intertek
Total Quality. Assured.

Johnson Health Tech. Co., Ltd

TEST REPORT

SCOPE OF WORK:
47 CFR FCC Part 15.407 – Radio Spectrum report

Model:
Target Training Console-02

REPORT NUMBER
210700133THC-001

ISSUE DATE
Aug. 31, 2021

PAGES
93

DOCUMENT CONTROL NUMBER
GFT-OP-10h (28-Nov-2018)

Radio Spectrum
TEST REPORT

Applicant:	**Johnson Health Tech. Co., Ltd.** **No.999, Sec. 2, Dongda Rd., Daya Dist Taichung City 428, Taiwan**
Product:	**Console for Exercise Machine**
Model No.:	**Target Training Console-02**
Brand Name:	**MATRIX FITNESS**
FCC ID:	**TN7PHOENIX2**
Test Method/ Standard:	**47 CFR FCC Part 15.407** **KDB 789033 D02 v02r01** **ANSI C63.10 2013** **KDB 662911 D01 v02r01**
Test By:	**Intertek Testing Services Taiwan Ltd.,** **Hsinchu Laboratory** **No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,** **Shiang-Shan District, Hsinchu City, Taiwan**

Testing Laboratory
0597

Zero Chen
Engineer

Durant Wei
Reviewer

Revision History

Report No.	Issue Date	Revision Summary
210700133THC-001	Aug. 31, 2021	Original report

Table of Contents

Summary of Test Data 5

1. General Information 6
   1.1 Identification of the EUT 6
   1.2 Antenna description 6
   1.3 Peripherals equipment 7
   1.4 Operation mode 8
   1.5 Duty Cycle 9

2. Maximum Conducted Output Power 11
   2.1 Limit for maximum output power 11
   2.2 Measuring instrument setting 11
   2.3 Test procedure 11
   2.4 Test diagram 11
   2.5 Test results 12

3. Power Spectrum Density 13
   3.1 Limit for power spectrum density 13
   3.2 Measuring instrument setting 13
   3.3 Test procedure 14
   3.4 Test diagram 14
   3.5 Test results 15

4. Minimum Bandwidth 28
   4.1 Limit for minimum emission bandwidth. 28
   4.2 Measuring instrument setting 28
   4.3 Test procedure 28
   4.4 Test diagram 29
   4.5 Test results 30

5. Emissions in Restricted Frequency Bands (Radiated emission measurements) 69
   5.1 Limit for emission in restricted frequency bands (Radiated emission measurement) 69
   5.2 Measuring instrument setting 70
   5.3 Test procedure 71
   5.4 Test configuration 72
   5.4.1 Radiated emission from 9 kHz to 30MHz using Loop Antenna 72
   5.4.2 Radiated emission below 1GHz using Bilog Antenna 72
   5.4.3 Radiated emission above 1GHz using Horn Antenna 73
   5.5 Test results 74
   5.5.1 Measurement results: frequencies from 9 kHz to 30MHz 74
   5.5.2 Measurement results: frequencies from 30 MHz to 1GHz 77
   5.5.3 Measurement results: frequency above 1GHz to 40GHz 79

6. Emission on The Band Edge 81
   6.1 Measuring instrument setting 81
   6.2 Test procedure 81

6.3 Test Result 82
7.AC Power Line Conducted Emission 91
Appendix A: Test equipment list 92
Appendix B: Measurement Uncertainty 93

Summary of Test Data

Test Requirement	Applicable Rule (Section 15.407)	Result
Maximum Conducted Output Power	15.407 (a)(1)/(2)/(3) KDB 789033 D02 v02r01	Pass
Power Spectrum Density	15.407 (a)(1)/(2)/(3) KDB 789033 D02 v02r01	Pass
Minimum Emission Bandwidth	15.407(a)(5), 15.407(e) KDB 789033 D02 v02r01	Pass
Emissions In Restricted Frequency Bands (Radiated emission measurements)	15.407(b), 15.209	Pass
Emission on The Band Edge	15.407(b), 15.209	Pass
AC Line Conducted Emission	15.407(b)(6) 15.207	Pass
Antenna requirement	15.203	Pass

Note: Please note that the test results with statement of conformity, the decision rules which are based on: Safety Testing: the specification, standard or IEC Guide 115.
Other Testing: the specification, standard and not taking into account the measurement uncertainty.

1. General Information

1.1 Identification of the EUT

Product:	Console for Exercise Machine
Model No.:	Target Training Console-02
Operating Frequency Range & Number of Channels:	1. 7 channels for 5180MHz~5240MHz in 802.11a/n(HT20/40)/ ac(VHT20/40/80) 2. 8 channels for 5745MHz~5825MHz in 802.11a/n(HT20/40)/ ac(VHT20/40/80)
Access scheme:	OFDM
Rated Power:	DC 5V
Power Cord:	N/A
Sample receiving date:	2021/07/09
Sample condition:	Workable
Test Date(s):	2021/08/07 ~ 2021/08/16

1.2 Antenna description

Antenna 1

Antenna Gain : 3 dBi
Antenna Type : Unipolar Antenna
Connector Type : I-PEX

Antenna 2

Antenna Gain : 3 dBi
Antenna Type : Unipolar Antenna
Connector Type : I-PEX

1.3 Peripherals equipment

No.	Model no.	Specification
Adapter	GS18U05	I/P: 100-240V~,50/60Hz, 0.5A O/P: 5Vdc 3.0A 15W Max

Peripherals	Brand	Model No.	Serial No.	Data cable
Notebook PC	HP	HP ProBook 440 G3	5CD8021S9H	USB to Micro USB cable 1 meter

1.4 Operation mode

The EUT was supplied with DC 5 V from Adapter (Test voltage: 120Vac, 60Hz).

The EUT connected to Notebook PC, executing “CMD” and select different frequency and modulation.

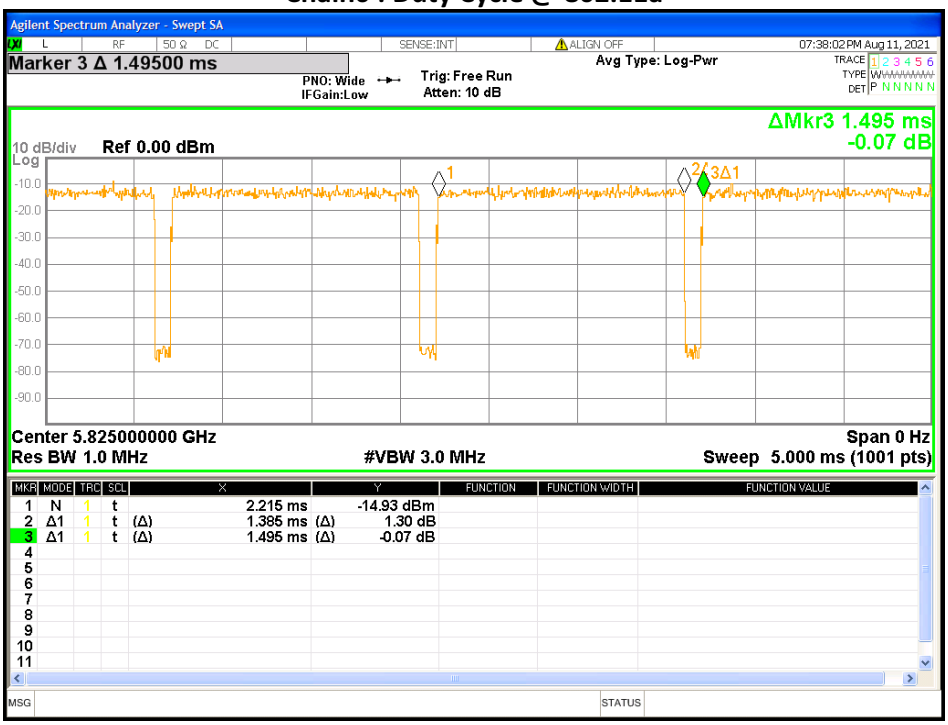
With individual verifying, the maximum output power were found out 6 Mbps data rate for 802.11a mode, 13 Mbps data rate for 802.11ac(VHT20) mode, 27 Mbps data rate for 802.11ac(VHT40) mode , 58.5 Mbps data rate for 802.11ac(VHT80) mode, the final tests were executed under these conditions recorded in this report individually.

