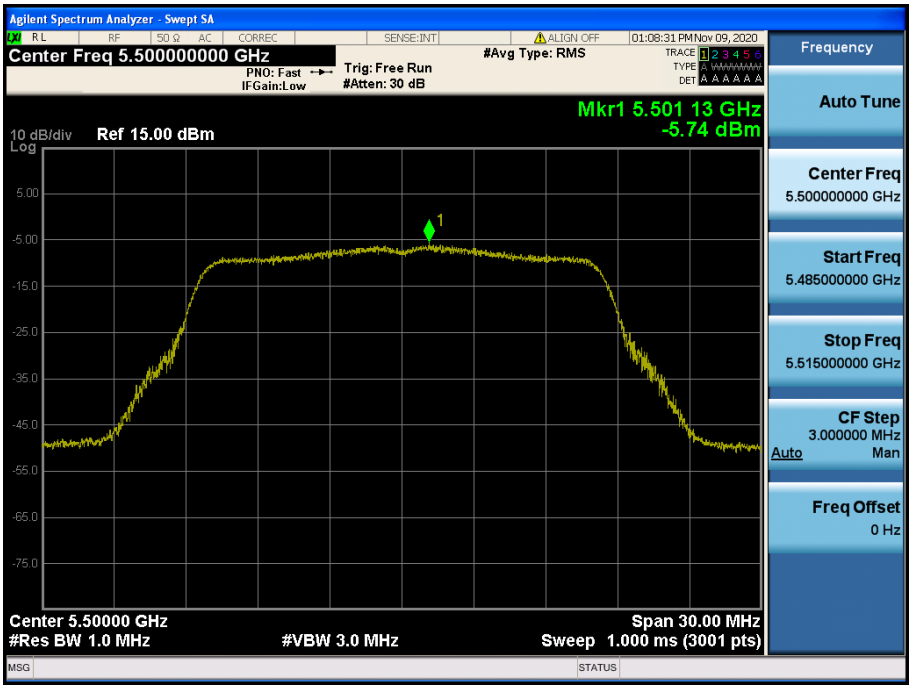
Maximum Power Spectral Density

Test Mode: TM 1 & Ch.64



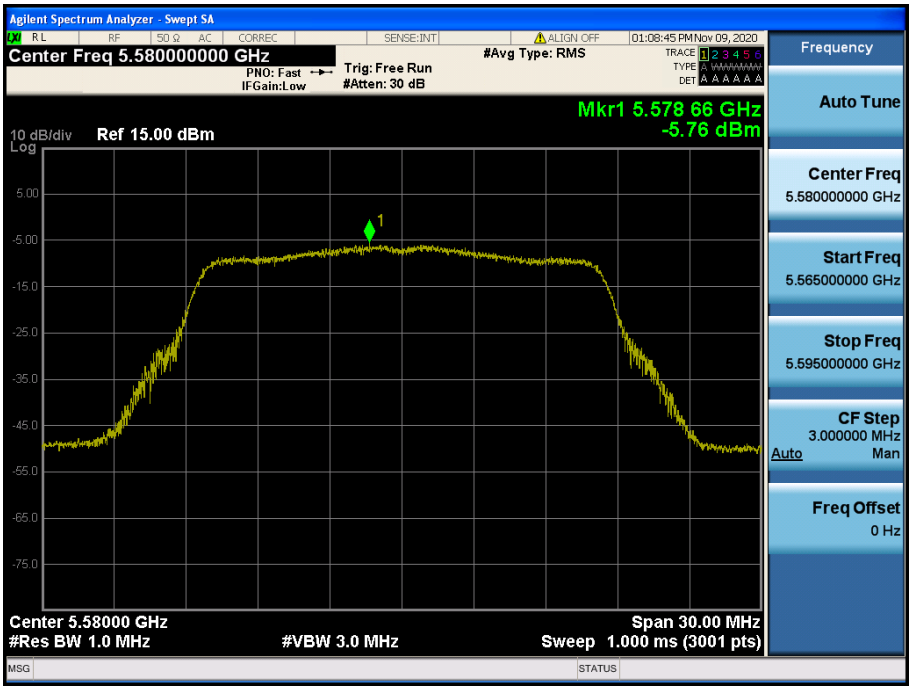
Maximum Power Spectral Density

Test Mode: TM 1 & Ch.100

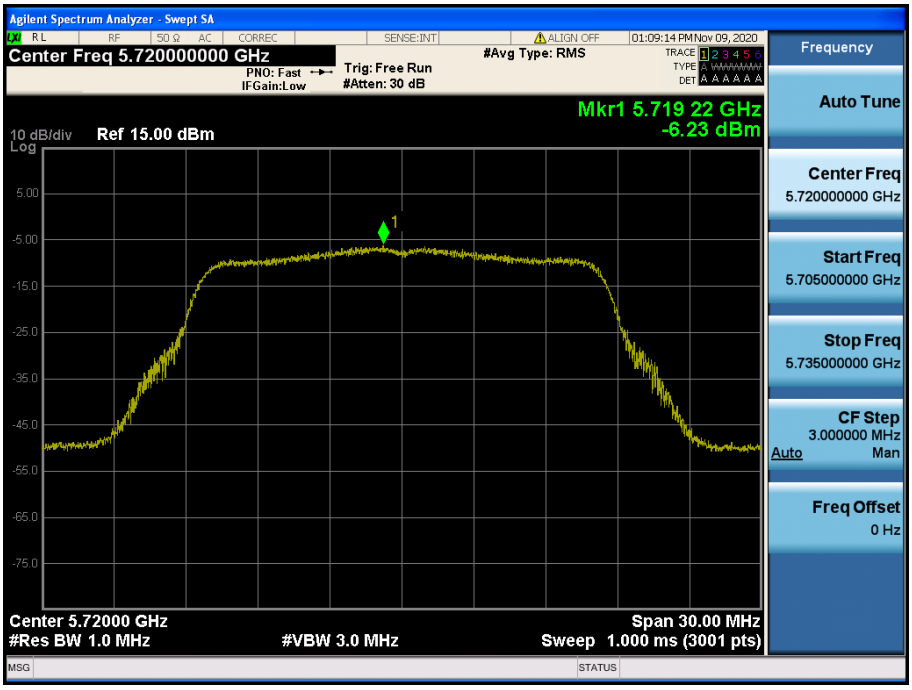


