

Report No.: FR041508-01AB



# FCC RADIO TEST REPORT

FCC ID

: G95-CGA4236

Equipment

: Cable Moden DOCSSIS 3.1

Trade Name

: technicolor

Model Number: CGA4236

Product Code : CGA4236VGW-TCH3;CGA4236DGW-TCH3;

CGA4236-TCH2

(Refer to section 1.1.5 for detail information)

Applicant

: Technicolor Connected Home USA LLC

5030 Sugarloaf Parkway, Building 6, Lawrenceville, Georgia, United States

Manufacturer

: Technicolor Connected Home USA LLC

5030 Sugarloaf Parkway, Building 6, Lawrenceville, Georgia, United States

Standard

: 47 CFR FCC Part 15.407

The product was received on Apr. 09, 2020, and testing was started from May 05, 2020 and completed on Jul. 21, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

TEL: 886-3-656-9065

FAX: 886-3-656-9085

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: Aug. 10, 2020

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Photographs of EUT v01

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# History of this test report

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FR041508-01AB	01	Initial issue of report	Aug. 10, 2020

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# **Summary of Test Result**

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Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.407(a)	Emission Bandwidth	PASS	-
3.2	15.407(a)	Maximum Conducted Output Power	PASS	-
3.3	15.407(a)	Peak Power Spectral Density	PASS	-
3.4	15.407(b)	Unwanted Emissions	PASS	-

#### **Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

### **Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen
Report Producer: Cindy Peng

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# 1 General Description

## 1.1 Information

### 1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
5150-5250	a, n (HT20), ac (VHT20), ax (HEW20)	5180-5240	36-48 [4]
5725-5850		5745-5825	149-165 [5]
5150-5250	n (HT40), ac (VHT40), ax (HEW40)	5190-5230	38-46 [2]
5725-5850		5755-5795	151-159 [2]
5150-5250	ac (VHT80), ax (HEW80)	5210	42 [1]
5725-5850		5775	155 [1]

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Band	Mode	BWch (MHz)	Nant
5.15-5.25GHz	802.11a	20	4TX
5.15-5.25GHz	802.11n (HT20)	20	4TX
5.15-5.25GHz	802.11n (HT20)-BF	20	4TX
5.15-5.25GHz	802.11ac (VHT20)	20	4TX
5.15-5.25GHz	802.11ac (VHT20)-BF	20	4TX
5.15-5.25GHz	802.11ax (HEW20)	20	4TX
5.15-5.25GHz	802.11ax HEW20-BF	20	4TX
5.15-5.25GHz	802.11n (HT40)	40	4TX
5.15-5.25GHz	802.11n (HT40)-BF	40	4TX
5.15-5.25GHz	802.11ac (VHT40)	40	4TX
5.15-5.25GHz	802.11ac (VHT40)-BF	40	4TX
5.15-5.25GHz	802.11ax (HEW40)	40	4TX
5.15-5.25GHz	802.11ax (HEW40)-BF	40	4TX
5.15-5.25GHz	802.11ac (VHT80)	80	4TX
5.15-5.25GHz	802.11ac (VHT80)-BF	80	4TX
5.15-5.25GHz	802.11ax (HEW80)	80	4TX
5.15-5.25GHz	802.11ax (HEW80)-BF	80	4TX
5.725-5.85GHz	802.11a	20	4TX
5.725-5.85GHz	802.11n (HT20)	20	4TX
5.725-5.85GHz	802.11n (HT20)-BF	20	4TX
5.725-5.85GHz	802.11ac (VHT20)	20	4TX

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Band	Mode	BWch (MHz)	Nant
5.725-5.85GHz	802.11ac (VHT20)-BF	20	4TX
5.725-5.85GHz	802.11ax (HEW20)	20	4TX
5.725-5.85GHz	802.11ax HEW20-BF	20	4TX
5.725-5.85GHz	802.11n (HT40)	40	4TX
5.725-5.85GHz	802.11n (HT40)-BF	40	4TX
5.725-5.85GHz	802.11ac (VHT40)	40	4TX
5.725-5.85GHz	802.11ac (VHT40)-BF	40	4TX
5.725-5.85GHz	802.11ax (HEW40)	40	4TX
5.725-5.85GHz	802.11ax (HEW40)-BF	40	4TX
5.725-5.85GHz	802.11ac (VHT80)	80	4TX
5.725-5.85GHz	802.11ac (VHT80)-BF	80	4TX
5.725-5.85GHz	802.11ax (HEW80)	80	4TX
5.725-5.85GHz	802.11ax (HEW80)-BF	80	4TX

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#### Note:

- 11a, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
- VHT20, VHT40 and VHT80 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation.
- HEW20, HEW40 and HEW80 use a combination of OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation.
- BWch is the nominal channel bandwidth.

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#### 1.1.2 Antenna Information

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	1	TCH	1415-07JS0V8	Dipole Antenna	N/A	
2	2	TCH	1415-07JT0V8	Dipole Antenna	N/A	
3	3	TCH	1415-07JR0V8	Dipole Antenna	N/A	
4	1	TCH	1415-07JV0V8	Dipole Antenna	N/A	Note 1
5	2	TCH	1415-07JU0V8	Dipole Antenna	N/A	
6	3	TCH	1415-07JV0V8	Dipole Antenna	N/A	
7	4	TCH	1415-07JU0V8	Dipole Antenna	N/A	

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#### Note 1:

A m 4	Uncorrelated Gain (dBi)				
Ant.	2.4GHz	5GHz Band 1	5GHz Band 4		
1	2.35	-	-		
2	3.32	-	-		
3	2.87	-	-		
4	-	2.90	4.64		
5	-	3.42	2.20		
6	-	2.92	2.48		
7	-	2.68	3.51		
Correlated Gain (dBi)	6.01	6.63	7.30		

Note 2: The above information was declared by manufacturer.

#### For 2.4GHz function:

For IEEE 802.11b/g/n/VHT/ax mode (3TX/3RX)

Ant.1, Ant. 2 and Ant. 3 can be used as transmitting/receiving antenna.

Ant.1, Ant. 2 and Ant. 3 could transmit/receive simultaneously.

#### For 5GHz function:

For IEEE 802.11a/n/ac/ax mode (4TX/4RX)

Ant. 4, Ant. 5, Ant. 6 and Ant. 7 can be used as transmitting/receiving antenna.

Ant. 4, Ant. 5, Ant. 6 and Ant. 7 could transmit/receive simultaneously.

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### 1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
802.11ax HEW20-BF	0.979	0.09	2.93m	1k
802.11ax HEW40-BF	0.96	0.18	4.358m	300
802.11ax HEW80-BF	0.928	0.32	4.143m	300

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N	∩te	

- DC is Duty Cycle.
- DCF is Duty Cycle Factor.

## 1.1.4 EUT Operational Condition

EUT Power Type		From power adapter				
Beamforming Function		With beamforming for 2.4GHz: 802.11n/VHT/ax, 5GHz: 802.11n/ac/ax		Without beamforming		
Function		Outdoor P2M	$\boxtimes$	Indoor P2M		
runction		Fixed P2P		Client		
Test Software Version		accessMTool (3.2.0.0)				
Firmware Version		Broadcom BCA: 17.10 RC121.11 wl0: Feb 19 2020 10:51:50 version 17.10.121.11 (r783116 WLTEST)				

Note: The above information was declared by manufacturer.