Modulation mode	Transmit path	
	Chain 0	Chain 1
802.11 a	V	V
802.11 ac (VHT20)	V	V
802.11 ac (VHT40)	V	V
802.11 ac (VHT80)	V	V

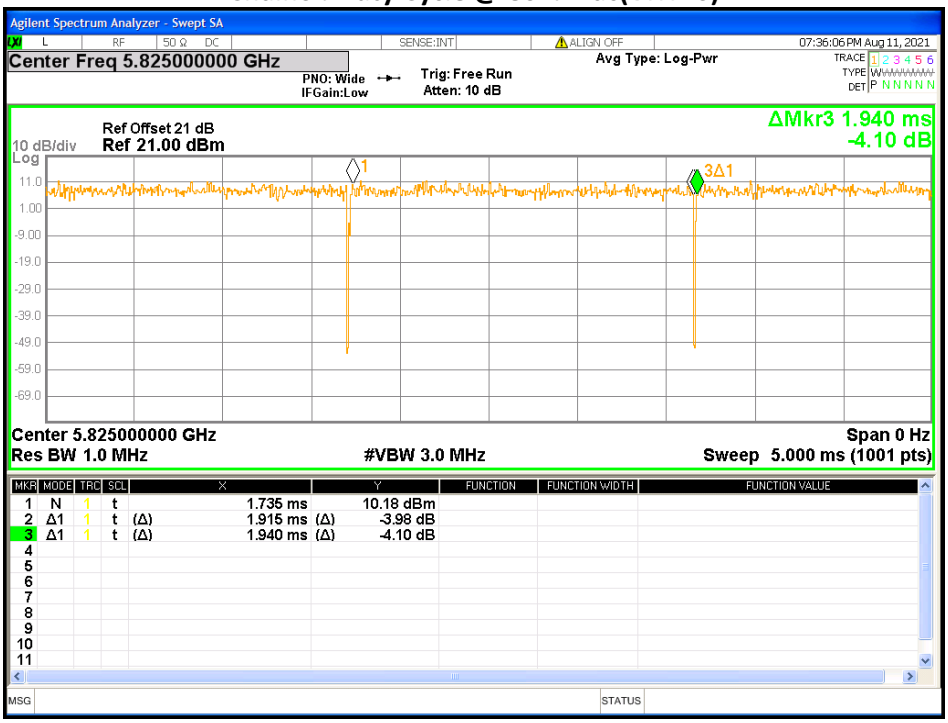
Mode	Channel	Frequency (MHz)	Data rate (Mbps)	Signal on time (ms)	Signal on+off time (ms)	Duty cycle	Duty factor (dB)	1/T Minimum VBW (kHz)
802.11a	100	5825	6	1.39	1.50	92.64%	0.66	0.72
802.11ac (VHT20)	100	5825	13	1.92	1.94	98.71%	0.11	0.01
802.11ac (VHT40)	102	5795	27	1.51	1.57	96.18%	0.34	0.66
802.11ac (VHT80)	106	5775	58.5	2.21	2.27	97.35%	0.23	0.45

1.5 Duty Cycle

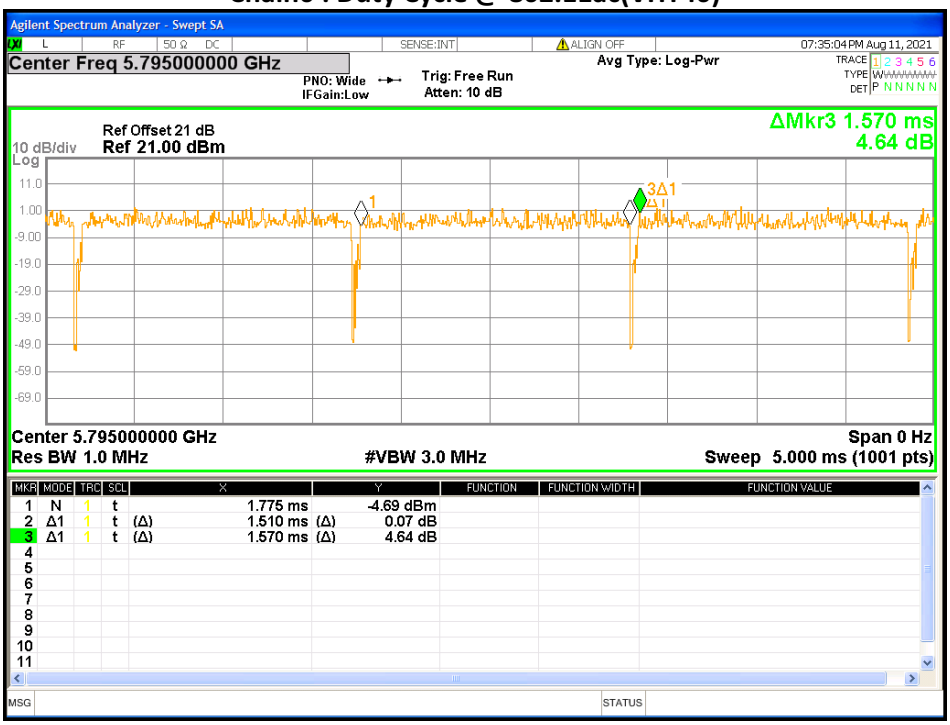
Chain0 : Duty Cycle @ 802.11a



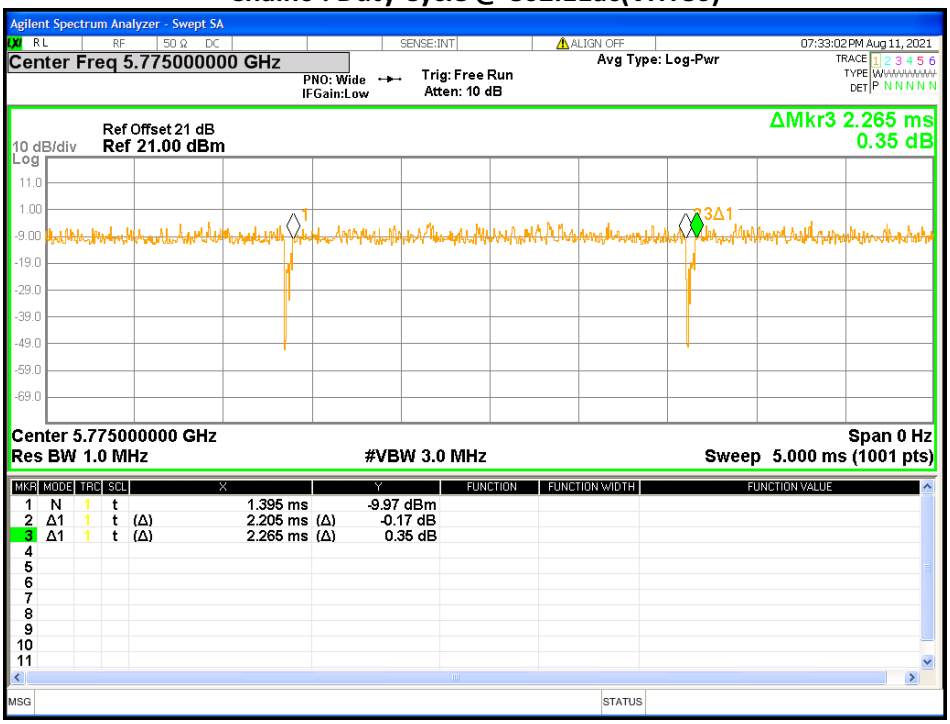
Chain0 : Duty Cycle @ 802.11ac(VHT20)



Chain0 : Duty Cycle @ 802.11ac(VHT40)



Chain0 : Duty Cycle @ 802.11ac(VHT80)



2. Maximum Conducted Output Power

2.1 Limit for maximum output power

Operating Frequency (MHz)	Conducted output power limit
5150~5725	< 0.25 W (24 dBm)
5725~5850	< 1 W (30 dBm)

Operating Frequency (MHz)	Maximum E.I.R.P. limit
5150~5725	< 1 W (30 dBm)
5725~5850	< 4 W (36 dBm)

2.2 Measuring instrument setting

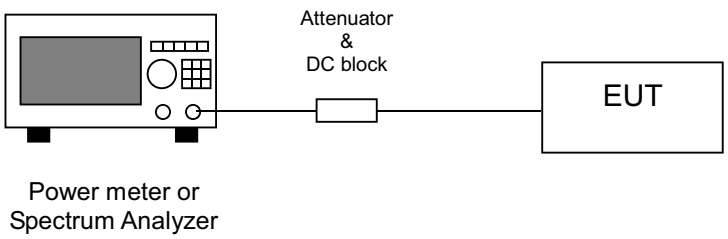
Power meter for Nominal Bandwidth less than 65MHz	
Power meter	**Setting**
Bandwidth	65MHz bandwidth is greater than the EUT emission bandwidth
Detector	Average

