TEST REPORT

KOSTEC CO., Ltd.
28(175-20, Annyeong-dong) 406-gil sejaro,
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Tel:031-222-4251, Fax:031-222-4252

Report No.: KST-FCR-180007(2)

KOSTEC Co., Ltd.
http://www.kostec.org

1. Applicant

- Name : SAM JIN CO., LTD.
- Address : 81, Anyangcheonseo-ro, Manan-gu Anyang-si, Gyeonggi-do, South Korea

2. Test Item

- Product Name: HUB
- Model Name: STH-ETH-300
- Brand: None
- FCC ID: 2AF4S-STH-ETH-300 • IC : 20753-STHETH300

3. Manufacturer

- Name : QINGDAO SANJIN ELECTRONIC CO.,LTD.
- Address : 81, Anyangcheonseo-ro, Manan-gu Anyang-si, Gyeonggi-do, South Korea

4. Date of Test : 2018. 01. 15. ~ 2018. 01. 17.

5. Test Method Used : FCC CFR 47, Part 15. Subpart E-15.407

6. Test Result : Compliance

7. Note: None

Supplementary Information

The device bearing the brand name and FCC ID specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with measurement procedures specified in ANSI C 63.10-2013.

We attest to the accuracy of data and all measurements reported herein were performed by KOSTEC Co., Ltd. and were made under Chief Engineer's supervision. We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

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

Affirmation	Tested by Name : Jung, Ho-cheol (Signature)	Technical Manager Name : Park, Gyeong-Hyeon (Signature)

2018. 04. 18.

KOSTEC Co., Ltd.

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1. GENERAL INFORMATION

1.1 Test Facility

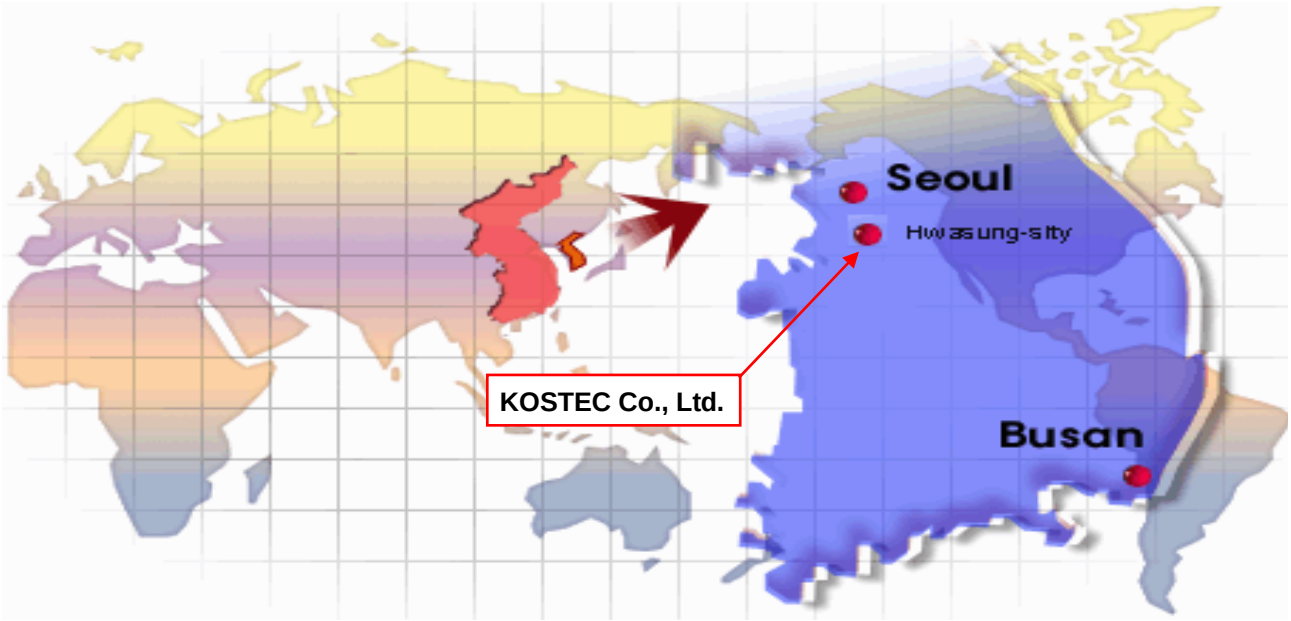
Test laboratory and address

KOSTEC Co., Ltd.
128(175-20,Annyeong-dong)406-gil sejaro, Hwaseong-si Gyeonggi-do, Korea

Registration information

KOLAS No. : 232
FCC Designation No. : KR0041
IC Registration Site No. : 8305A-1

1.2 Location



1.3 Revision History of test report

Rev.	Revisions	Effect page	Reviewed	Date
-	Initial issue	All	Gyeong Hyeon, Park	2018. 02. 09.
1	Revised address and Product name Revised 5.1 and 5.2 add Emissions Mask	1, 5, 15~20, 59~63	Gyeong Hyeon, Park	2018. 04. 16.
2	Revised Used Test Equipment List Revised 5.2	8~9, 19~20	Gyeong Hyeon, Park	2018. 04. 18.