#### 1.1.5 Table for Multiple Listing

Product Code	Description
CGA4236VGW-TCH3	All the product code are identical the difference product code of
CGA4236DGW-TCH3	All the product code are identical, the difference product code as
CGA4236-TCH2	marketing strategy.

From the above list, product code: CGA4236VGW-TCH3 was selected as representative model for the test and its data was recorded in this report.

### 1.1.6 Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR041508AB Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
	1. Emission Bandwidth.
Adding beam-forming function for 2.4GHz:	Maximum Conducted Output Power.
802.11n/VHT/ax, 5GHz: 802.11n/ac/ax.	3. Peak Power Spectral Density.
	4. Unwanted Emissions Above 1GHz

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## 1.2 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

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- 47 CFR FCC Part 15
- ANSI C63.10-2013
- FCC KDB 789033 D02 v02r01

The following reference test guidance is not within the scope of accreditation of TAF.

- FCC KDB 662911 D01 v02r01
- FCC KDB 412172 D01 v01r01

## 1.3 Testing Location Information

Testing Location					
	HWA YA	ADD	:	No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)	
		TEL	:	886-3-327-3456 FAX : 886-3-327-0973	
$\boxtimes$	JHUBEI	ADD	:	No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.	
		TEL	:	886-3-656-9065 FAX : 886-3-656-9085	

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-CB	Paul Chen	21.8~23.2°C / 55~58%	May 05, 2020~Jul. 21, 2020
Radiated	03CH03-CB, 03CH04-CB	Paul Chen	24.9~25.8°C / 58~62%	Jul. 16, 2020

Test site Designation No. TW0006 with FCC

Test site registered number IC 4086D with Industry Canada.

## 1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Test Items	Uncertainty	Remark
Radiated Emission (1GHz ~ 18GHz)	4.9 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.6 dB	Confidence levels of 95%
Conducted Emission	2.8 dB	Confidence levels of 95%
Output Power Measurement	1.4 dB	Confidence levels of 95%
Power Density Measurement	2.8 dB	Confidence levels of 95%
Bandwidth Measurement	0.39%	Confidence levels of 95%

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# 2 Test Configuration of EUT

# 2.1 Test Channel Mode

Mode	Power Setting
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	-
5180MHz	86
5200MHz	95
5240MHz	96
5745MHz	84
5785MHz	81
5825MHz	82
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	-
5190MHz	80
5230MHz	96
5755MHz	87
5795MHz	87
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	-
5210MHz	80
5775MHz	87

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## 2.2 The Worst Case Measurement Configuration

Th	e Worst Case Mode for Following Conformance Tests
Tests Item	Emission Bandwidth Maximum Conducted Output Power Peak Power Spectral Density
Test Condition	Conducted measurement at transmit chains

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The Worst Case Mode for Following Conformance Tests		
Tests Item	Unwanted Emissions	
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.	
Operating Mode > 1GHz	СТХ	

The Worst Case Mode for Following Conformance Tests		
Tests Item Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation		
Operating Mode		
1 WLAN 2.4GHz + WLAN 5GHz		
Refer to Sporton Test Report No.: FA041508-01 for Co-location RF Exposure Evaluation.		

Note: The EUT can be used at Y axis position only.

## 2.3 EUT Operation during Test

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

During the test, the following programs under WIN 7 were executed.

The program was executed as follows:

- 1. During the test, the EUT operation to normal function.
- 2. Executed command fixed test channel under Telnet.
- 3. Executed "Lantest.exe" to link with the remote workstation to transmit and receive packet by Wireless AP and transmit duty cycle no less than 98%.

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## 2.4 Accessories

		Accessories		
<b>Equipment Name</b>	<b>Brand Name</b>	Model Name	Rating	
Adapter 1	ноіото	ADS-36FKJ-12 12036EPCU	INPUT: 100-240V, 50/60Hz, Max.1.0A OUTPUT: 12V, 3.0A	
Adapter 2	AcBel	ADG009 AD:AD0G2	INPUT: 100-240V, 50/60Hz, MAX.1.5A OUTPUT: 12V, 4.5A	
Others				
Power cord*1, Non-shielded, 1.8m (For adapter 2 use)				

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# 2.5 Support Equipment

#### For Radiated:

	Support Equipment			
No.	Equipment	Brand Name	Model Name	FCC ID
Α	Notebook	DELL	E4300	N/A
В	Notebook	DELL	E4300	N/A
С	WLAN AP	ASUS	RT-AX88U	MSQ-RTAXHP00

#### For RF Conducted:

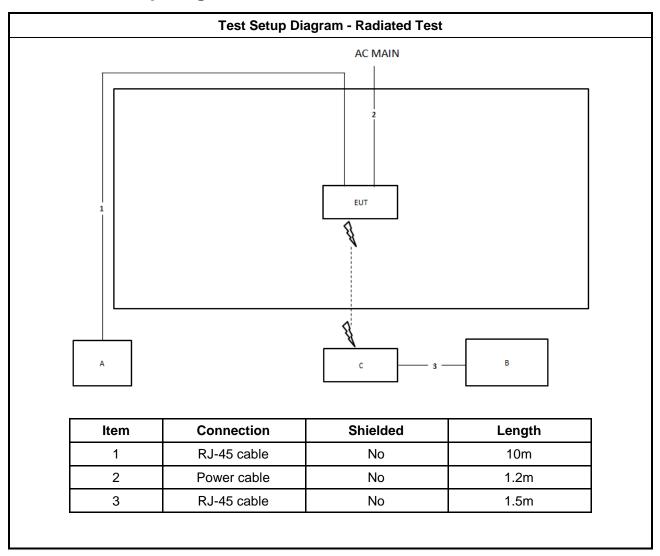
Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
Α	Notebook	DELL	E4300	N/A

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# 2.6 Test Setup Diagram



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# 3 Transmitter Test Result

## 3.1 Emission Bandwidth

#### 3.1.1 Emission Bandwidth Limit

	Emission Bandwidth Limit
UNI	I Devices
$\boxtimes$	For the 5.15-5.25 GHz band, N/A
	For the 5.25-5.35 GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or 11 dBm $\pm$ 10 log B, where B is the 26 dB emission bandwidth in MHz.
	For the $5.47-5.725$ GHz band, the maximum conducted output power shall not exceed the lesser of $250$ mW or $11$ dBm + $10$ log B, where B is the $26$ dB emission bandwidth in MHz.
$\boxtimes$	For the 5.725-5.85 GHz band, 6 dB emission bandwidth ≥ 500kHz.
LE-	LAN Devices
	For the band 5.15-5.25 GHz, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
	For the 5.25-5.35 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz
	For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz
	For the 5.725-5.85 GHz band, 6 dB emission bandwidth ≥ 500kHz.

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## 3.1.2 Measuring Instruments

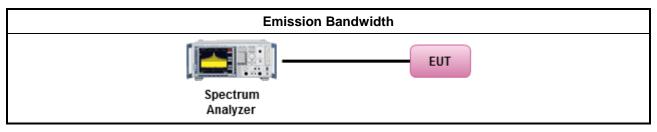
Refer a test equipment and calibration data table in this test report.

#### 3.1.3 Test Procedures

	Test Method									
•	For the emission bandwidth shall be measured using one of the options below:									
	Refer as FCC KDB 789033, clause C for EBW and clause D for OBW measurement.									
	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.									
	☐ Refer as IC RSS-Gen, clause 4.6 for bandwidth testing.									