2.3 Test procedure

Test procedures refer to clause E) 3) b) measurement using a gated RF average power meter of KDB 789033 D02 v02r01

Test procedures refer to clause E) 2) b) Method SA-1 of KDB 789033 D02 v02r01

2.4 Test diagram



2.5 Test results

Temperature (℃) :	27
Relative Humidity (%) :	61
Test date :	2021/8/11

Mode	Channel	Frequency (MHz)	Output Power (AV)		Total Power (AV)		Antenna0 Gain (dBi)	Antenna1 Gain (dBi)	E.I.R.P. (dBm)	Limit of Conducted Power (dBm)	Margin (dB)	Limit of E.I.R.P. (dBm)	Margin (dB)
			Chain 0	Chain 1									
			dBm	dBm	mW	dBm							
802.11a Chain0+1	36	5180	16.68	15.82	84.75	19.28	3.00	3.00	22.28	24.00	-4.72	30.00	-7.72
	44	5220	16.12	16.00	80.74	19.07	3.00	3.00	22.07	24.00	-4.93	30.00	-7.93
	48	5240	16.43	16.85	92.37	19.66	3.00	3.00	22.66	24.00	-4.34	30.00	-7.34
	149	5745	16.67	16.50	91.12	19.60	3.00	3.00	22.60	30.00	-10.40	36.00	-13.40
	157	5785	17.16	16.47	96.36	19.84	3.00	3.00	22.84	30.00	-10.16	36.00	-13.16
	165	5825	17.20	16.94	101.91	20.08	3.00	3.00	23.08	30.00	-9.92	36.00	-12.92
802.11ac (VHT20) Chain0+1	36	5180	15.58	15.61	72.53	18.61	3.00	3.00	21.61	24.00	-5.39	30.00	-8.39
	44	5220	15.57	15.18	69.02	18.39	3.00	3.00	21.39	24.00	-5.61	30.00	-8.61
	48	5240	15.38	15.39	69.11	18.40	3.00	3.00	21.40	24.00	-5.60	30.00	-8.60
	149	5745	15.53	15.24	69.15	18.40	3.00	3.00	21.40	30.00	-11.60	36.00	-14.60
	157	5785	16.13	15.33	75.14	18.76	3.00	3.00	21.76	30.00	-11.24	36.00	-14.24
	165	5825	15.80	15.20	71.13	18.52	3.00	3.00	21.52	30.00	-11.48	36.00	-14.48
802.11ac (VHT40) Chain0+1	38	5190	12.83	12.38	36.48	15.62	3.00	3.00	18.62	24.00	-8.38	30.00	-11.38
	46	5230	12.94	12.61	37.92	15.79	3.00	3.00	18.79	24.00	-8.21	30.00	-11.21
	151	5755	13.14	13.39	42.43	16.28	3.00	3.00	19.28	30.00	-13.72	36.00	-16.72
	159	5795	13.34	13.31	43.01	16.34	3.00	3.00	19.34	30.00	-13.66	36.00	-16.66
802.11ac (VHT80) Chain0+1	42	5210	12.14	11.29	29.83	14.75	3.00	3.00	17.75	24.00	-9.25	30.00	-12.25
	155	5775	11.51	11.92	29.72	14.73	3.00	3.00	17.73	30.00	-15.27	36.00	-18.27

3. Power Spectrum Density

3.1 Limit for power spectrum density

Operating Frequency (MHz)	Power density limit
5150~5725	< 11 dBm/1MHz
5725~5850	< 30 dBm/500kHz

3.2 Measuring instrument setting

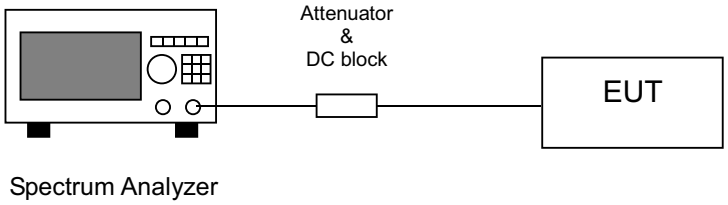
Spectrum analyzer settings (5150~5725MHz)	
Spectrum Analyzer function	**Setting**
Detector	RMS
RBW	=1MHz
VBW	≧3 MHz
Sweep	Auto couple
Trace	Average
Span	Encompass the 26 dB EBW
Attenuation	Auto
Sweep point	≥ 2 Span / RBW

Spectrum analyzer settings (5725~5850MHz)	
Spectrum Analyzer function	**Setting**
Detector	RMS
RBW	=100kHz
VBW	≧300 kHz
Sweep	Auto couple
Trace	Average
Span	Encompass the 6 dB EBW
Attenuation	Auto
Sweep point	≥ 2 Span / RBW

3.3 Test procedure

Set relevant parameter according to clause 4.3.
Trace average at least 100 traces in power averaging mode.
Compute power by integrating the spectrum across the 26 dB or 6dB EBW of the signal using the instrument's band power measurement function with band limits set equal to the EBW band edges.
If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement. The RBW is 100 kHz. So, we will add 6.989 to the results.

3.4 Test diagram



3.5 Test results

Temperature (℃) :	27
Relative Humidity (%) :	61
Test date :	2021/8/11

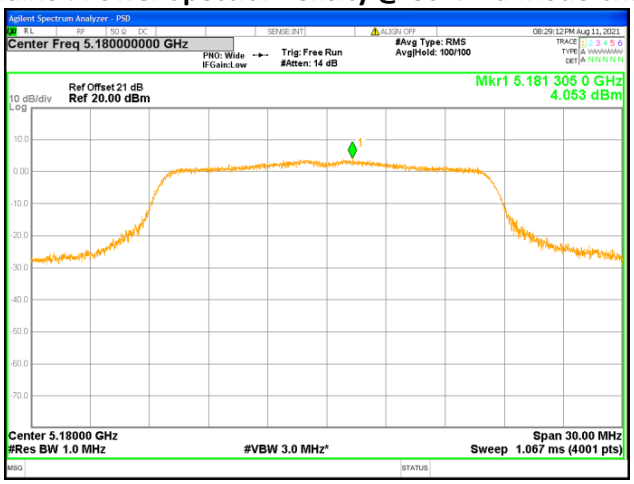
Mode	Channel	Frequency (MHz)	PSD (dBm)		Total PSD		Duty Factor	Result (dBm)	Limit (dBm)	Margin (dB)
			chain0	chain1	mW	dBm				
802.11a Chain0+1	36	5180	4.05	3.18	4.62	6.65	0.11	6.76	11.00	-4.24
	44	5220	3.40	3.29	4.32	6.36	0.11	6.47	11.00	-4.53
	48	5240	3.02	2.60	3.83	5.83	0.11	5.94	11.00	-5.06
802.11ac(VHT20) Chain0+1	36	5180	4.37	4.06	5.28	7.23	0.11	7.34	11.00	-3.66
	44	5220	4.51	4.16	5.43	7.35	0.11	7.46	11.00	-3.54
	48	5240	4.59	4.20	5.51	7.41	0.11	7.52	11.00	-3.48
802.11ac(VHT40) Chain0+1	38	5190	-3.22	-3.92	0.88	-0.55	0.34	-0.21	11.00	-11.21
	46	5230	-2.61	-3.78	0.97	-0.15	0.34	0.19	11.00	-10.81
802.11ac(VHT80) Chain0+1	42	5210	-6.77	-7.42	0.39	-4.07	0.23	-3.84	11.00	-14.84

Mode	Channel	Frequency (MHz)	PSD (dBm)		Total PSD		RBW factor	PSD in 500kHz (dBm)	Duty Factor	Result (dBm)	Limit (dBm)	Margin (dB) (dB)
			chain0	chain1	mW	dBm						
802.11a Chain0+1	149	5745	-4.94	-5.79	0.58	-2.34	6.99	4.65	0.11	4.77	30.00	-25.23
	157	5785	-5.71	-6.33	0.50	-3.00	6.99	3.99	0.11	4.10	30.00	-25.90
	165	5825	-4.92	-5.51	0.60	-2.19	6.99	4.80	0.11	4.91	30.00	-25.09
802.11ac(VHT20) Chain0+1	149	5745	-4.34	-4.11	0.76	-1.21	6.99	5.78	0.11	5.89	30.00	-24.11
	157	5785	-3.86	-4.03	0.81	-0.93	6.99	6.06	0.11	6.17	30.00	-23.83
	165	5825	-3.62	-4.32	0.80	-0.95	6.99	6.04	0.11	6.16	30.00	-23.84
802.11ac(VHT40) Chain0+1	151	5755	-11.28	-11.48	0.15	-8.37	6.99	-1.38	0.34	-1.04	30.00	-31.04
	159	5795	-10.54	-11.12	0.17	-7.81	6.99	-0.82	0.34	-0.48	30.00	-30.48
802.11ac(VHT80) Chain0+1	155	5775	-15.60	-15.58	0.06	-12.58	6.99	-5.59	0.23	-5.36	30.00	-35.36