Maximum Power Spectral Density

Test Mode: TM 1 & Ch.116

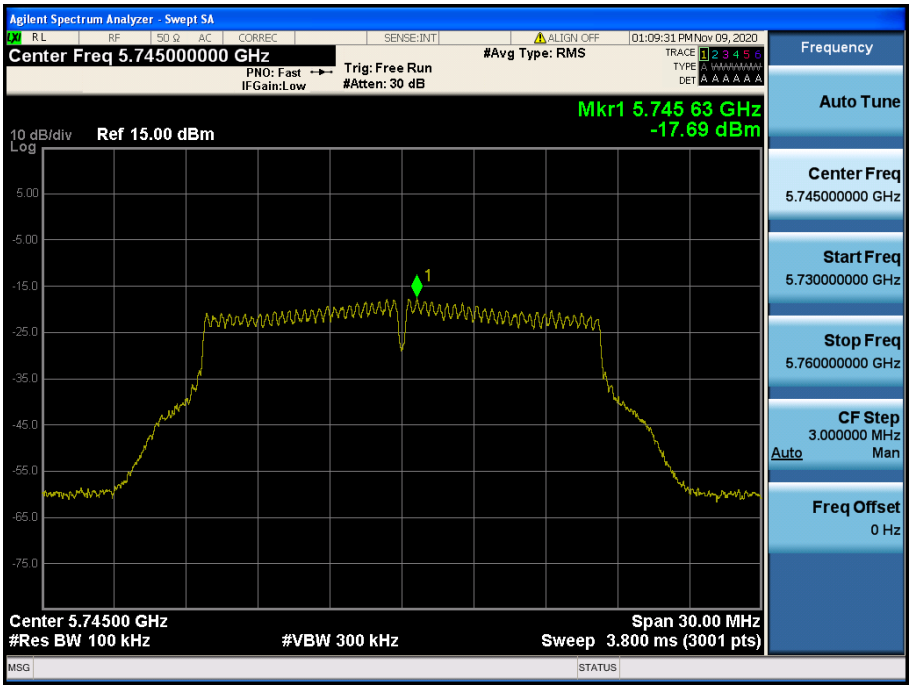


Maximum Power Spectral Density Test Mode: TM 1 & Ch.144



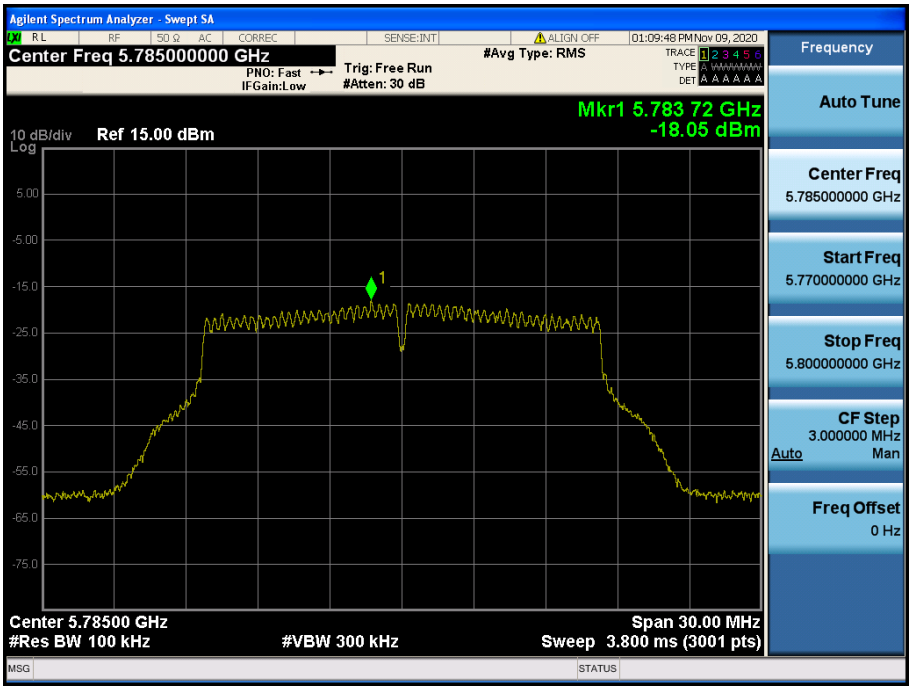
Maximum Power Spectral Density

Test Mode: TM 1 & Ch.149