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## 3.1.4 Test Setup



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#### 3.1.5 Test Result of Emission Bandwidth

Refer as Appendix A

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# 3.2 Maximum Conducted Output Power

## 3.2.1 Maximum Conducted Output Power Limit

	Maximum Conducted Output Power Limit
UNI	I Devices
$\boxtimes$	For the 5.15-5.25 GHz band:
	Outdoor AP: the maximum conducted output power ( $P_{Out}$ ) shall not exceed the lesser of 1 W. If $G_{TX}$ > 6 dBi, then $P_{Out}$ = 30 - ( $G_{TX}$ - 6). e.i.r.p. at any elevation angle above 30 degrees $\leq$ 125mW [21dBm]
	Indoor AP: the maximum conducted output power ( $P_{Out}$ ) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$
	Point-to-point AP: the maximum conducted output power ( $P_{Out}$ ) shall not exceed the lesser of 1 W If $G_{TX} > 23$ dBi, then $P_{Out} = 30 - (G_{TX} - 23)$ .
	■ Mobile or Portable Client: the maximum conducted output power ( $P_{Out}$ ) shall not exceed the lesser of 250 mW. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$ .
	For the 5.25-5.35 GHz band, the maximum conducted output power ( $P_{Out}$ ) shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$ .
	For the 5.47-5.725 GHz band, the maximum conducted output power ( $P_{Out}$ ) shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If $G_{TX}$ > 6 dBi, then $P_{Out}$ = 24 – ( $G_{TX}$ – 6).
$\boxtimes$	For the 5.725-5.85 GHz band:
	Point-to-multipoint systems (P2M): the maximum conducted output power ( $P_{Out}$ ) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ .
	<ul> <li>Point-to-point systems (P2P): the maximum conducted output power (P<sub>Out</sub>) shall not exceed the lesser of 1 W.</li> </ul>
LE-	LAN Devices
	For the 5.15-5.25 GHz band, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
	For the 5.25-5.35 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz
	For the $5.47-5.6$ GHz band and $5.65-5.725$ GHz band, the maximum e.i.r.p. shall not exceed $1.0$ W or $17+10\log B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz
	For the 5.725-5.85 GHz band:
	Point-to-multipoint systems (P2M): the maximum conducted output power ( $P_{Out}$ ) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ .
	Point-to-point systems (P2P): the maximum conducted output power (P <sub>Out</sub> ) shall not exceed the lesser of 1 W.
	= maximum conducted output power in dBm, = the maximum transmitting antenna directional gain in dBi.

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## 3.2.2 Measuring Instruments

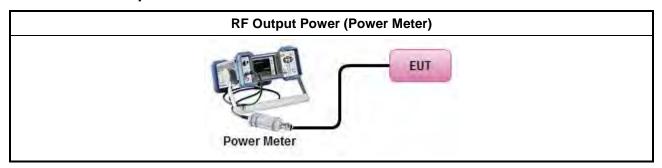
Refer a test equipment and calibration data table in this test report.

#### 3.2.3 Test Procedures

	Test Method							
•	Maximum Conducted Output Power							
	Average over on/off periods with duty factor							
	Refer as FCC KDB 789033, clause E Method SA-2 (spectral trace averaging).							
	Refer as FCC KDB 789033, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)							
	Wideband RF power meter and average over on/off periods with duty factor							
	Refer as FCC KDB 789033, clause E Method PM-G (using an RF average power meter).							
•	For conducted measurement.							
	■ If the EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.							
	<ul> <li>If multiple transmit chains, EIRP calculation could be following as methods:</li> <li>P<sub>total</sub> = P<sub>1</sub> + P<sub>2</sub> + + P<sub>n</sub></li> <li>(calculated in linear unit [mW] and transfer to log unit [dBm])</li> <li>EIRP<sub>total</sub> = P<sub>total</sub> + DG</li> </ul>							

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### 3.2.4 Test Setup



## 3.2.5 Test Result of Maximum Conducted Output Power

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# 3.3 Peak Power Spectral Density

## 3.3.1 Peak Power Spectral Density Limit

	Peak Power Spectral Density Limit
UNI	I Devices
$\boxtimes$	For the 5.15-5.25 GHz band:
	<ul> <li>Outdoor AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If G<sub>TX</sub> &gt; 6 dBi, then P<sub>Out</sub> = 17 - (G<sub>TX</sub> - 6).</li> </ul>
	Indoor AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 17 - (G_{TX} - 6)$ .
	Point-to-point AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If $G_{TX} > 23$ dBi, then $P_{Out} = 17 - (G_{TX} - 23)$ .
	■ Mobile or Portable Client: the peak power spectral density (PPSD) $\leq$ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then PPSD= 11 – $(G_{TX} - 6)$
	For the 5.25-5.35 GHz band, the peak power spectral density (PPSD) $\leq$ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then PPSD= 11 – ( $G_{TX} - 6$ ).
	For the 5.47-5.725 GHz band, the peak power spectral density (PPSD) $\leq$ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then PPSD= 11 – ( $G_{TX} - 6$ ).
$\boxtimes$	For the 5.725-5.85 GHz band:
	Point-to-multipoint systems (P2M): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz. If $G_{TX} > 6$ dBi, then PPSD= $30 - (G_{TX} - 6)$ .
	Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz.
LE-	LAN Devices
	For the 5.15-5.25 GHz band, the e.i.r.p. peak power spectral density (PPSD) ≤ 10 dBm/MHz.
	For the 5.25-5.35 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz.
	<ul> <li>e.i.r.p. greater than 200 mW shall comply with the following e.i.r.p. at different elevations, where θ is the angle above the local horizontal plane (of the Earth) as shown below:</li> <li>-13 dBW/MHz for 0° ≤ θ &lt; 8°; -13 − 0.716 (θ-8) dBW/MHz for 8° ≤ θ &lt; 40°</li> <li>-35.9 − 1.22 (θ-40) dBW/MHz for 40° ≤ θ ≤ 45°; -42 dBW/MHz for θ &gt; 45°</li> </ul>
	For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the peak power spectral density (PPSD) $\leq$ 11 dBm/MHz.
	For the 5.725-5.85 GHz band:
	Point-to-multipoint systems (P2M): the peak power spectral density (PPSD) $\leq$ 30 dBm/500kHz. If $G_{TX} > 6$ dBi, then PPSD= $30 - (G_{TX} - 6)$ .
	<ul> <li>Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz.</li> </ul>
pow	<b>SD</b> = peak power spectral density that he same method as used to determine the conducted output ver shall be used to determine the power spectral density. And power spectral density in dBm/MHz = the maximum transmitting antenna directional gain in dBi.