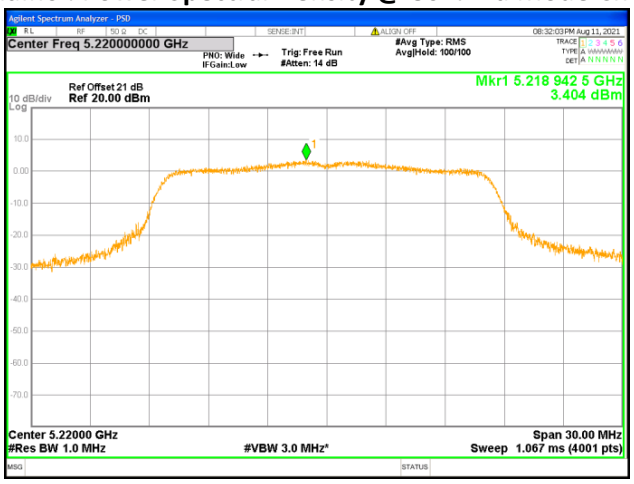
Result=Total Power+Duty Factor

Note : RBW Correction in 5725~5850MHz : 10log(500kHz/100kHz)

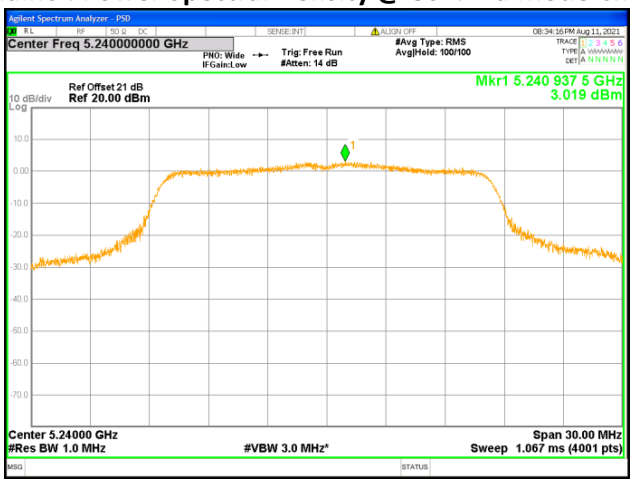
Chain0 : Power Spectral Density @ 802.11a Mode Ch36



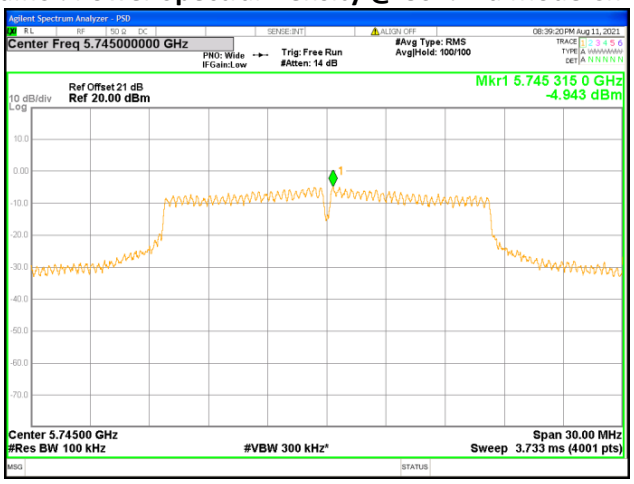
Chain0 : Power Spectral Density @ 802.11a Mode Ch44



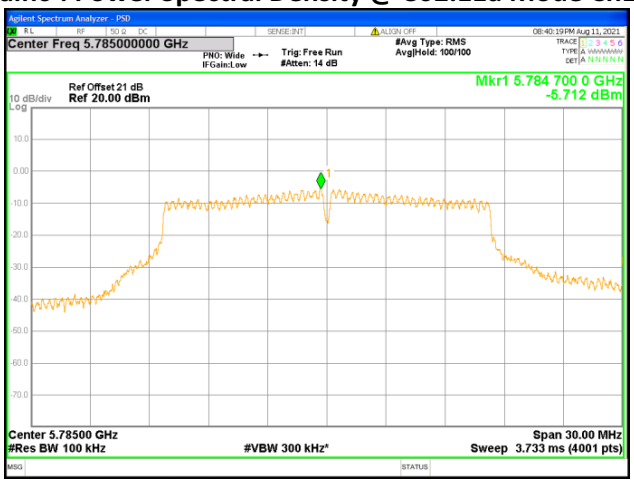
Chain0 : Power Spectral Density @ 802.11a Mode Ch48



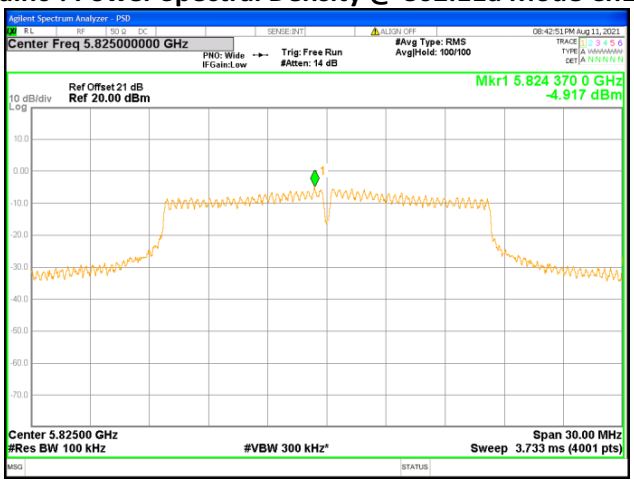
Chain0 : Power Spectral Density @ 802.11a Mode Ch149



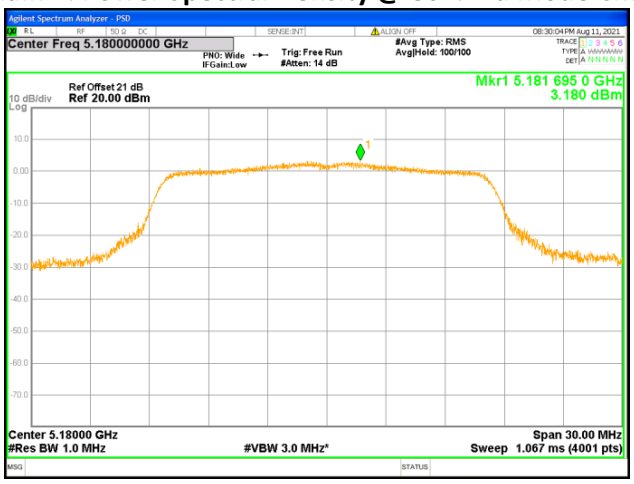
Chain0 : Power Spectral Density @ 802.11a Mode Ch157



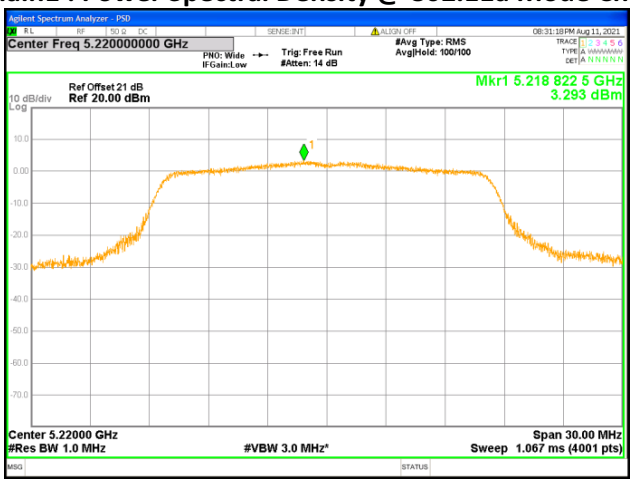
Chain0 : Power Spectral Density @ 802.11a Mode Ch165