2. EQUIPMENT DESCRIPTION

The product specification described herein was declared by manufacturer. And refer to user's manual for the details.

Equipment Name	HUB
Model No	STH-ETH-300
Usage	Smart Hub
Serial Number	Proto type
Modulation type	256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Emission Type	G1D, D1D
Maximum output power	5 180 ~ 5 240 MHz 802.11a : 12.80 dBm, 802.11n(HT20) : 13.83 dBm, 802.11n(HT40) : 13.76 dBm, 802.11ac(VHT20) : 13.63 dBm, 802.11ac(VHT40) : 13.90 dBm, 802.11ac(VHT80) : 14.11 dBm 5 745 ~ 5 825 MHz 802.11a : 6.73 dBm, 802.11n(HT20) : 9.11 dBm, 802.11n(HT40) : 8.68 dBm, 802.11ac(VHT20) : 9.49 dBm, 802.11ac(VHT40) : 8.49 dBm, 802.11ac(VHT80) : 7.75 dBm
Operated Frequency	5 180 ~ 5 240 MHz 802.11a/ n(HT20)/ ac(VHT20): 5 180 MHz – 5 240 MHz 802.11n(HT40)/ ac(VHT40): 5 190 MHz ~ 5 230 MHz 802.11ac(VHT80): 5 210 MHz 5 745 ~ 5 825 MHz 802.11a/ n(HT20)/ ac(VHT20): 5 745 MHz – 5 825 MHz 802.11n(HT40)/ ac(VHT40): 5 755 MHz ~ 5 795 MHz 802.11ac(VHT80): 5 775 MHz
Channel Number	5 180 ~ 5 240 MHz: 4 for 802.11a, 802.11n(HT20), 802.11ac(VHT20) 2 for 802.11n(HT40), 802.11ac(VHT40) 1 for 802.11ac(VHT80) 5 745 ~ 5 825 MHz: 5 for 802.11a, 802.11n(HT20), 802.11ac(VHT20) 2 for 802.11n(HT40), 802.11ac(VHT40) 1 for 802.11ac(VHT80)
Operation temperature	-10 °C ~ 55 °C
Power Source	Adapter DC 5.0 V
Antenna Description	Internal PCB pattern antenna 5 180 ~ 5 240 MHz: Ant1: 2.36 dBi, Ant2: 2.34 dBi 5 745 ~ 5 825 MHz: Ant1: 1.08 dBi, Ant2: -0.87 dBi
Remark	1. The device was operating at its maximum output power for all measurements. 2. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case (X) is shown in the report. 3. The above DUT's information was declared by manufacturer. Please refer to the specifications or user manual for more detailed description.
FCC ID	2AF4S-STH-ETH-300
IC	20753- STHETH300

3. SYSTEM CONFIGURATION FOR TEST

3.1 Characteristics of equipment

The Equipment Under Test (EUT) contains the following capabilities: This equipment is Smart Hub. The detailed explanation is refer as user manual.

3.2 Used peripherals list

Description	Model No.	Serial No.	Manufacture	Remark
Notebook	LG15N54	412NZET043212	LG	
Adapter	PA-1900-14	None	LG	For notebook

3.3 Product Modification

N/A

3.4 Operating Mode

Constantly transmitting with a modulated carrier at maximum power on the low, middle and high channels.

3.5 Test Setup of EUT

The measurements were taken in continuous transmit / receive mode using the TEST MODE.

For controlling the EUT as TEST MODE, the test program and the test cables were provided by the applicant.

3.6 Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

▣ TX Power setting value during test

Band	Mode	TX Power setting value					
		Ant 1			Ant 2		
		Low CH	Middle CH	High CH	Low CH	Middle CH	High CH
5 GHz band	802.11a	5	5	5	5	5	5
	802.11n(HT20)	5	5	5	5	5	5
	802.11n(HT40)	5	5	5	5	5	5
	802.11ac(VHT20)	5	5	5	5	5	5
	802.11ac(VHT40)	5	5	5	5	5	5
	802.11ac(VHT80)	5	5	5	5	5	5

3.7 Table for Carrier Frequencies

5 180 ~ 5 240 MHz

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	**5 180**	40	5 200
44	**5 220**	**48**	**5 240**
38	**5 190**	**46**	**5 230**
42	**5 210**		

5 745 ~ 5 825 MHz

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	**5 745**	153	5 765
157	**5 785**	161	5 805
165	**5 825**		
151	**5 755**	**159**	**5 795**
155	**5 775**		

* For 20 ㎒ bandwidth, use ch 1 - 11, for 40 ㎒ bandwidth use ch 3 - 9

3.8 Duty Cycle Of Test signal

Duty cycle is < 98%, duty factor shall be considered. Duty cycle = Tx on/(Tx on+ Tx off),Duty factor = 10*log(1/duty cycle)

Band	Mode	Duty cycle	Note
5 GHz band	802.11a	> 98 %	
	802.11n(HT20)	> 98 %	
	802.11n(HT40)	> 98 %	
	802.11ac(VHT20)	> 98 %	
	802.11ac(VHT40)	> 98 %	
	802.11ac(VHT80)	> 98 %	