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### 3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

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### 3.3.3 Test Procedures

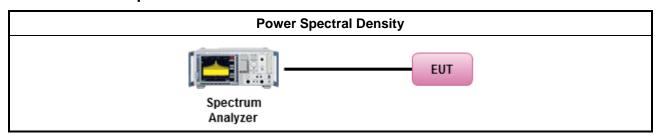
		Test Method									
	Peak power spectral density procedures that the same method as used to determine the conducted output power shall be used to determine the peak power spectral density and use the peak search function on the spectrum analyzer to find the peak of the spectrum. For the peak power spectral density shall be measured using below options:										
		Refer as FCC KDB 789033, F)5) power spectral density can be measured using resolution bandwidths < 1 MHz provided that the results are integrated over 1 MHz bandwidth									
	[duty	/ cycle ≥ 98% or external video / power trigger]									
	$\boxtimes$	Refer as FCC KDB 789033, clause E Method SA-1 (spectral trace averaging).									
		Refer as FCC KDB 789033, clause E Method SA-1 Alt. (RMS detection with slow sweep speed)									
	duty	cycle < 98% and average over on/off periods with duty factor									
		Refer as FCC KDB 789033, clause E Method SA-2 (spectral trace averaging).									
		Refer as FCC KDB 789033, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)									
•	For o	conducted measurement.									
	•	If the EUT supports multiple transmit chains using options given below:									
		Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.									
		Option 2: Measure and sum spectral maxima across the outputs. With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs. These operations shall be performed separately over frequency spans that have different out-of-band or spurious emission limits,									
		Option 3: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.									
	•	If multiple transmit chains, EIRP PPSD calculation could be following as methods: $ PPSD_{total} = PPSD_1 + PPSD_2 + + PPSD_n \\ (calculated in linear unit [mW] and transfer to log unit [dBm]) \\ EIRP_{total} = PPSD_{total} + DG $									

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## 3.3.4 Test Setup



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## 3.3.5 Test Result of Peak Power Spectral Density

Refer as Appendix C

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#### 3.4 Unwanted Emissions

#### 3.4.1 Transmitter Unwanted Emissions Limit

Unwanted emissions below 1 GHz and restricted band emissions above 1GHz limit									
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)						
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300						
0.490~1.705	24000/F(kHz)	33.8 - 23	30						
1.705~30.0	30	29	30						
30~88	100	40	3						
88~216	150	43.5	3						
216~960	200	46	3						
Above 960	500	54	3						

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- Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).
- Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

	Un-restricted band emissions above 1GHz Limit								
Operating Band	Limit								
⊠ 5.15 - 5.25 GHz	e.i.r.p27 dBm [68.2 dBuV/m@3m]								
☐ 5.25 - 5.35 GHz	e.i.r.p27 dBm [68.2 dBuV/m@3m]								
☐ 5.47 - 5.725 GHz	e.i.r.p27 dBm [68.2 dBuV/m@3m]								
⊠ 5.725 - 5.85 GHz	all emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing 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.								

Note 1: Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of

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linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

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### 3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

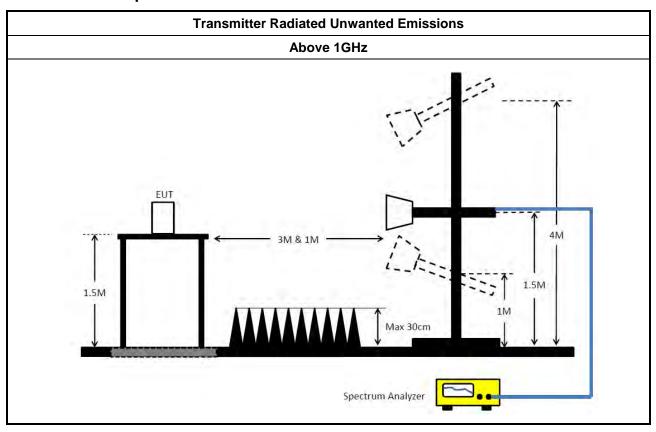
#### 3.4.3 Test Procedures

#### **Test Method**

- Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).
- The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].
- For the transmitter unwanted emissions shall be measured using following options below:
  - Refer as FCC KDB 789033, clause G)2) for unwanted emissions into non-restricted bands.
  - Refer as FCC KDB 789033, clause G)1) for unwanted emissions into restricted bands.
    - Refer as FCC KDB 789033, G)6) Method AD (Trace Averaging).
    - Refer as FCC KDB 789033, G)6) Method VB (Reduced VBW).
    - Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.
    - Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.
    - Refer as FCC KDB 789033, clause G)5) measurement procedure peak limit.
    - Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit.
- For radiated measurement.
  - Refer as ANSI C63.10, clause 6.4 for radiated emissions below 30 MHz and test distance is 3m.
  - Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.
  - Refer as ANSI C63.10. clause 6.6 for radiated emissions above 1GHz.
- The any unwanted emissions level shall not exceed the fundamental emission level.
- All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

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## 3.4.4 Test Setup



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#### 3.4.5 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor (if applicable) = Level.

### 3.4.6 Test Result of Transmitter Unwanted Emissions

Refer as Appendix D

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# 4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Horn Antenna	ETS · Lindgren	3115	6821	750MHz~18GHz	Jan. 20, 2020	Jan. 19, 2021	Radiation (03CH03-CB)
Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170507	15GHz ~ 40GHz	Jun. 11, 2020	Jun. 10, 2021	Radiation (03CH03-CB)
Pre-Amplifier	Agilent	8449B	3008A02097	1GHz ~ 26.5GHz	Jul. 03, 2020	Jun. 02, 2021	Radiation (03CH03-CB)
Pre-Amplifier	EMCI	EMC12630S E	980383	1GHz ~ 26.5GHz	Aug. 02, 2019	Aug. 01, 2020	Radiation (03CH03-CB)
Pre-Amplifier	MITEQ	TTA1840-35- HG	1864479	18GHz ~ 40GHz	Jul. 08, 2020	Jul. 07, 2021	Radiation (03CH03-CB)
Spectrum Analyzer	R&S	FSP40	100019	9kHz ~ 40GHz	Jun. 09, 2020	Jun. 08, 2021	Radiation (03CH03-CB)
RF Cable-high	Woken	RG402	High Cable-20+27(s pare)	1GHz ~ 18GHz	Jul. 03, 2020	Jul. 02, 2021	Radiation (03CH03-CB)
RF Cable-high	Woken	RG402	High Cable-27(spar e)	1GHz ~ 18GHz	Jul. 03, 2020	Jul. 02, 2021	Radiation (03CH03-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 24, 2019	Jul. 23, 2020	Radiation (03CH03-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 24, 2019	Jul. 23, 2020	Radiation (03CH03-CB)
Horn Antenna	ETS · Lindgren	3115	00143147	750MHz~18GHz	Oct. 22, 2019	Oct. 21, 2020	Radiation (03CH04-CB)
Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170507	15GHz ~ 40GHz	Jun. 11, 2020	Jun. 10, 2021	Radiation (03CH04-CB)
Pre-Amplifier	Agilent	83017A	MY53270063	0.5GHz ~ 26.5GHz	Mar. 11, 2020	Mar. 10, 2021	Radiation (03CH04-CB)
Pre-Amplifier	Agilent	83017A	MY53270063	0.5GHz ~ 26.5GHz	Jul. 14, 2020	Jul. 13, 2021	Radiation (03CH04-CB)
Amplifier	-	-	TF-130N-R1	18GHz ~ 40GHz	Jun. 19, 2020	Jun. 18, 2021	Radiation (03CH04-CB)
Spectrum Analyzer	R&S	FSP40	100142	9kHz~40GHz	Dec. 18, 2019	Dec. 17, 2020	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-21	1GHz - 18GHz	Jul. 07, 2020	Jul. 06, 2021	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-21+22	1GHz - 18GHz	Feb. 01, 2020	Jan. 31, 2021	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 24, 2019	Jul. 23, 2020	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 24, 2019	Jul. 23, 2020	Radiation (03CH04-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	May 05, 2020	May 04, 2021	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz – 26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)

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Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-28	1 GHz –26.5 GHz	Nov. 18, 2019	Nov. 17, 2020	Conducted (TH01-CB)
Power Sensor	Agilent	E9327A	US40442088	50MHz~18GHz	Feb. 07, 2020	Feb. 06, 2021	Conducted (TH01-CB)
Power Meter	Agilent	E4416A	GB41291199	50MHz~18GHz	Feb. 07, 2020	Feb. 06, 2021	Conducted (TH01-CB)

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Note: Calibration Interval of instruments listed above is one year.