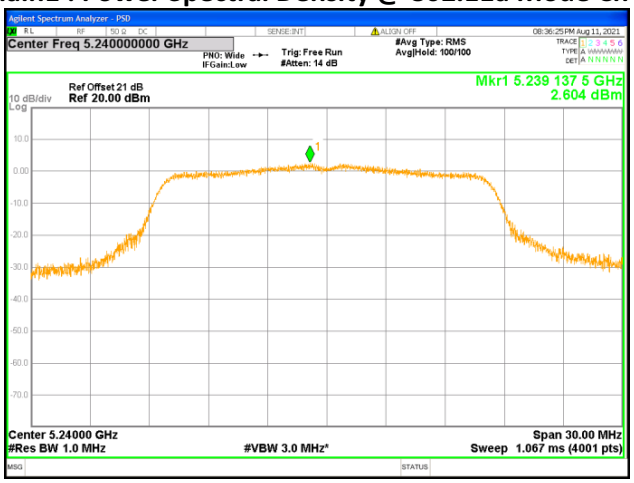
Chain1 : Power Spectral Density @ 802.11a Mode Ch36



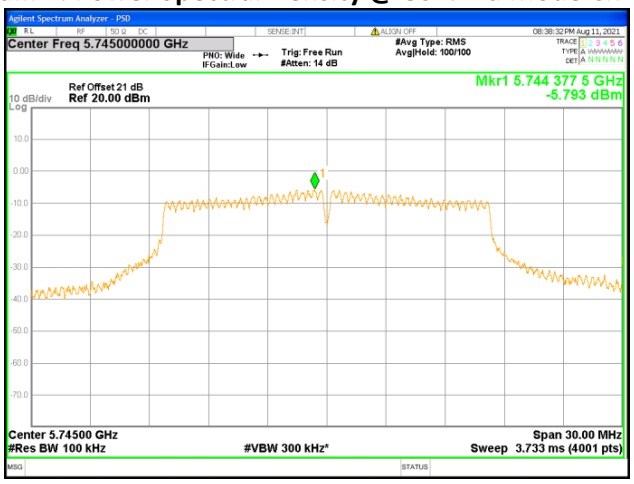
Chain1 : Power Spectral Density @ 802.11a Mode Ch44



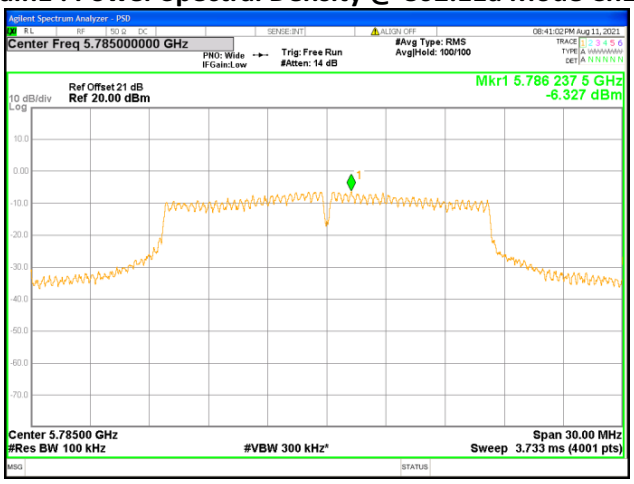
Chain1 : Power Spectral Density @ 802.11a Mode Ch48



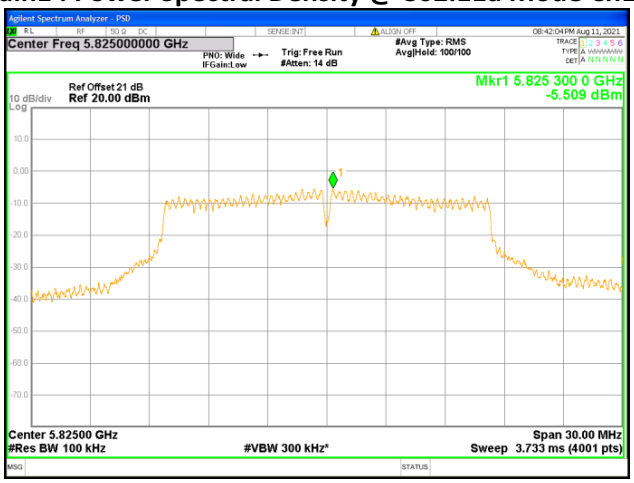
Chain1 : Power Spectral Density @ 802.11a Mode Ch149



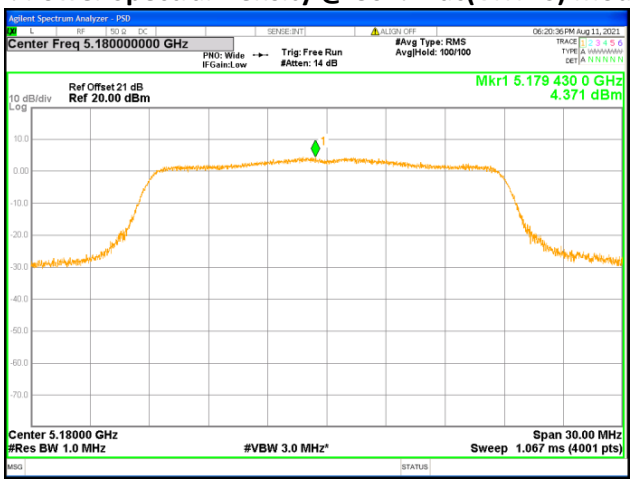
Chain1 : Power Spectral Density @ 802.11a Mode Ch157



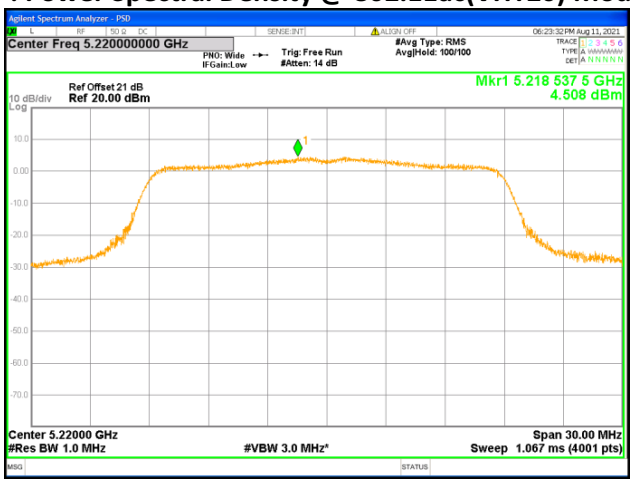
Chain1 : Power Spectral Density @ 802.11a Mode Ch165



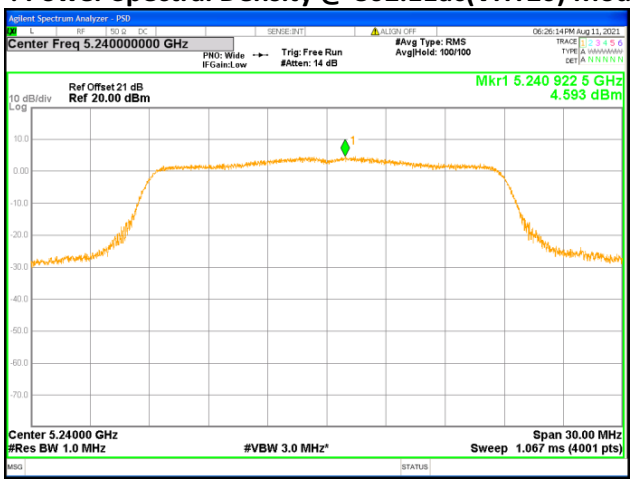
Chain0 : Power Spectral Density @ 802.11ac(VHT20) Mode Ch36



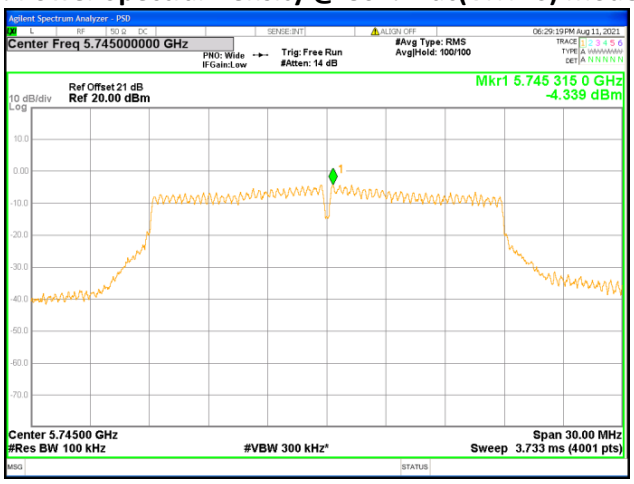
Chain0 : Power Spectral Density @ 802.11ac(VHT20) Mode Ch44