3.9 Used Test Equipment List

No.	Instrument	Model	S/N	Manufacturer	Due to cal date	Cal interval	used
1	T & H Chamber	EY-101	90E14260	TABAI ESPEC	2018.09.06	1 year	☐
2	T & H Chamber	RCT-V-THC-403-1(H)	20030210	R.C.T	2018.09.06	1 year	☒
3	Spectrum Analyzer	8593E	3710A02859	Agilent Technology	2018.02.02	1 year	☐
4	Spectrum Analyzer	FSV30	20-353063	Rohde& Schwarz	2018.02.01	1 year	☒
5	Signal Analyzer	N9010A	MY56070441	Agilent Technologies	2018.05.15	1 year	☐
6	EMI Test Receiver	ESCI7	100823	Rohde& Schwarz	2018.01.31	1 year	☐
7	EMI Test Receiver	ESI	837514/004	Rohde& Schwarz	2018.09.05	1 year	☐
8	Vector Signal Analyzer	89441A	3416A02620	Agilent Technology	2018.02.03	1 year	☐
9	Network Analyzer	8753ES	US39172348	AGILENT	2018.09.04	1 year	☐
10	EPM Series Power meter	E4418B	GB39512547	Agilent Technology	2018.02.01	1 year	☐
11	RF Power Sensor	E9300A	MY41496631	Agilent Technology	2018.02.01	1 year	☐
12	Microwave Frequency Counter	5352B	2908A00480	Agilent Technology	2018.02.01	1 year	☐
13	Audio Analyzer	8903B	3514A16919	Agilent Technology	2018.01.31	1 year	☐
14	Audio Telephone Analyzer	DD-5601CID	520010281	CREDIX	2018.02.02	1 year	☐
15	Digital storage Oscilloscope	TDS3052	B015962	Tektronix	2018.09.04	1 year	☐
16	ESG-D Series Signal Generator	E4436B	US39260458	Agilent Technology	2018.02.02	1 year	☐
17	Vector Signal Generator	SMBV100A	257557	Rohde & Schwarz	2018.02.02	1 year	☒
18	Signal Generator	SMB100A	179628	Rohde & Schwarz	2018.05.18	1 year	☒
19	Tracking Source	85645A	070521-A1	Agilent Technology	2018.02.03	1 year	☐
20	SLIDAC	None	0207-4	Myoung sung Ele.	2018.01.31	1 year	☐
21	DC Power supply	DRP-5030	9028029	Digital Electronic Co.,Ltd	2018.02.01	1 year	☐
22	DC Power supply	6038A	3440A12674	Agilent Technology	2018.01.31	1 year	☐
23	DC Power supply	E3610A	KR24104505	Agilent Technology	2018.01.31	1 year	☒
24	DC Power supply	UP-3005T	68	Unicon Co.,Ltd	2018.01.31	1 year	☐
25	DC Power Supply	SM 3004-D	114701000117	DELTA ELEKTRONIKA	2018.01.31	1 year	☐
26	Attenuator	24-30-34	BX5630	Aeroflex / Weinschel	2018.12.15	1 year	☐
27	Attenuator	8498A	3318A09485	HP	2018.02.01	1 year	☐
28	Step Attenuator	8494B	3308A32809	HP	2018.02.02	1 year	☐
29	Attenuator	18B50W-20F	64671	INMET	2018.02.02	1 year	☐
30	Attenuator	10 dB	1	Rohde & Schwarz	2018.05.18	1 year	☒
31	Attenuator	10 dB	2	Rohde & Schwarz	2018.05.18	1 year	☐
32	Attenuator	10 dB	3	Rohde & Schwarz	2018.05.18	1 year	☐
33	Attenuator	10 dB	4	Rohde & Schwarz	2018.05.18	1 year	☐
34	Attenuator	54A-10	74564	WEINSCHEL	2018.05.18	1 year	☐
35	Attenuator	56-10	66920	WEINSCHEL	2018.05.18	1 year	☐
36	Power divider	11636B	51212	HP	2018.02.01	1 year	☐
37	3Way Power divider	KPDSU3W	00070365	KMW	2018.09.04	1 year	☐
38	4Way Power divider	70052651	173834	KRYTAR	2018.02.01	1 year	☐
39	3Way Power divider	1580	SQ361	WEINSCHEL	2018.05.18	1 year	☐
40	OSP	OSP120	101577	Rohde & Schwarz	2018.05.19	1 year	☐
41	White noise audio filter	ST31EQ	101902	SoundTech	2018.09.04	1 year	☐
42	Dual directional coupler	778D	17693	HEWLETT PACKARD	2018.02.02	1 year	☐
43	Dual directional coupler	772D	2839A00924	HEWLETT PACKARD	2018.02.02	1 year	☐
44	Band rejection filter	3TNF-0006	26	DOVER Tech	2018.02.03	1 year	☐
45	Band rejection filter	3TNF-0007	311	DOVER Tech	2018.02.03	1 year	☐
46	Band rejection filter	WTR-BRF2442-84NN	09020001	WAVE TECH Co.,LTD	2018.02.02	1 year	☐
47	Band rejection filter	WRCJV12-5695-5725-5825-5855-50SS	1	Wainwright Instruments GmbH	2018.05.18	1 year	☒
48	Band rejection filter	WRCJV12-5120-5150-5350-5380-40SS	4	Wainwright Instruments GmbH	2018.05.18	1 year	☒
49	Band rejection filter	WRCGV10-2360-2400-2500-2540-50SS	2	Wainwright Instruments GmbH	2018.05.18	1 year	☐