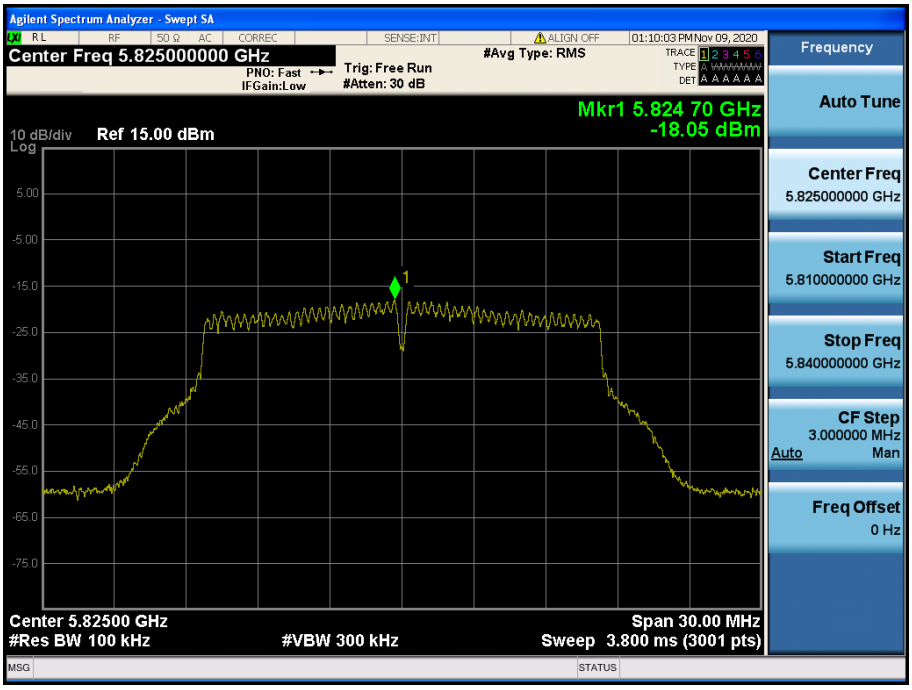
Maximum Power Spectral Density

Test Mode: TM 1 & Ch.157



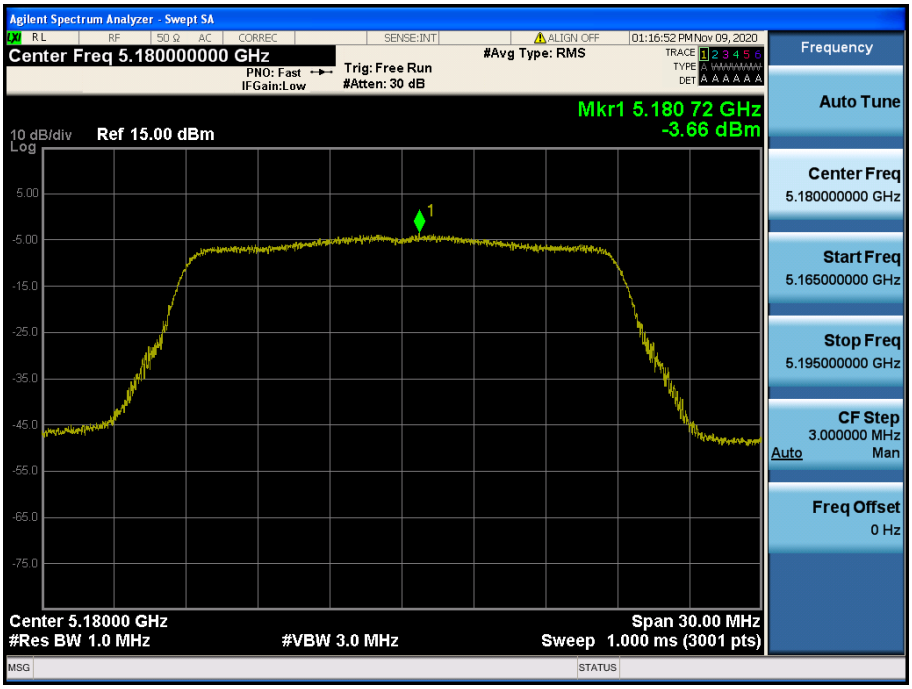
Maximum Power Spectral Density

Test Mode: TM 1 & Ch.165



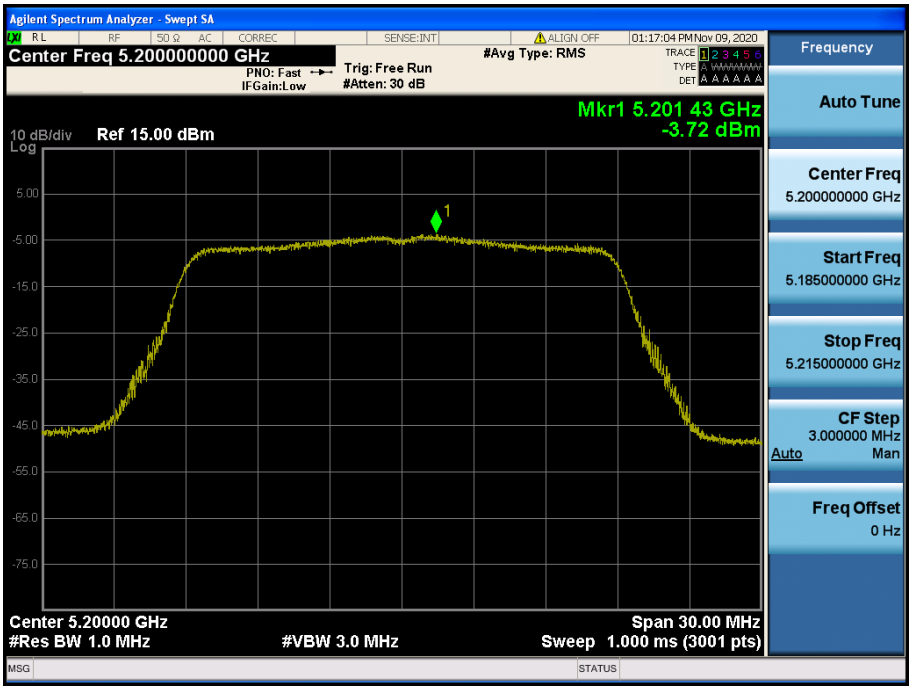
Maximum Power Spectral Density