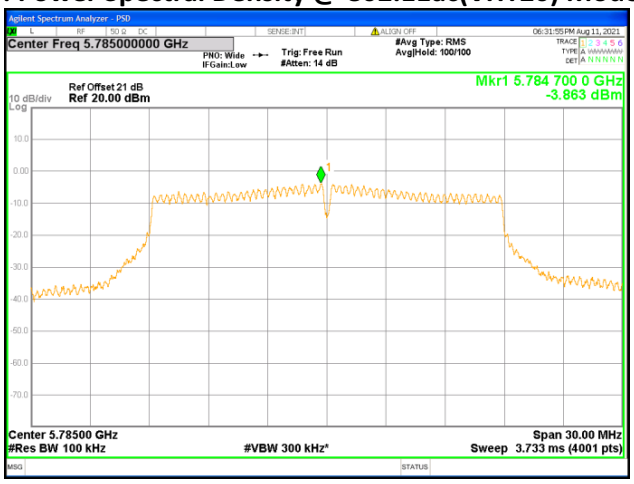
Chain0 : Power Spectral Density @ 802.11ac(VHT20) Mode Ch48



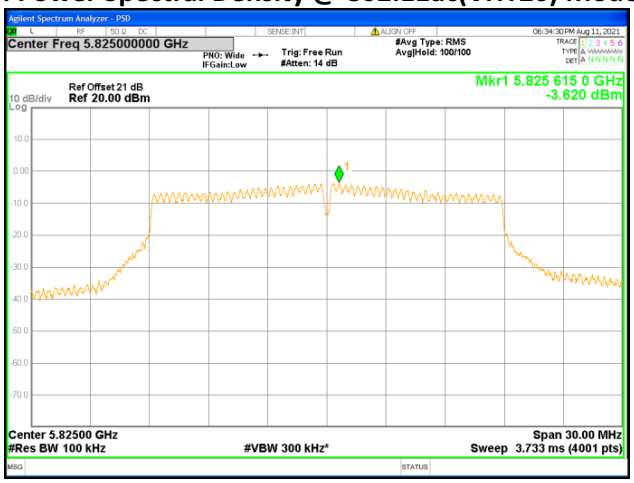
Chain0 : Power Spectral Density @ 802.11ac(VHT20) Mode Ch149



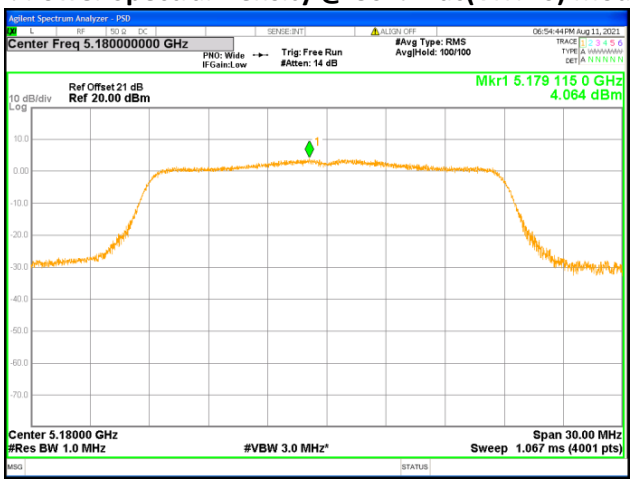
Chain0 : Power Spectral Density @ 802.11ac(VHT20) Mode Ch157



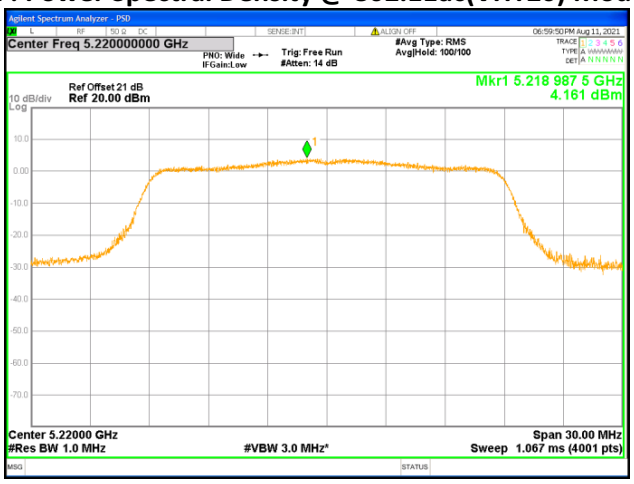
Chain0 : Power Spectral Density @ 802.11ac(VHT20) Mode Ch165



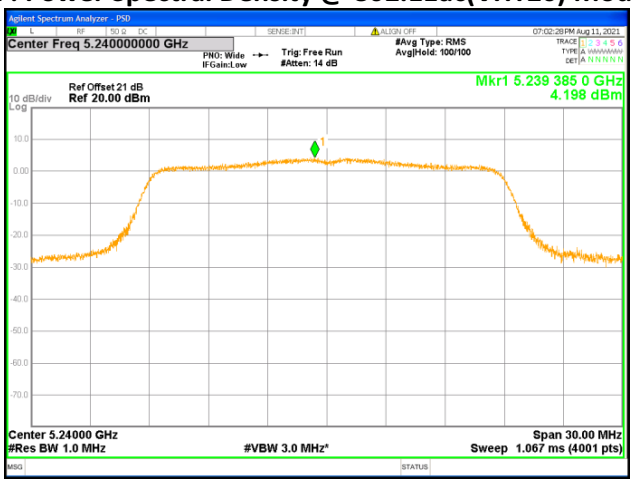
Chain1 : Power Spectral Density @ 802.11ac(VHT20) Mode Ch36



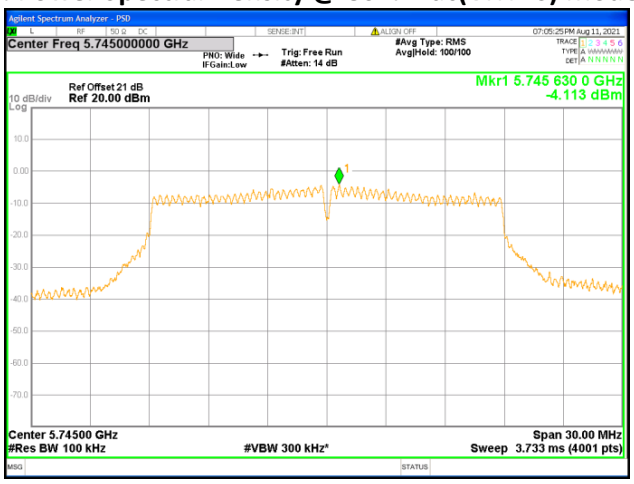
Chain1 : Power Spectral Density @ 802.11ac(VHT20) Mode Ch44



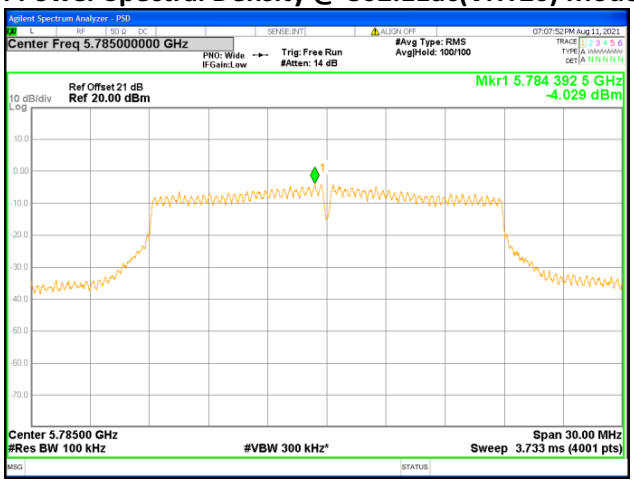
Chain1 : Power Spectral Density @ 802.11ac(VHT20) Mode Ch48