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Appendix A **EBW Result** 

**Summary** 

Mode	Max-N dB	Max-OBW	ITU-Code	Min-N dB	Min-OBW
	(Hz)	(Hz)		(Hz)	(Hz)
5.15-5.25GHz	-	-	-	-	-
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	32.55M	19.34M	19M3D1D	21.36M	19.04M
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	72.72M	37.841M	37M8D1D	39.9M	37.541M
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	81.6M	77.001M	77M0D1D	81.12M	76.762M
5.725-5.85GHz	-	-	-	-	-
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	19.02M	19.16M	19M2D1D	18.87M	19.07M
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	37.38M	37.781M	37M8D1D	36.54M	37.601M
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	76.44M	77.121M	77M1D1D	75.12M	77.001M

Max-N dB = Maximum 6dB down bandwidth for 5.725-5.85GHz band / Maximum 26dB down bandwidth for other band;

Max-OBW = Maximum99% occupied bandwidth;
Min-N dB = Minimum 6dB down bandwidth for 5.725-5.85GHz band / Maximum 26dB down bandwidth for other band;

**Min-OBW** = Minimum 99% occupied bandwidth;

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EBW Result Appendix A

#### Result

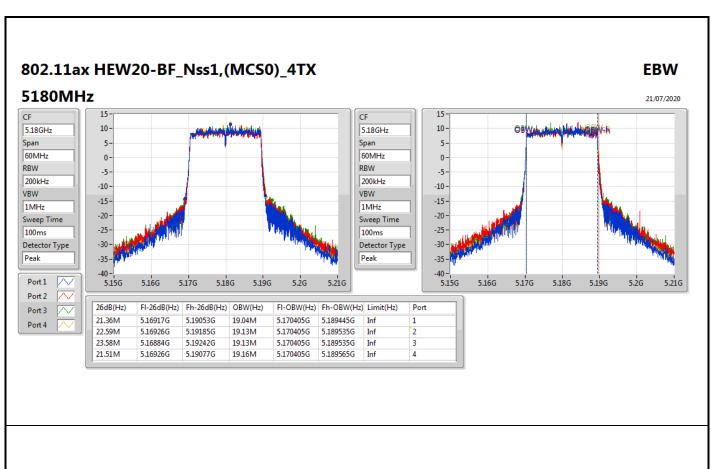
Mode	Result	Limit	Port 1-N dB	Port 1-OBW	Port 2-N dB	Port 2-OBW	Port 3-N dB	Port 3-OBW	Port 4-N dB	Port 4-OBW
		(Hz)	(Hz)	(Hz)	(Hz)	(Hz)	(Hz)	(Hz)	(Hz)	(Hz)
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-	-	-
5180MHz	Pass	Inf	21.36M	19.04M	22.59M	19.13M	23.58M	19.13M	21.51M	19.16M
5200MHz	Pass	Inf	23.7M	19.13M	28.29M	19.19M	30.87M	19.28M	23.28M	19.19M
5240MHz	Pass	Inf	23.76M	19.13M	26.13M	19.22M	32.55M	19.34M	23.4M	19.25M
5745MHz	Pass	500k	18.93M	19.07M	18.93M	19.1M	18.93M	19.13M	18.9M	19.16M
5785MHz	Pass	500k	18.99M	19.07M	18.93M	19.07M	18.87M	19.1M	19.02M	19.13M
5825MHz	Pass	500k	18.93M	19.07M	18.96M	19.07M	18.87M	19.1M	18.93M	19.13M
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-	-	-
5190MHz	Pass	Inf	40.2M	37.541M	39.9M	37.601M	40.02M	37.541M	39.96M	37.601M
5230MHz	Pass	Inf	47.76M	37.721M	47.16M	37.781M	72.72M	37.841M	62.82M	37.721M
5755MHz	Pass	500k	37.32M	37.601M	37.26M	37.661M	37.38M	37.781M	37.38M	37.661M
5795MHz	Pass	500k	36.9M	37.661M	36.54M	37.661M	37.26M	37.721M	36.78M	37.661M
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-	-	-
5210MHz	Pass	Inf	81.36M	76.762M	81.12M	77.001M	81.6M	76.762M	81.6M	76.762M
5775MHz	Pass	500k	76.44M	77.001M	75.12M	77.121M	76.32M	77.121M	75.48M	77.121M

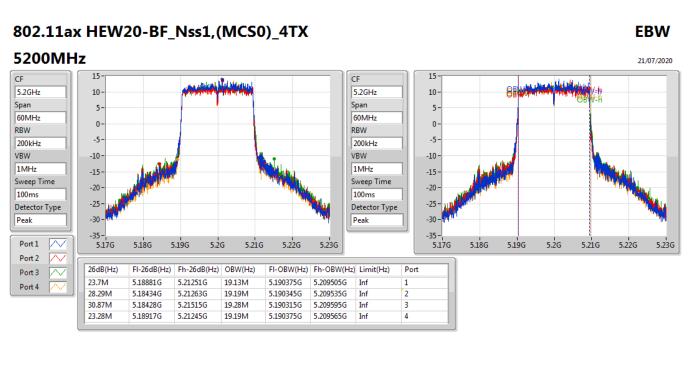
Port X-N dB = Port X 6dB down bandwidth for 5.725-5.85GHz band / 26dB down bandwidth for other band Port X-OBW = Port X 99% occupied bandwidth;

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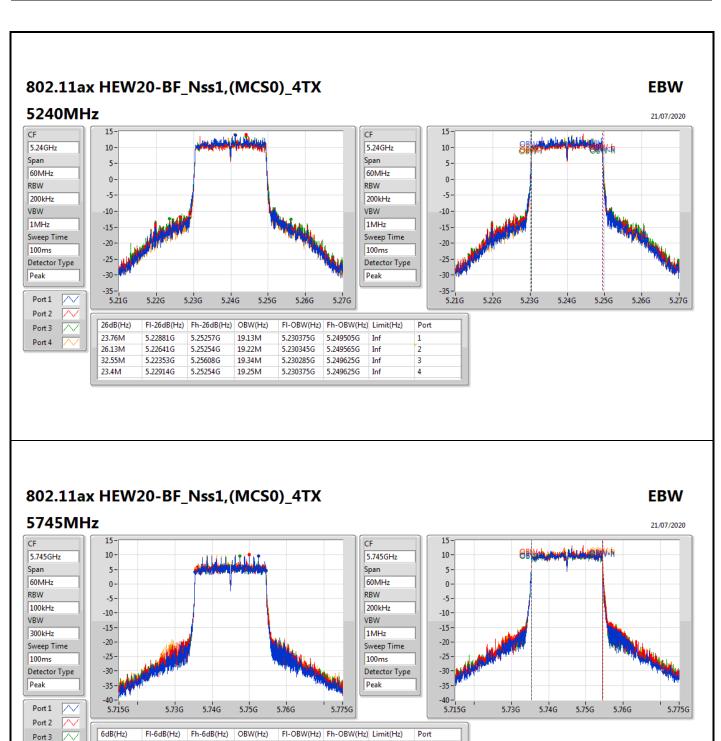
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19.07M