No.	Instrument	Model	S/N	Manufacturer	Due to cal date	Cal interval	used
50	Highpass Filter	WHJS1100-10EF	1	WAINWRIGHT	2018.02.02	1 year	☐
51	Highpass Filter	WHJS3000-10EF	1	WAINWRIGHT	2018.02.02	1 year	☐
52	Highpass Filter	WHNX6-5530-3000-26500-40CC	2	Wainwright Instruments GmbH	2018.05.19	1 year	☒
53	Highpass Filter	WHNX6-2370-7000-26500-40CC	4	Wainwright Instruments GmbH	2018.05.19	1 year	☐
54	WideBand Radio Communication Tester	CMW500	102276	Rohde & Schwarz	2018.02.03	1 year	☐
55	Radio Communication Tester	CMU 200	112026	Rohde & Schwarz	2018.02.03	1 year	☐
56	Bluetooth Tester	TC-3000B	3000B6A0166	TESCOM CO., LTD.	2018.02.03	1 year	☐
57	Loop Antenna	6502	9203-0493	EMCO	2019.05.29	2 year	☒
58	BiconiLog Antenna	3142B	9910-1432	EMCO	2018.04.25	2 year	☒
59	Trilog-Broadband Antenna	VULB 9168	9168-606	SCHWARZBECK	2018.09.09	2 year	☐
60	Horn Antenna	3115	2996	EMCO	2018.02.11	2 year	☒
61	Horn Antenna	BBHA9170	BBHA9170152	SCHWARZBECK	2019.04.25	2 year	☒
62	Antenna Master(3)	AT13	None	AUDIX	N/A	N/A	☐
63	Turn Table(3)	None	None	AUDIX	N/A	N/A	☐
64	PREAMPLIFIER(3)	8449B	3008A02577	Agilent	2018.02.01	1 year	☐
65	Antenna Master(10)	MA4000-EP	None	inno systems GmbH	N/A	N/A	☒
66	Turn Table(10)	None	None	inno systems GmbH	N/A	N/A	☒
67	AMPLIFIER(10)	TK-PA6S	120009	TESTEK	2018.01.31	1 year	☒
68	AMPLIFIER	8447D	2944A07881	H.P	2018.01.31	1 year	☐
69	Antenna Mast	MA2000-EP	None	inno systems GmbH	N/A	N/A	☐
70	Turn Device	DE3700-RH	None	inno systems GmbH	N/A	N/A	☐

4. SUMMARY TEST RESULTS

Description of Test	FCC Rule	Reference Clause	Used	Test Result
Transmit Power	15.407(a)(1)	Clause 5.1	☒	Compliance
Peak power spectral density	15.407(a)(1)	Clause 5.2	☒	Compliance
Emission Bandwidth	15.407(a)(1)	Clause 5.3	☒	Compliance
Frequency Stability	15.407(g)	Clause 5.4	☒	Compliance
Spurious RF radiated emissions	15.407(b)(1) / 15.209	Clause 5.5	☒	Compliance
Antenna requirement	15.203	Clause 5.6	☒	Compliance
AC Power Conducted emissions	15.407(b)(6) /15.207	Clause 5.7	☒	Compliance
Compliance/pass : The EUT complies with the essential requirements in the standard. Not Compliance : The EUT does not comply with the essential requirements in the standard. N/A : The test was not applicable in the standard.				

Procedure Reference

FCC CFR 47, Part 15. Subpart E-15.407

ANSI C 63.10-2013

5. MEASUREMENT RESULTS

5.1 Transmit Power

5.1.1 Standard Applicable [FCC §15.407(a)(1)(3)]

For the 5.15-5.25 GHz band, 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 and For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

5.1.2 Test Environment conditions

• Ambient temperature : (24 ~ 25) ℃ • Relative Humidity : (49 ~ 55) % R.H.

5.1.3 Measurement Procedure

The transmitter output was connected to the power meter with an attenuator. The Transmit power was measured and recorded with the RF average power meter. EUT was programmed to be in continuously transmitting mode. Duty factor is not added to measured value.

All conducted power tests were performed using the power meter in accordance with FCC KDB 789033 D02 Section E.3.a Measurement Procedure Method PM.

The EUT has two RF ports, Power from both ports was measured and combined using the measure-and-sum method stated in FCC KDB 662911 D01
The Customer declared that the transmit signals from both ports are correlated.