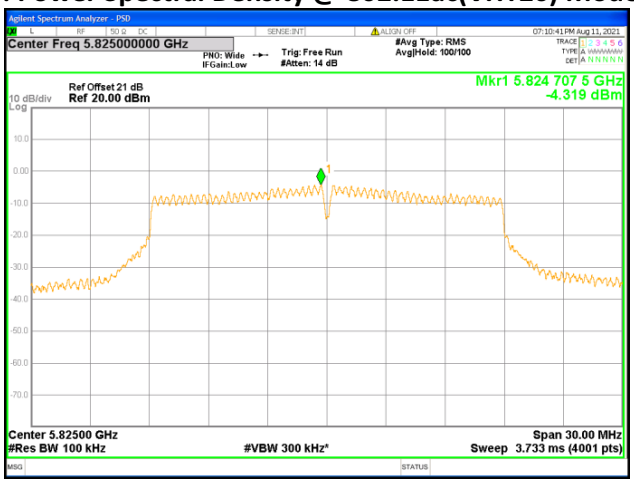
Chain1 : Power Spectral Density @ 802.11ac(VHT20) Mode Ch149



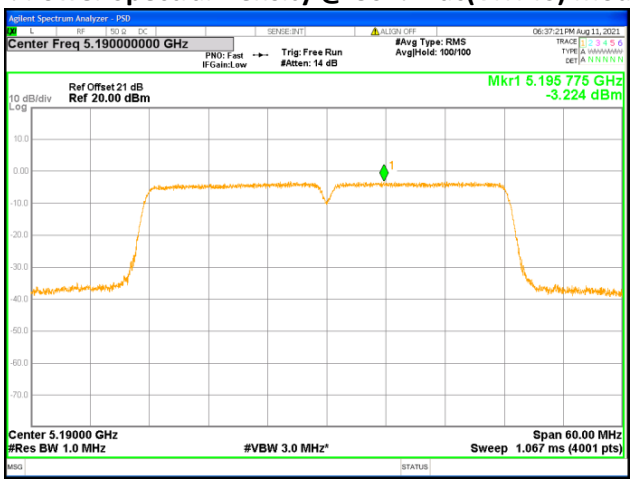
Chain1 : Power Spectral Density @ 802.11ac(VHT20) Mode Ch157



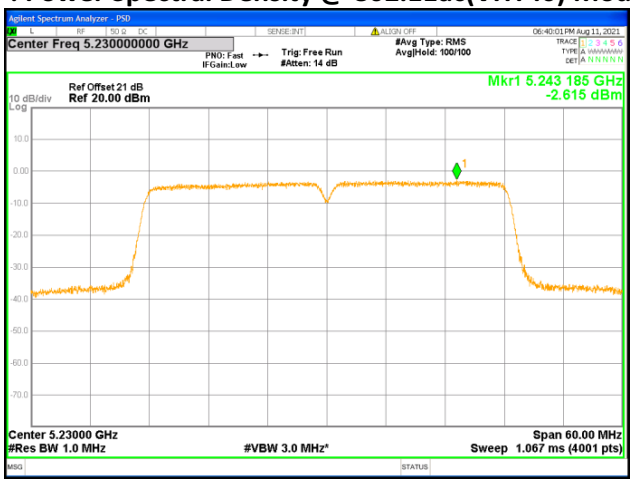
Chain1 : Power Spectral Density @ 802.11ac(VHT20) Mode Ch165



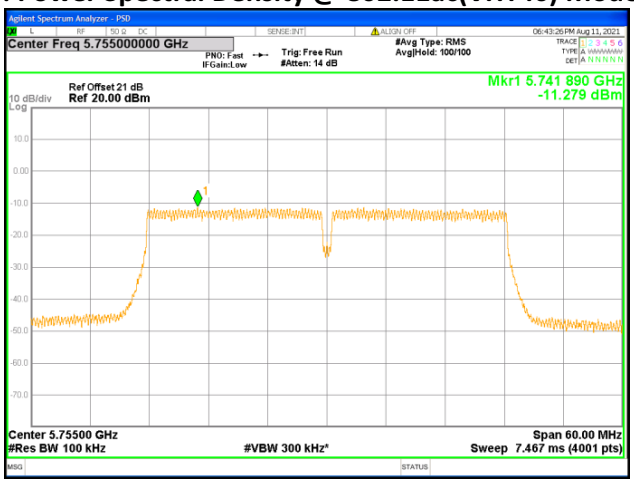
Chain0 : Power Spectral Density @ 802.11ac(VHT40) Mode Ch38



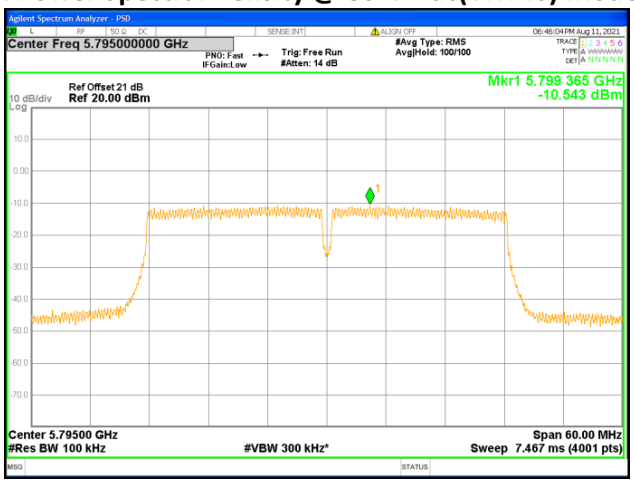
Chain0 : Power Spectral Density @ 802.11ac(VHT40) Mode Ch46



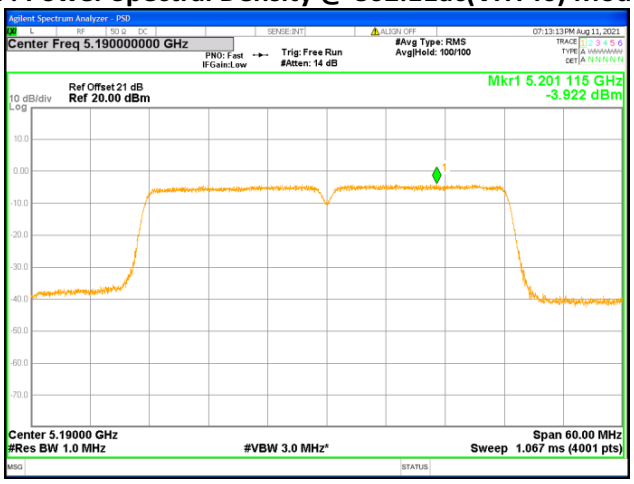
Chain0 : Power Spectral Density @ 802.11ac(VHT40) Mode Ch151



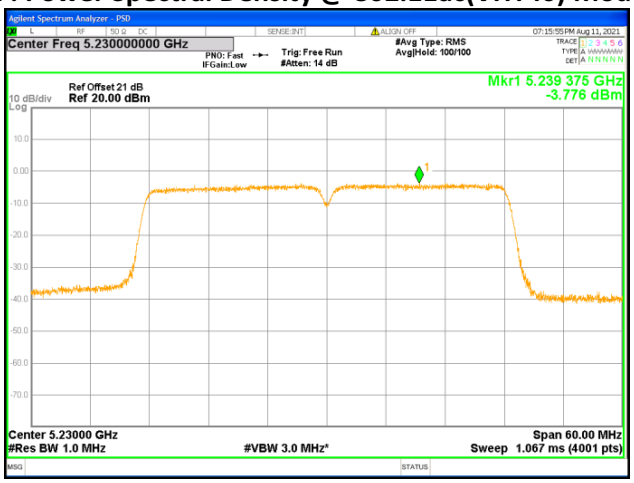
Chain0 : Power Spectral Density @ 802.11ac(VHT40) Mode Ch159



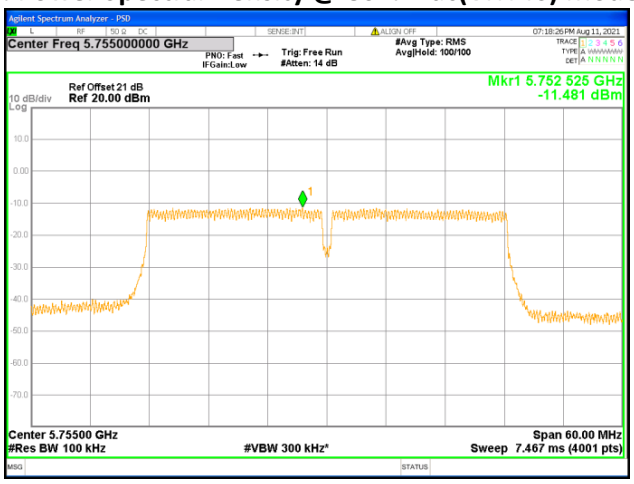
Chain1 : Power Spectral Density @ 802.11ac(VHT40) Mode Ch38