Test Mode: TM 2 & Ch.36



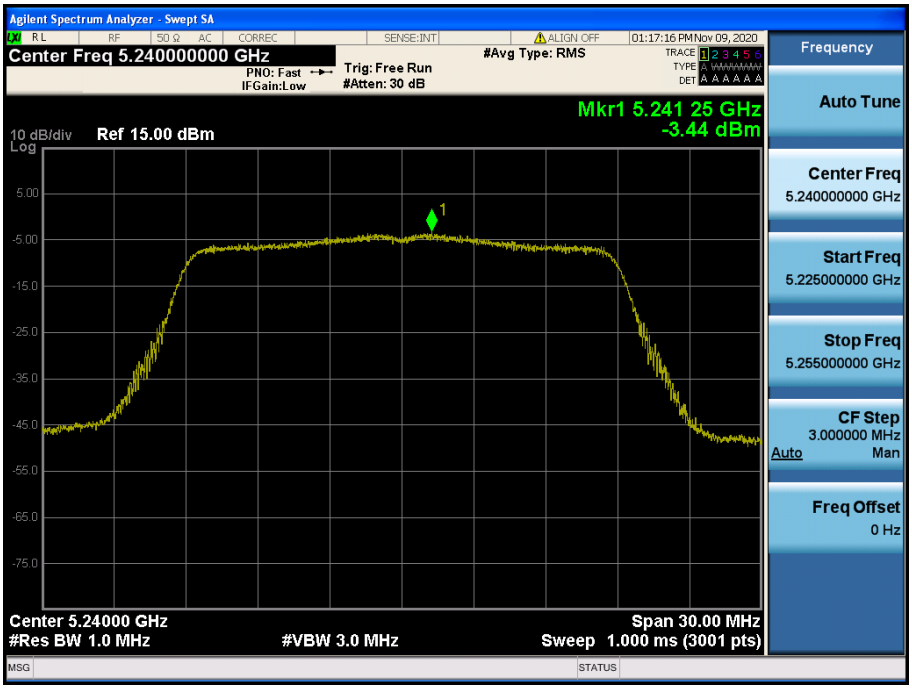
Maximum Power Spectral Density

Test Mode: TM 2 & Ch.40



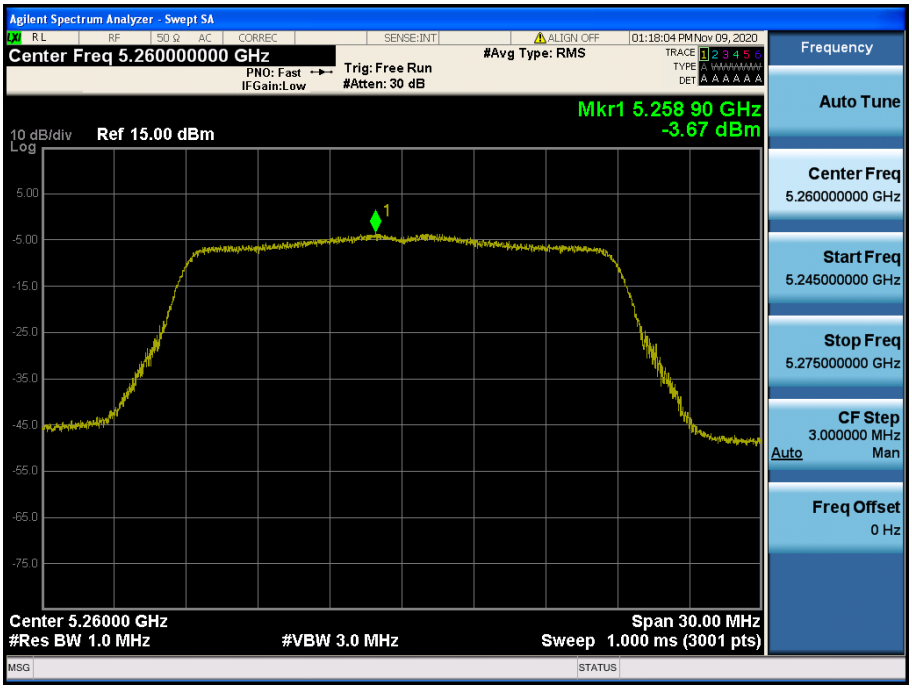
Maximum Power Spectral Density

Test Mode: TM 2 & Ch.48



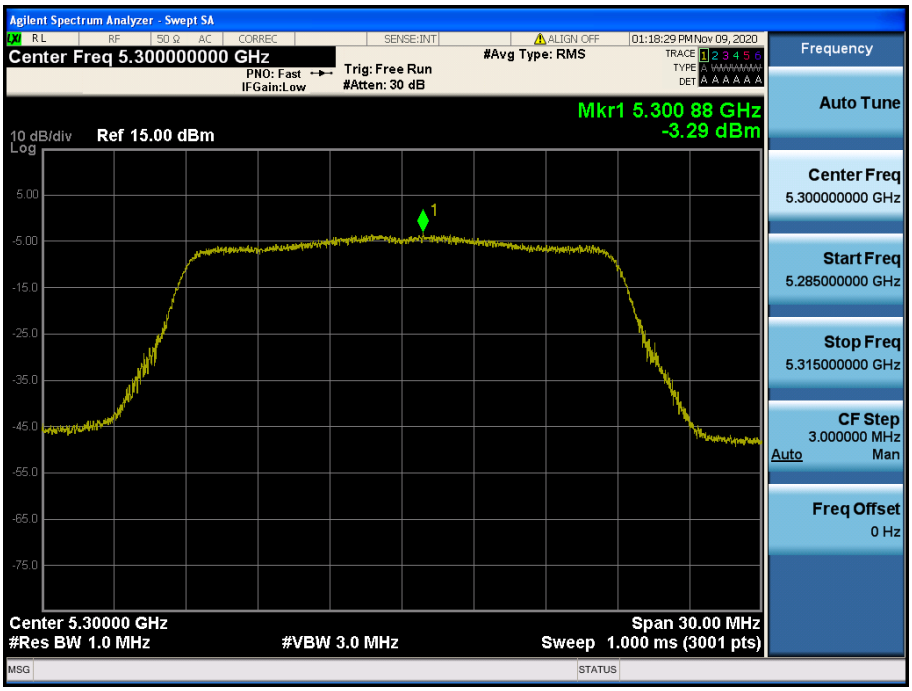