•WLAN5GHz Band1
The Customer stated that the 2 antennas used have unequal antenna gains: G1 =1.97 dBi and G2 = 1.65 dBi. The directional gain was calculated in accordance with FCC KDB 662911 D01 Directional Gain Calculations:

$$10 \log[(10^{G1/20} + 10^{G2/20})^2/2]$$

The total array gain was calculated as:

$$10 \log[(10^{2.36/20} + 10^{2.34/20})^2/2] = 5.36 \text{ dBi}$$

In accordance with 15.247(b)(4), 5.36 dBi is complied with the directional gain of 6 dBi

•WLAN5GHz Band4
The Customer stated that the 2 antennas used have unequal antenna gains: G1 =1.97 dBi and G2 = 1.65 dBi. The directional gain was calculated in accordance with FCC KDB 662911 D01 Directional Gain Calculations:

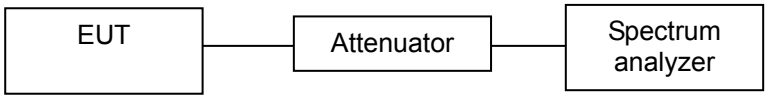
$$10 \log[(10^{G1/20} + 10^{G2/20})^2/2]$$

The total array gain was calculated as:

$$10 \log[(10^{1.08/20} + 10^{-0.87/20})^2/2] = 3.17 \text{ dBi}$$

In accordance with 15.247(b)(4), 3.17 dBi is complied with the directional gain of 6 dBi

5.1.4 Test setup



5.1.5 Measurement Result

5 180 ~ 5 240 MHz

Port1 802.11a

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
36	5 180	11.36	13.68	30	Compliance
44	5 220	12.80	19.05	30	Compliance
48	5 240	12.25	16.79	30	Compliance

Port2 802.11a

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
36	5 180	8.57	7.19	30	Compliance
44	5 220	8.94	7.83	30	Compliance
48	5 240	9.74	9.42	30	Compliance

Port 1 802.11n(HT20)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
36	5 180	11.90	15.49	30	Compliance
44	5 220	10.63	11.56	30	Compliance
48	5 240	11.84	15.28	30	Compliance

Port 2 802.11n(HT20)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
36	5 180	9.37	8.65	30	Compliance
44	5 220	8.35	6.84	30	Compliance
48	5 240	7.70	5.89	30	Compliance

Port 1+Port 2 802.11n(HT20) (combined using the measure-and-sum method)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
36	5 180	13.83	24.14	30	Compliance
44	5 220	12.65	18.40	30	Compliance
48	5 240	13.26	21.16	30	Compliance

Port 1 802.11n(HT40)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
38	5 190	11.30	13.49	30	Compliance
46	5 230	12.05	16.03	30	Compliance

Port 2 802.11n(HT40)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
38	5 190	9.94	9.86	30	Compliance
46	5 230	8.90	7.76	30	Compliance

Port 1 + Port 2 802.11n(HT40) (combined using the measure-and-sum method)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
38	5 190	13.68	23.35	30	Compliance
46	5 230	13.76	23.79	30	Compliance

Port 1 802.11ac(VHT20)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
36	5 180	11.81	15.17	30	Compliance
44	5 220	11.57	14.35	30	Compliance
48	5 240	11.35	13.65	30	Compliance

Port 2 802.11ac(VHT20)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
36	5 180	8.97	7.89	30	Compliance
44	5 220	7.84	6.08	30	Compliance
48	5 240	8.40	6.92	30	Compliance

Port 1 + Port 2 802.11ac(VHT20) (combined using the measure-and-sum method)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
36	5 180	13.63	23.06	30	Compliance
44	5 220	13.10	20.44	30	Compliance
48	5 240	13.13	20.56	30	Compliance

Port 1 802.11ac(VHT40)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
38	5 190	12.17	16.48	30	Compliance
46	5 230	10.91	12.33	30	Compliance

Port 2 802.11ac(VHT40)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
38	5 190	9.08	8.09	30	Compliance
46	5 230	8.33	6.81	30	Compliance

Port 1 + Port 2 802.11ac(VHT40) (combined using the measure-and-sum method)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
38	5 190	13.90	24.57	30	Compliance
46	5 230	12.82	19.14	30	Compliance

Port 1 802.11ac(VHT80)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
42	5 210	12.48	17.70	30	Compliance

Port 2 802.11ac(HT80)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
42	5 210	9.07	8.07	30	Compliance

Port 1 + Port 2 802.11ac(VHT80) (combined using the measure-and-sum method)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
42	5 210	14.11	25.77	30	Compliance

5 745 ~ 5 825 MHz

Port1 802.11a

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
149	5 745	2.92	1.96	30	Compliance
157	5 785	4.75	2.99	30	Compliance
165	5 825	5.73	3.74	30	Compliance

Port2 802.11a

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
149	5 745	5.18	3.30	30	Compliance
157	5 785	5.89	3.88	30	Compliance
165	5 825	6.73	4.71	30	Compliance

Port 1 802.11n(HT20)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
149	5 745	2.94	1.97	30	Compliance
157	5 785	4.49	2.81	30	Compliance
165	5 825	5.62	3.65	30	Compliance