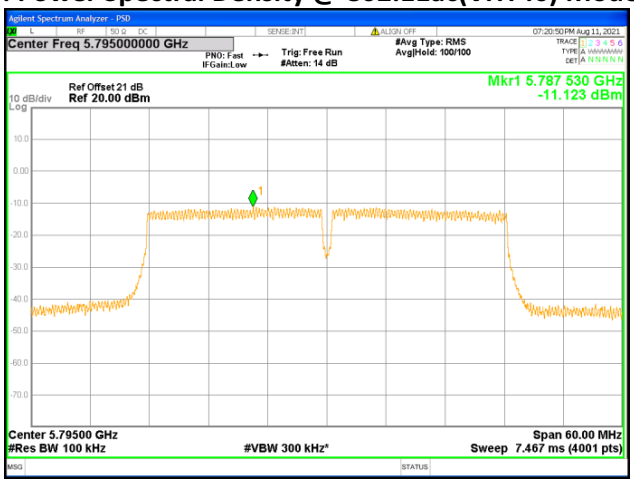
Chain1 : Power Spectral Density @ 802.11ac(VHT40) Mode Ch46



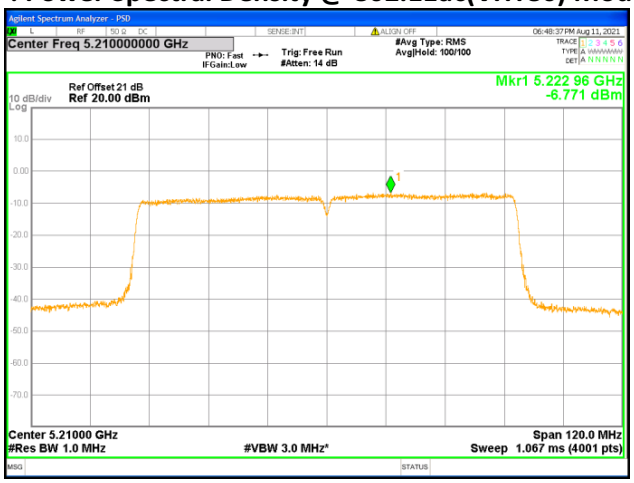
Chain1 : Power Spectral Density @ 802.11ac(VHT40) Mode Ch151



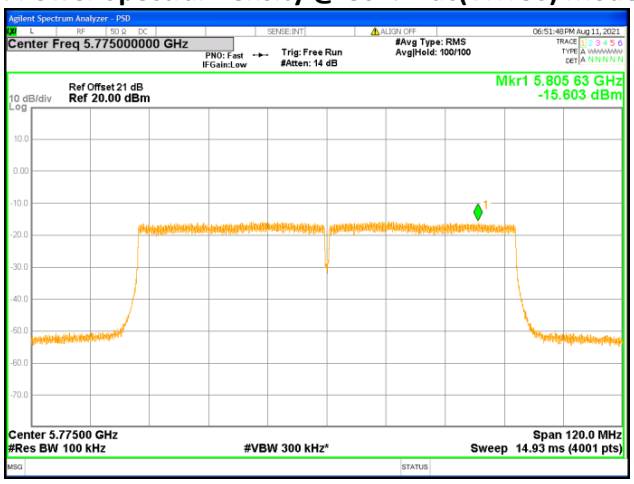
Chain1 : Power Spectral Density @ 802.11ac(VHT40) Mode Ch159



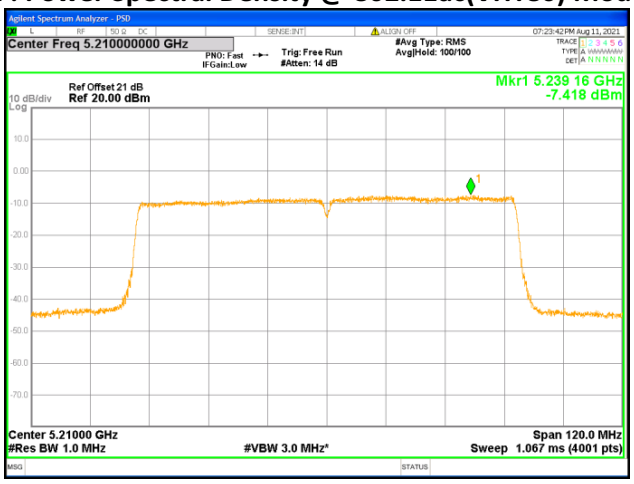
Chain0 : Power Spectral Density @ 802.11ac(VHT80) Mode Ch42



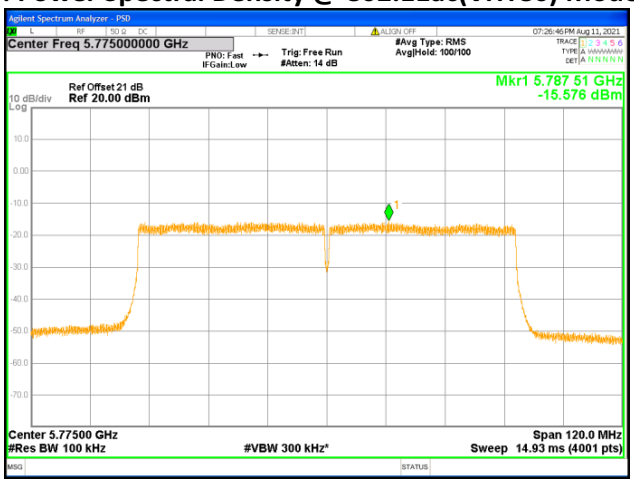
Chain0 : Power Spectral Density @ 802.11ac(VHT80) Mode Ch155



Chain1 : Power Spectral Density @ 802.11ac(VHT80) Mode Ch42



Chain1 : Power Spectral Density @ 802.11ac(VHT80) Mode Ch155



4. Minimum Bandwidth

4.1 Limit for minimum emission bandwidth.

Within the 5.15-5.725 GHz, the 26 dB bandwidth is for reporting purpose only.
Within the 5.725-5.85 GHz, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

4.2 Measuring instrument setting

For 5.15-5.25 GHz

Spectrum analyzer settings	
Spectrum Analyzer function	**Setting**
Detector	Peak
RBW	Approximately 1% of the EBW
VBW	> RBW
Trace mode	Max hold

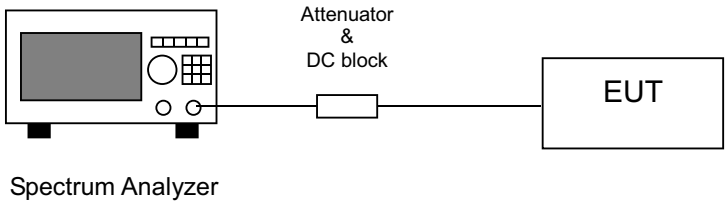
For 5.725-5.85 GHz

Spectrum analyzer settings	
Spectrum Analyzer function	**Setting**
Detector	Peak
RBW	100kHz
VBW	≧3 x RBW
Sweep	Auto couple
Trace mode	Max hold

4.3 Test procedure

1. The transmitter output was connected to the spectrum analyzer.
2. Test was performed in accordance with section C of KDB 789033 D02 v02r01.
3. For the 5.725-5.85 GHz, 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.
4. For the 5.15-5.25 GHz and 5.725-5.85 GHz, measure the maximum width of the emission that is 26 dB down from the maximum of the emission.

4.4 Test diagram



4.5 Test results

Temperature (℃) :	27
Relative Humidity (%) :	61
Test date :	2021/8/11

Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	26dB Bandwidth (MHz)	Limit (MHz)	Result
802.11a Chain0	36	5180		26.58	N/A	
	44	5220		25.76		
	48	5240		30.76		
	149	5745	16.04		>0.5	Pass
	157	5785	14.41			Pass
	165	5825	16.34			Pass
802.11a Chain1	36	5180		26.34	N/A	
	44	5220		24.38		
	48	5240		27.36		
	149	5745	16.26		>0.5	Pass
	157	5785	16.26			Pass
	165	5825	15.66			Pass
802.11ac(VHT20) Chain0	36	5180		23.20	N/A	
	44	5220		23.88		
	48	5240		22.54		
	149	5745	17.32		>0.5	Pass
	157	5785	17.64			Pass
	165	5825	17.54			Pass
802.11ac(VHT20) Chain1	36	5180		22.06	N/A	
	44	5220		21.48		
	48	5240		26.34		
	149	5745	17.60		>0.5	Pass
	157	5785	17.56			Pass
	165	5825	17.55			Pass