Maximum Power Spectral Density

Test Mode: TM 2 & Ch.52

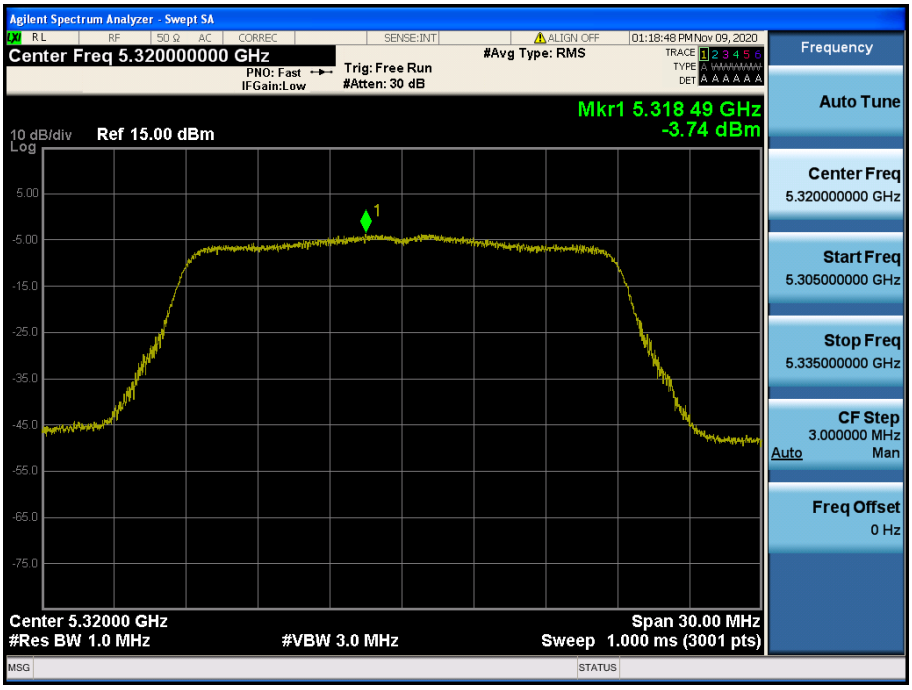


Maximum Power Spectral Density

Test Mode: TM 2 & Ch.60

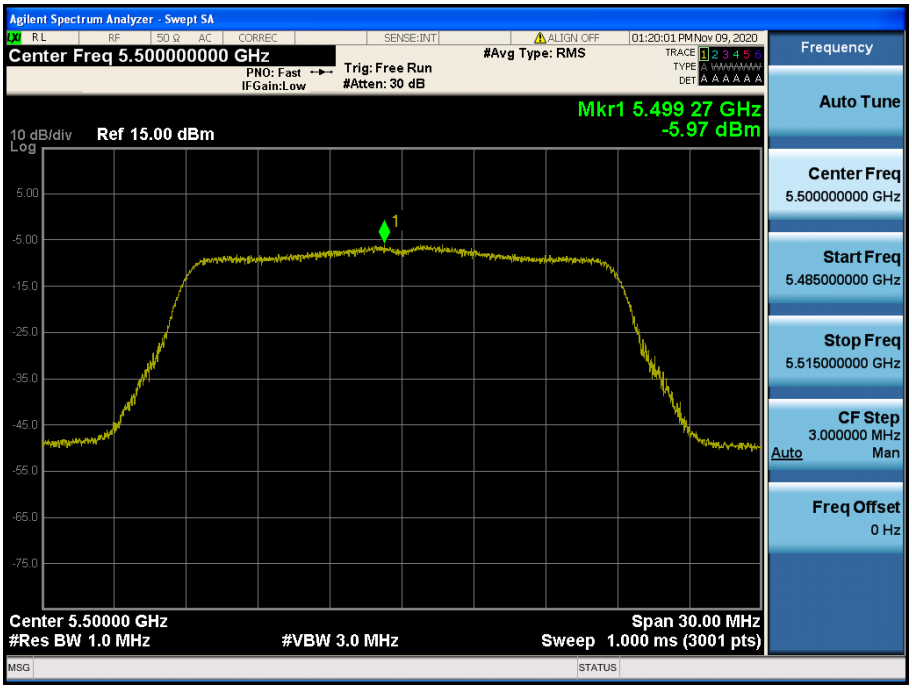


Maximum Power Spectral Density Test Mode: TM 2 & Ch.64