19.1M

19.13M

19.16M

5.735375G

5.735405G

5.735375G

5.735375G

5.754445G

5.754505G

5.754505G

5.754535G

500k

500k

500k

500k

18.93M

18.93M

18.93M

18.9M

Port 4

5.73546G

5.73549G

5.73546G

5.73549G

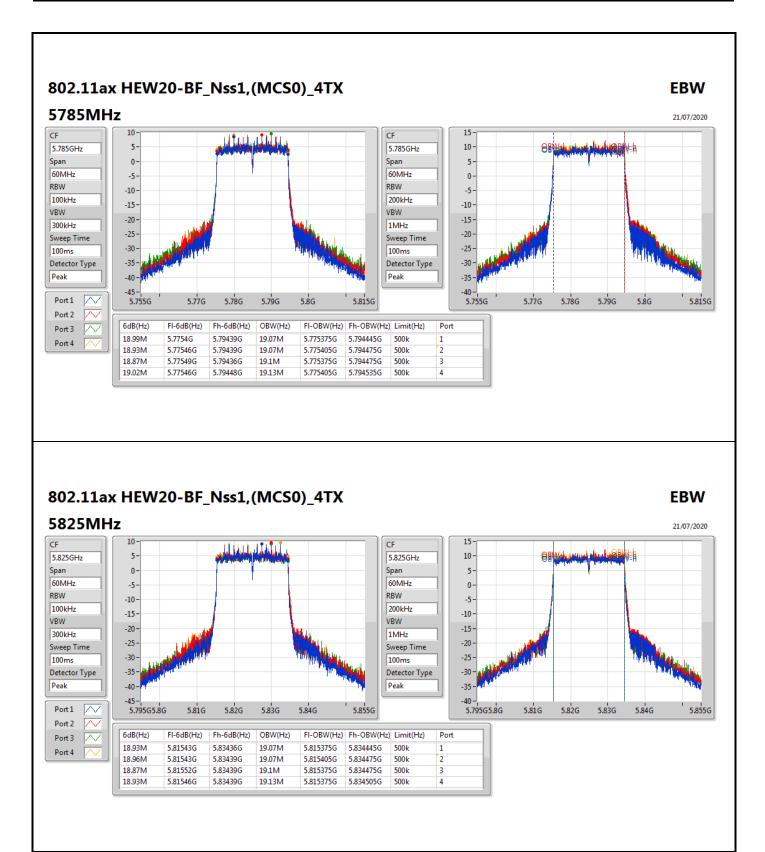
5.75439G

5.75442G

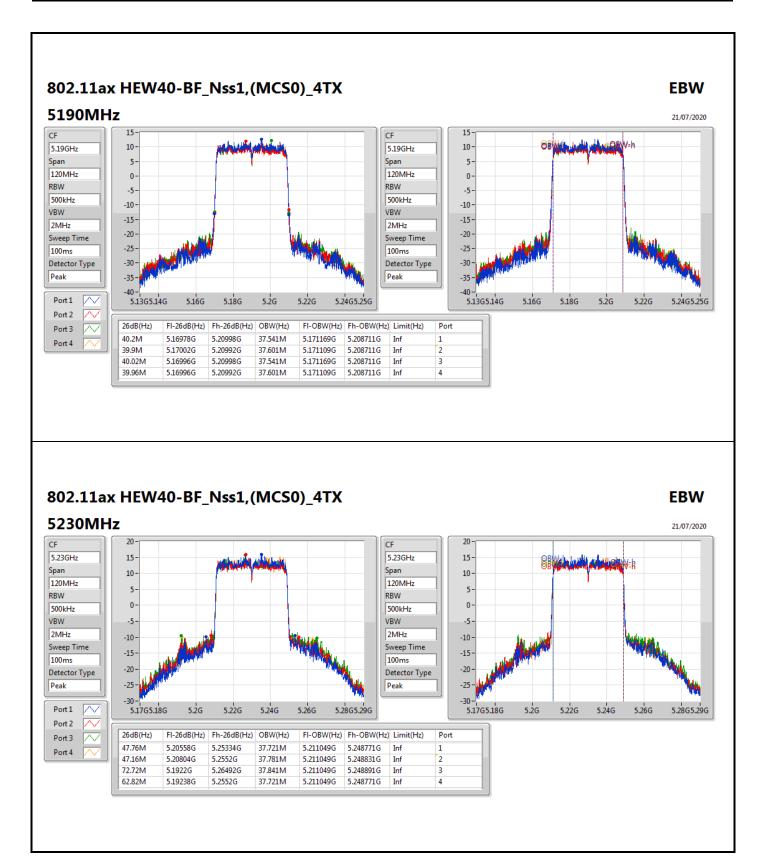
5.75439G

5.75439G

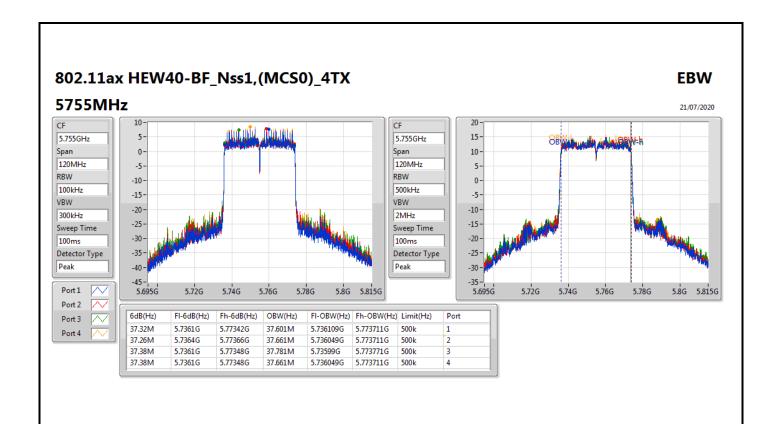


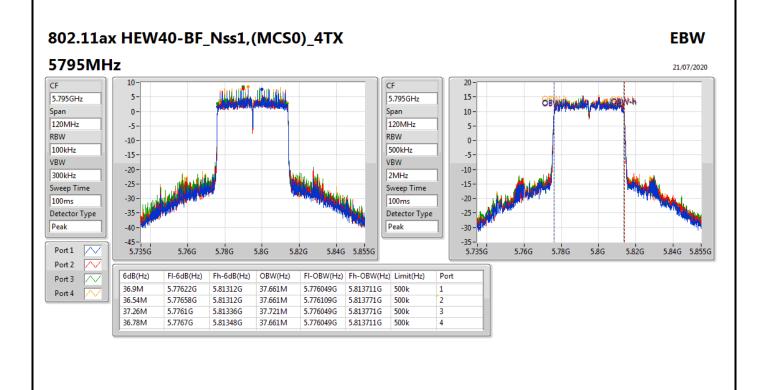




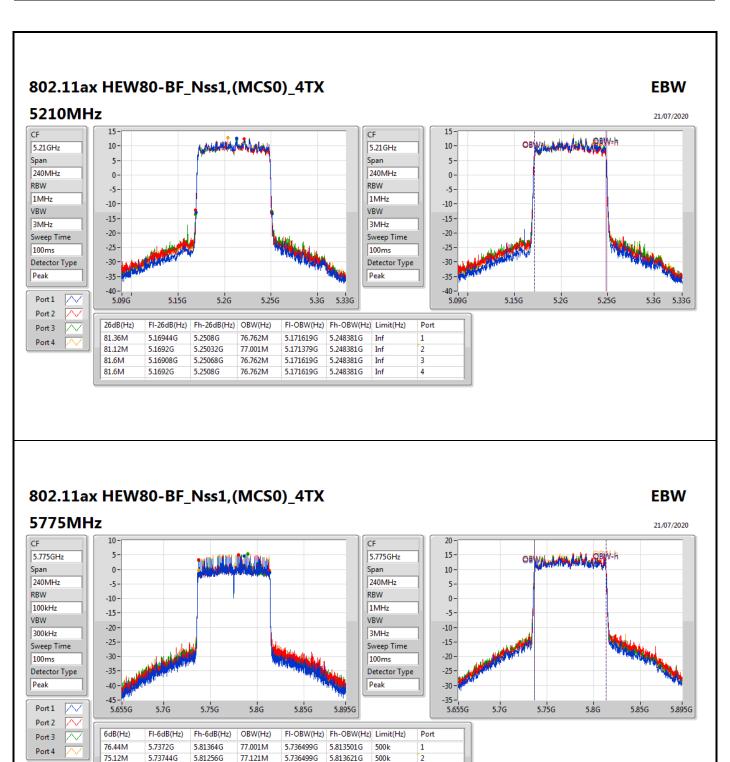


EBW Result Appendix A









77.121M

77.121M

5.736379G

5.736379G

5.813501G

5.813501G

500k

500k

76.32M

75.48M

5.73732G

5.73708G

5.81364G

5.81256G



Appendix B



**Summary** 

Mode	Total Power	Total Power
	(dBm)	(W)
5.15-5.25GHz	-	-
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	29.26	0.84333
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	28.98	0.79068
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	25.50	0.35481
5.725-5.85GHz	-	-
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	28.01	0.63241
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	28.65	0.73282
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	28.42	0.69502



#### Result

Mode	Result	DG	Port 1	Port 2	Port 3	Port 4	Total Power	Power Limit
		(dBi)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-
5180MHz	Pass	6.63	20.93	20.79	21.04	21.12	26.99	29.37