Port 2 802.11n(HT20)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
149	5 745	5.27	3.37	30	Compliance
157	5 785	5.83	3.83	30	Compliance
165	5 825	6.53	4.50	30	Compliance

Port 1+Port 2 802.11n(HT20) (combined using the measure-and-sum method)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
149	5 745	7.27	5.33	30	Compliance
157	5 785	8.22	6.64	30	Compliance
165	5 825	9.11	8.15	30	Compliance

Port 1 802.11n(HT40)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
151	5 755	3.06	2.02	30	Compliance
159	5 795	4.68	2.94	30	Compliance

Port 2 802.11n(HT40)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
151	5 755	5.69	3.71	30	Compliance
159	5 795	6.47	4.44	30	Compliance

Port 1 + Port 2 802.11n(HT40) (combined using the measure-and-sum method)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
151	5 755	7.58	5.73	30	Compliance
159	5 795	8.68	7.38	30	Compliance

Port 1 802.11ac(VHT20)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
149	5 745	2.94	1.97	30	Compliance
157	5 785	4.49	2.81	30	Compliance
165	5 825	5.33	3.41	30	Compliance

Port 2 802.11ac(VHT20)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
149	5 745	4.47	2.80	30	Compliance
157	5 785	6.27	4.24	30	Compliance
165	5 825	7.39	5.48	30	Compliance

Port 1 + Port 2 802.11ac(VHT20) (combined using the measure-and-sum method)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
149	5 745	6.78	4.77	30	Compliance
157	5 785	8.48	7.05	30	Compliance
165	5 825	9.49	8.89	30	Compliance

Port 1 802.11ac(VHT40)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
151	5 755	3.27	2.12	30	Compliance
159	5 795	4.58	2.87	30	Compliance

Port 2 802.11ac(VHT40)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
151	5 755	5.14	3.27	30	Compliance
159	5 795	6.22	4.19	30	Compliance

Port 1 + Port 2 802.11ac(VHT40) (combined using the measure-and-sum method)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
151	5 755	7.32	5.39	30	Compliance
159	5 795	8.49	7.06	30	Compliance

Port 1 802.11ac(VHT80)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
155	5 775	3.78	2.39	30	Compliance

Port 2 802.11ac(HT80)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
155	5 775	5.53	3.57	30	Compliance

Port 1 + Port 2 802.11ac(VHT80) (combined using the measure-and-sum method)

Channel	Frequency [㎒]	Conducted Power		Limit [dBm]	Test Results
		[dBm]	[㎽]		
155	5 775	7.75	5.96	30	Compliance

5.2 Power spectral density

5.2.1 Standard Applicable [15.407(a)(1)(3)]

For the 5.15-5.25 GHz band, the maximum power spectral density shell not exceed 17 dBm in any 1 MHz band and For the 5.725-5.85 GHz band, the maximum power spectral density shell not exceed 30 dBm in any 500 kHz band

5.2.2 Test Environment conditions

• Ambient temperature : (24 ~ 25) ℃ • Relative Humidity : (49 ~ 55) % R.H.

5.2.3 Measurement Procedure

The power spectral density conducted from the intentional radiator was measured with a spectrum analyzer connected to the antenna terminal, while EUT had the highest, middle and the lowest available channels. After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak power spectral density.

All conducted power tests were performed using a test receiver in accordance with FCC KDB 789033 D02 Section E.2 b Measurement Procedure Method SA-1.

The EUT has two RF ports, Power from both ports was measured and combined using the measure-and-sum method stated in FCC KDB 662911 D01

The Customer declared that the transmit signals from both ports are correlated.

•WLAN5GHz Band1

The Customer stated that the 2 antennas used have unequal antenna gains: G1 =1.97 dBi and G2 = 1.65 dBi. The directional gain was calculated in accordance with FCC KDB 662911 D01 Directional Gain Calculations:

$$10 \log[(10^{G1/20} + 10^{G2/20})^2/2]$$

The total array gain was calculated as:

$$10 \log[(10^{2.36/20} + 10^{2.34/20})^2/2] = 5.36 \text{ dB i}$$

In accordance with 15.247(b)(4), 5.36 dBi is complied with the directional gain of 6 dBi

•WLAN5GHz Band4

The Customer stated that the 2 antennas used have unequal antenna gains: G1 =1.97 dBi and G2 = 1.65 dBi. The directional gain was calculated in accordance with FCC KDB 662911 D01 Directional Gain Calculations:

$$10 \log[(10^{G1/20} + 10^{G2/20})^2/2]$$

The total array gain was calculated as:

$$10 \log[(10^{1.08/20} + 10^{-0.87/20})^2/2] = 3.17 \text{ dB i}$$

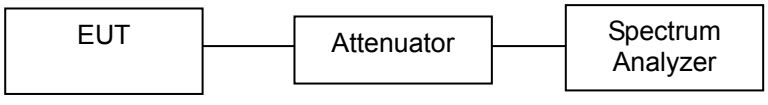
In accordance with 15.247(b)(4), 3.17 dBi is complied with the directional gain of 6 dBi

The spectrum analyzer is set to the as follows :