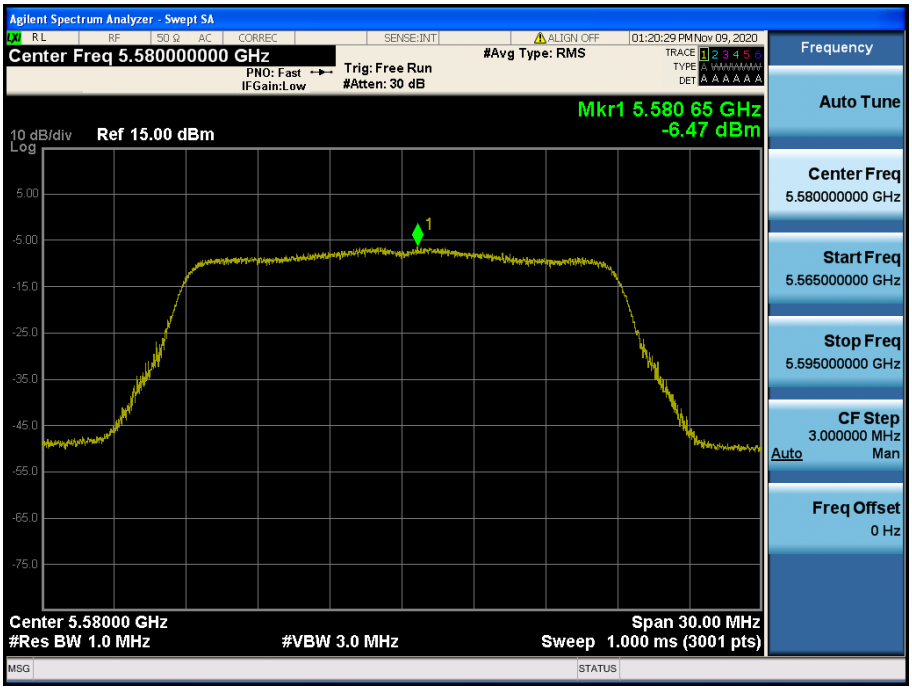
Maximum Power Spectral Density

Test Mode: TM 2 & Ch.100



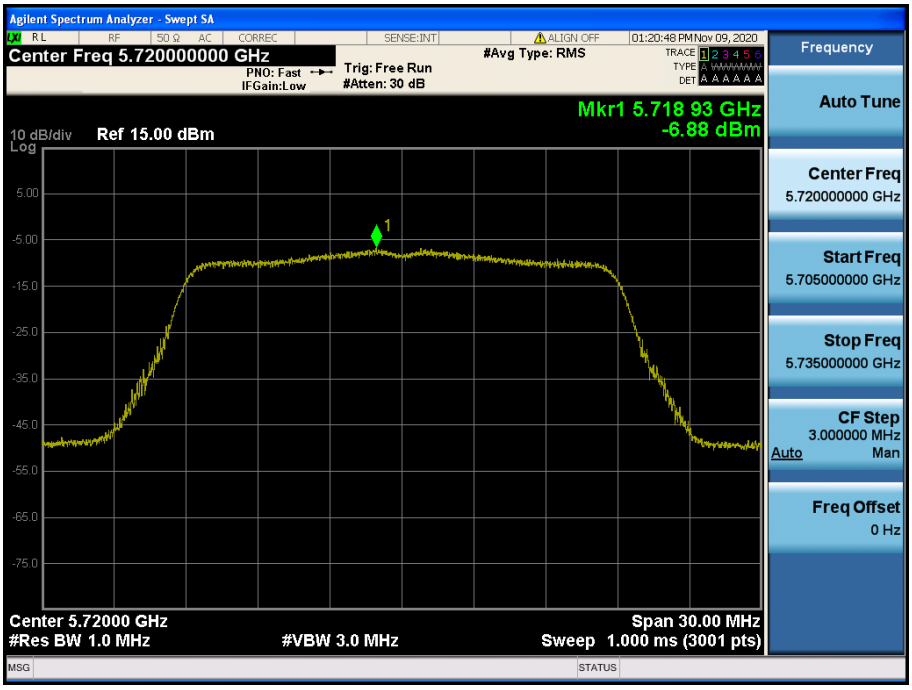
Maximum Power Spectral Density

Test Mode: TM 2 & Ch.116



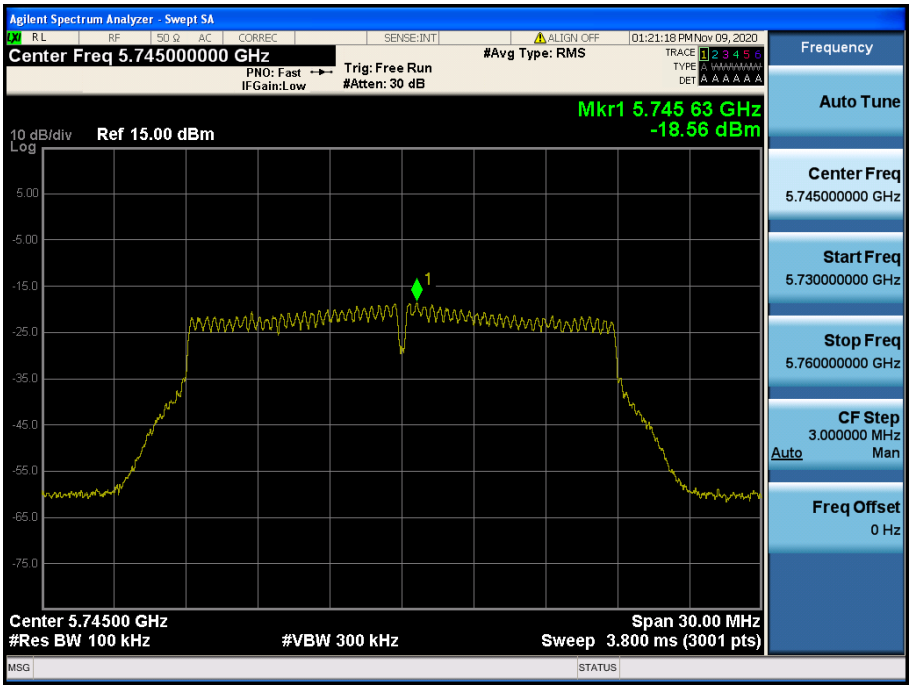