5200MHz	Pass	6.63	23.43	22.97	23.27	23.28	29.26	29.37
5240MHz	Pass	6.63	23.20	22.77	23.11	23.34	29.13	29.37
5745MHz	Pass	7.30	21.42	22.03	22.00	22.44	28.01	28.70
5785MHz	Pass	7.30	20.71	21.10	21.19	21.69	27.21	28.70
5825MHz	Pass	7.30	20.89	21.38	21.40	21.73	27.38	28.70
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-
5190MHz	Pass	6.63	19.90	19.31	19.49	19.76	25.64	29.37
5230MHz	Pass	6.63	23.07	22.74	22.88	23.15	28.98	29.37
5755MHz	Pass	7.30	22.23	22.57	22.49	22.86	28.56	28.70
5795MHz	Pass	7.30	22.27	22.64	22.66	22.93	28.65	28.70
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-
5210MHz	Pass	6.63	19.51	19.28	19.32	19.79	25.50	29.37
5775MHz	Pass	7.30	21.89	22.51	22.40	22.74	28.42	28.70

**DG** = Directional Gain; **Port X** = Port X output power



PSD Result Appendix C

**Summary** 

Mode	PD
	(dBm/RBW)
5.15-5.25GHz	·
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	15.19
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	12.35
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	6.24
5.725-5.85GHz	·
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	12.73
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	10.50
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	7.95

RBW = 500 kHz for 5.725-5.85GHz band / 1MHz for other band;

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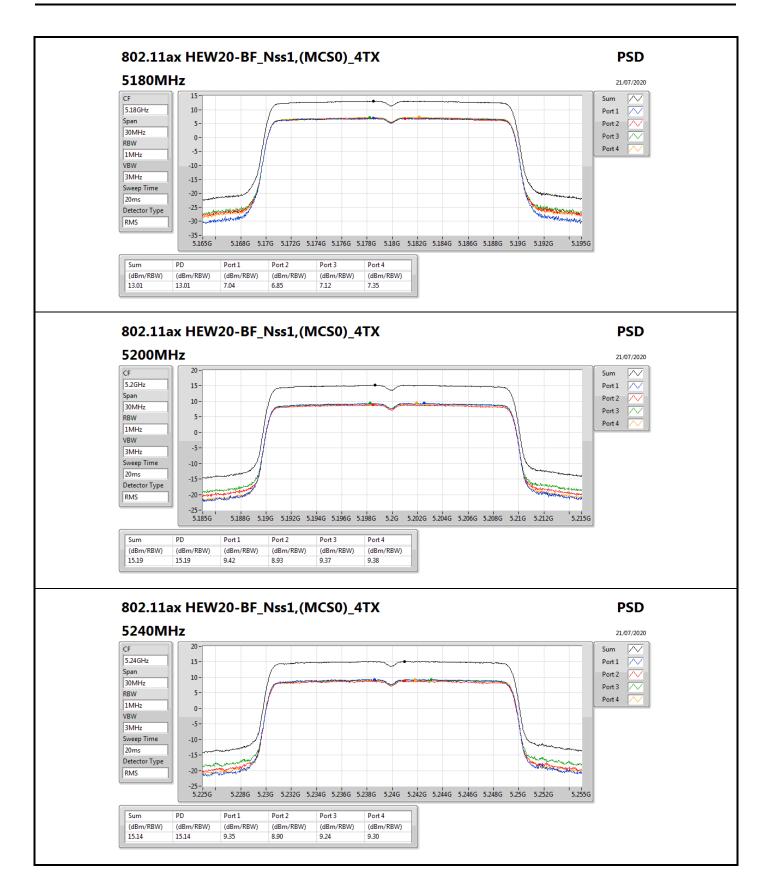
## Result