- Span : set span to encompass the entire EBW of the signal
- RBW : 1 MHz
- VBW : ≥3 MHz
- number of point in sweep: ≥2 Span/RBW
- Sweep time : auto
- Detector function : RMS
- Trace : Free run

Trace average at least 100 traces in power averaging mode. And record the max value

5.2.4 Test setup



5.2.5 Measurement Result

5 180 ~ 5 240 MHz

*Below result value is converted to power in 1 MHz Vs 510 kHz RBW for clause 5.2.6 test plot
*Result Value(dBm/MHz)= Reading Value(dBm/510kHz)+BWCF(dB)
*BWCF=10log(1MHz/RBW)=10log(1000/510)=2.92(dB)

802.11a

Ch	Freq [㎒]	BWCF (dB)	Result Value				Limit [dBm/MHz]	Test Results
			Port 1		Port 2			
			Reading [dBm/510kHz]	Result [dBm/MHz]	Reading [dBm/510kHz]	Result [dBm/MHz]		
36	5 180	2.92	1.26	4.18	-1.43	1.49	17	Compliance
44	5 220	2.92	1.12	4.04	-1.64	1.28	17	Compliance
48	5 240	2.92	0.49	3.41	-1.97	0.95	17	Compliance

802.11n(HT20)

Ch	Freq [㎒]	BWCF (dB)	Result Value					Limit [dBm/MHz]	Test Results
			Port 1		Port 2		Total		
			Reading [dBm/510kHz]	Result [dBm/MHz]	Reading [dBm/510kHz]	Result [dBm/MHz]			
36	5 180	2.92	0.86	3.78	-2.08	0.84	5.56	17	Compliance
44	5 220	2.92	0.82	3.74	-2.42	0.50	5.43	17	Compliance
48	5 240	2.92	0.92	3.84	-2.56	0.36	5.45	17	Compliance

802.11n(HT40)

Ch	Freq [㎒]	BWCF (dB)	Result Value					Limit [dBm/MHz]	Test Results
			Port 1		Port 2		Total		
			Reading [dBm/510kHz]	Result [dBm/MHz]	Reading [dBm/510kHz]	Result [dBm/MHz]			
38	5 190	2.92	-1.78	1.14	-5.45	-2.53	2.69	17	Compliance
46	5 230	2.92	-2.65	0.27	-5.66	-2.74	2.03	17	Compliance

802.11ac(VHT20)

Ch	Freq [㎒]	BWCF (dB)	Result Value					Limit [dBm/MHz]	Test Results
			Port 1		Port 2		Total		
			Reading [dBm/510kHz]	Result [dBm/MHz]	Reading [dBm/510kHz]	Result [dBm/MHz]			
36	5 180	2.92	1.09	4.01	-2.18	0.74	5.69	17	Compliance
44	5 220	2.92	0.94	3.86	-2.16	0.76	5.59	17	Compliance
48	5 240	2.92	-0.11	2.81	-2.66	0.26	4.73	17	Compliance

802.11ac(VHT40)

Ch	Freq [㎒]	BWCF (dB)	Result Value					Limit [dBm/MHz]	Test Results
			Port 1		Port 2		Total		
			Reading [dBm/510kHz]	Result [dBm/MHz]	Reading [dBm/510kHz]	Result [dBm/MHz]			
38	5 190	2.92	-1.73	1.19	-5.33	-2.41	2.76	17	Compliance
46	5 230	2.92	-2.03	0.89	-5.50	-2.58	2.50	17	Compliance

802.11ac(VHT80)

Ch	Freq [㎒]	BWCF (dB)	Result Value					Limit [dBm/MHz]	Test Results
			Port 1		Port 2		Total		
			Reading [dBm/510kHz]	Result [dBm/MHz]	Reading [dBm/510kHz]	Result [dBm/MHz]			
42	5 210	2.92	-5.99	-3.07	-8.29	-5.37	-1.06	17	Compliance

5 745 ~ 5 825 MHz

802.11a

Channel	Frequency [㎒]	Result Value[㏈m/500kHz]		Limit [㏈m/500kHz]	Test Results
		Port 1	Port 2		
149	5 745	-3.05	-5.25	30	Compliance
157	5 785	-1.93	-4.50	30	Compliance
165	5 825	-1.09	-2.86	30	Compliance

802.11n(HT20)

Channel	Frequency [㎒]	Result Value[㏈m/500kHz]			Limit [㏈m/500kHz]	Test Results
		Port 1	Port 2	Total		
149	5 745	-4.22	-5.84	-1.94	30	Compliance
157	5 785	-2.21	-4.42	-0.17	30	Compliance
165	5 825	-0.92	-4.11	0.78	30	Compliance

802.11n(HT40)

Channel	Frequency [㎒]	Result Value[㏈m/500kHz]			Limit [㏈m/500kHz]	Test Results
		Port 1	Port 2	Total		
151	5 755	-6.33	-8.11	-4.12	30	Compliance
159	5 795	-5.52	-7.83	-3.51	30	Compliance

802.11ac(VHT20)