Maximum Power Spectral Density

Test Mode: TM 2 & Ch.144



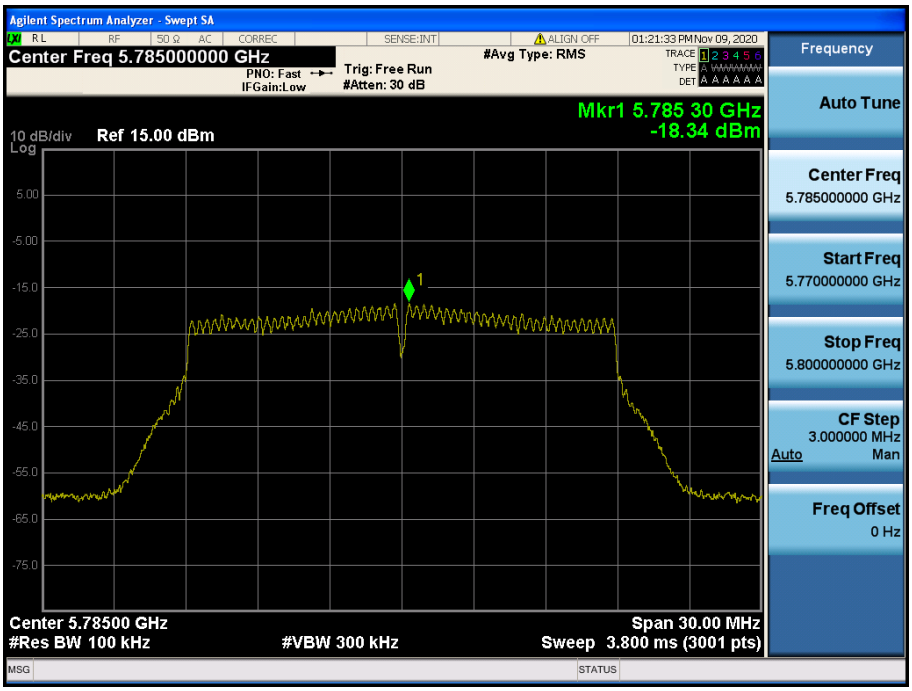
Maximum Power Spectral Density

Test Mode: TM 2 & Ch.149

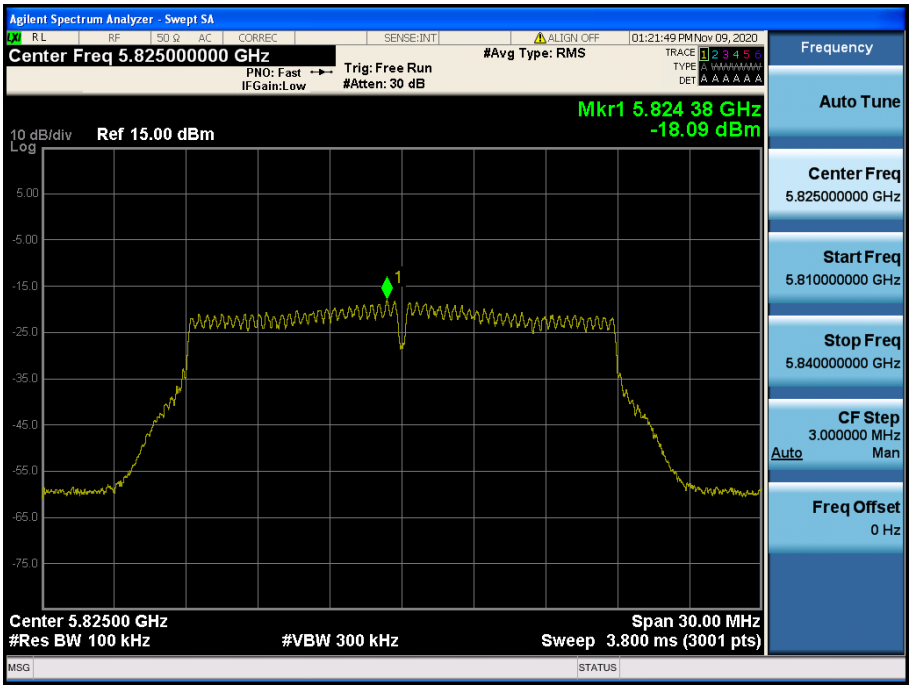


Maximum Power Spectral Density

Test Mode: 802.11n HT20 & Ch.157