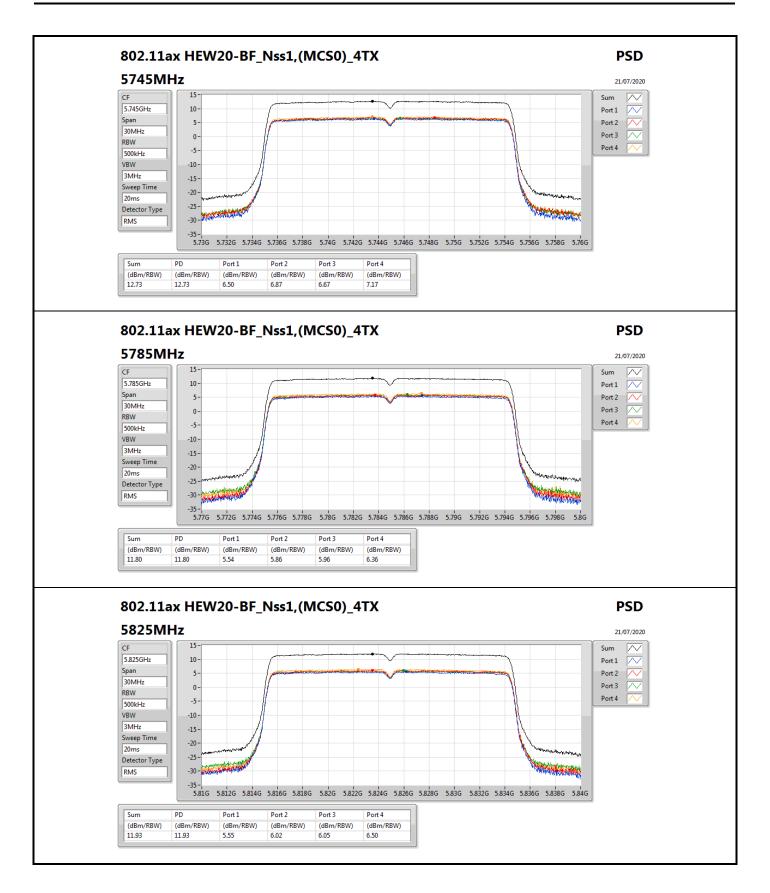
Mode	Result	DG	Port 1	Port 2	Port 3	Port 4	PD	PD Limit
		(dBi)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-
5180MHz	Pass	6.63	7.04	6.85	7.12	7.35	13.01	16.37
5200MHz	Pass	6.63	9.42	8.93	9.37	9.38	15.19	16.37
5240MHz	Pass	6.63	9.35	8.90	9.24	9.30	15.14	16.37
5745MHz	Pass	7.30	6.50	6.87	6.67	7.17	12.73	28.70
5785MHz	Pass	7.30	5.54	5.86	5.96	6.36	11.80	28.70
5825MHz	Pass	7.30	5.55	6.02	6.05	6.50	11.93	28.70
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-
5190MHz	Pass	6.63	3.28	2.59	2.93	3.18	8.88	16.37
5230MHz	Pass	6.63	6.67	6.13	6.37	6.60	12.35	16.37
5755MHz	Pass	7.30	4.22	4.49	4.62	4.80	10.50	28.70
5795MHz	Pass	7.30	4.24	4.57	4.51	4.89	10.49	28.70
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-
5210MHz	Pass	6.63	0.37	0.05	0.05	0.69	6.24	16.37
5775MHz	Pass	7.30	1.22	2.05	2.18	2.19	7.95	28.70

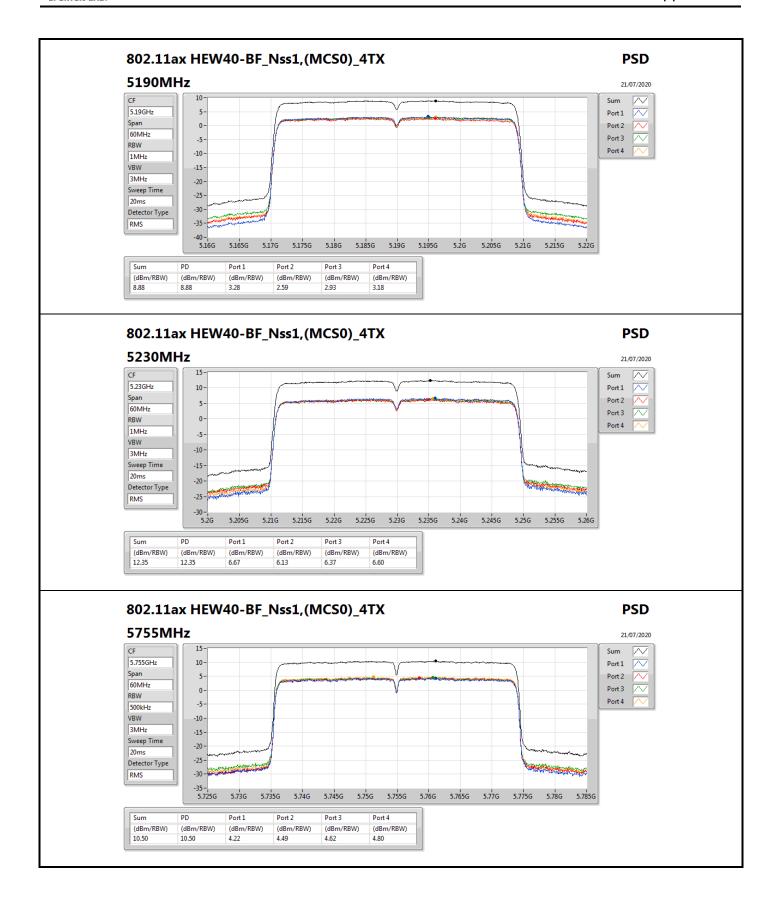
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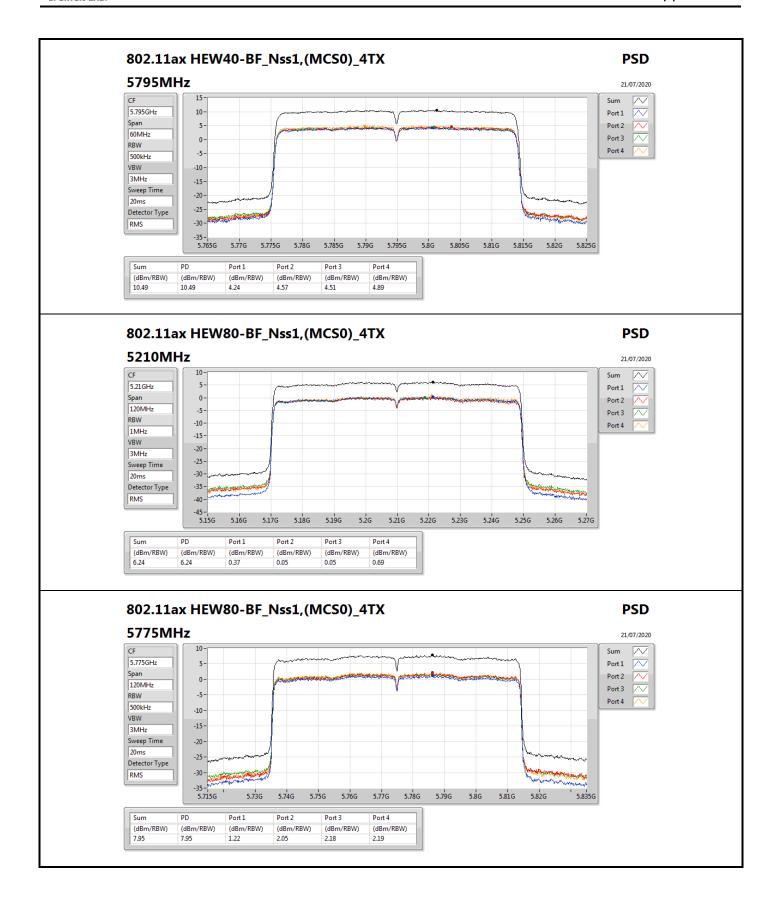
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DG = Directional Gain; RBW = 500 kHz for 5.725-5.85GHz band / 1MHz for other band;
PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; Port X = Port X power density;











## RSE TX above 1GHz Result

Appendix D

**Summary** 

Mode	Result	Туре	Freq	Level	Limit	Margin	Dist	Condition	Azimuth	Height	Comments
			(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(m)		(°)	(m)	
5.725-5.85GHz	-	-	-	-	-	-	-	-	-	-	-
802.11ax HEW80-BF_Nss1,(MCS0)_4TX	Pass	PK	17.31612G	68.18	68.20	-0.02	3	Horizontal	43	2.02	-