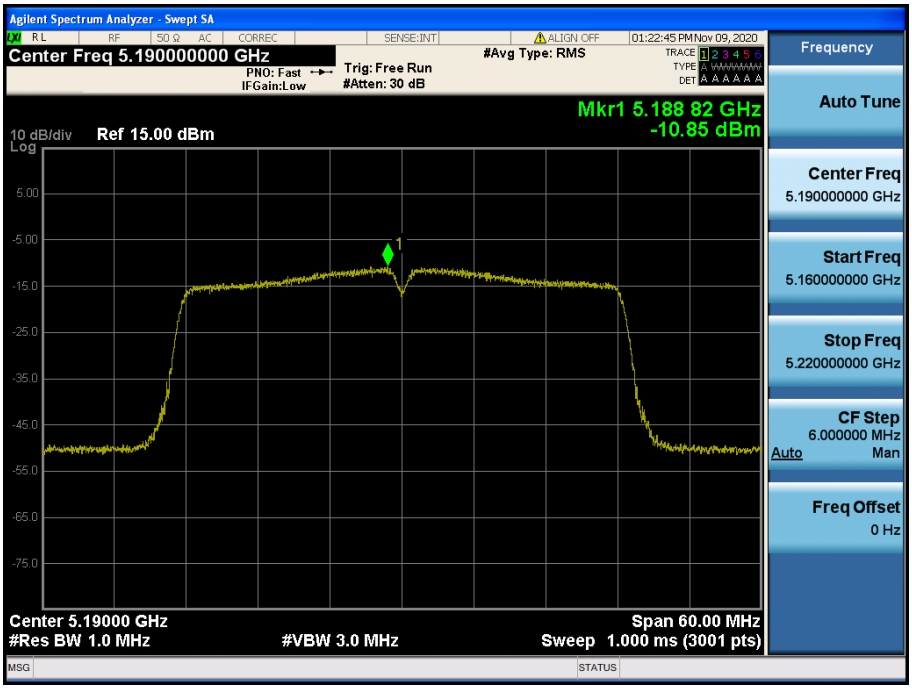


Maximum Power Spectral Density Test Mode: 802.11n HT20 & Ch.165



Maximum Power Spectral Density

Test Mode: 802.11n HT40 & Ch.38



Maximum Power Spectral Density

Test Mode: 802.11n HT40 & Ch.46