Channel	Frequency [㎒]	Result Value[㏈m/500kHz]			Limit [㏈m/500kHz]	Test Results
		Port 1	Port 2	Total		
149	5 745	-3.23	-5.51	-1.21	30	Compliance
157	5 785	-1.95	-3.65	0.29	30	Compliance
165	5 825	-1.78	-3.50	0.45	30	Compliance

802.11ac(VHT40)

Channel	Frequency [㎒]	Result Value[㏈m/500kHz]			Limit [㏈m/500kHz]	Test Results
		Port 1	Port 2	Total		
151	5 755	-6.59	-8.25	-4.33	30	Compliance
159	5 795	-4.56	-7.52	-2.78	30	Compliance

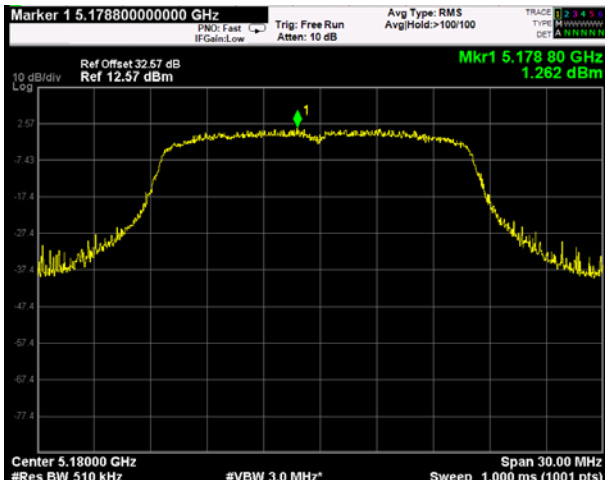
802.11ac(VHT80)

Channel	Frequency [㎒]	Result Value[㏈m/500kHz]			Limit [㏈m/500kHz]	Test Results
		Port 1	Port 2	Total		
155	5 775	-8.32	-10.23	-6.16	30	Compliance

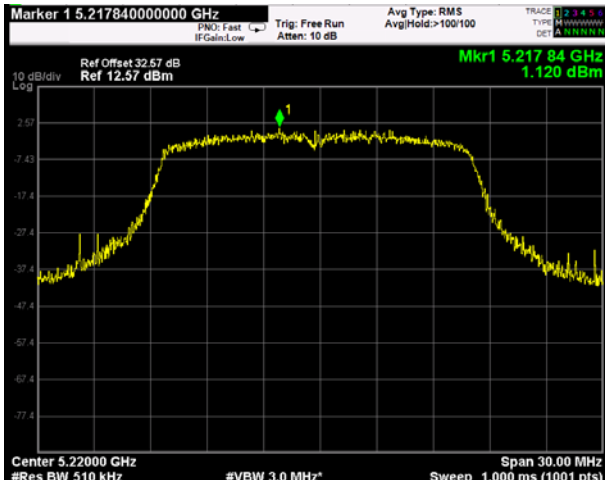
5.2.6 Test Plot

5 180 ~ 5 240 MHz

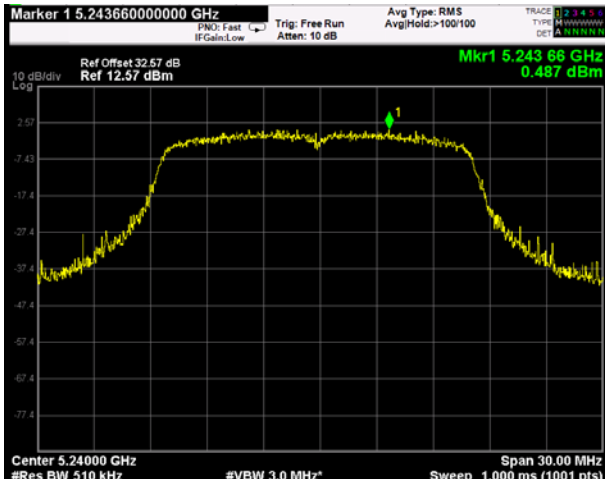
Port1 / 802.11a / CH Low



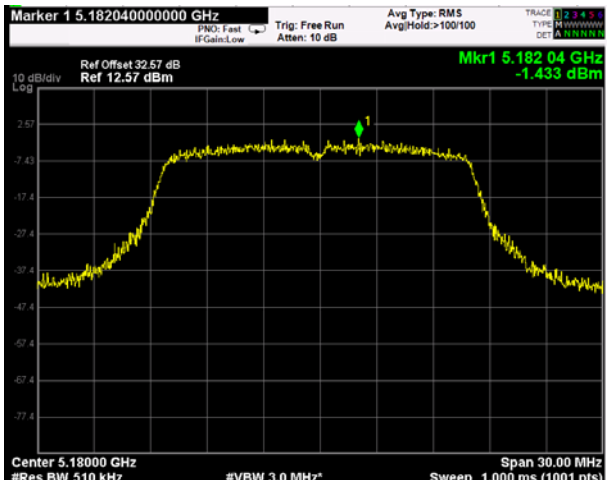
Port1 / 802.11a / CH Middle



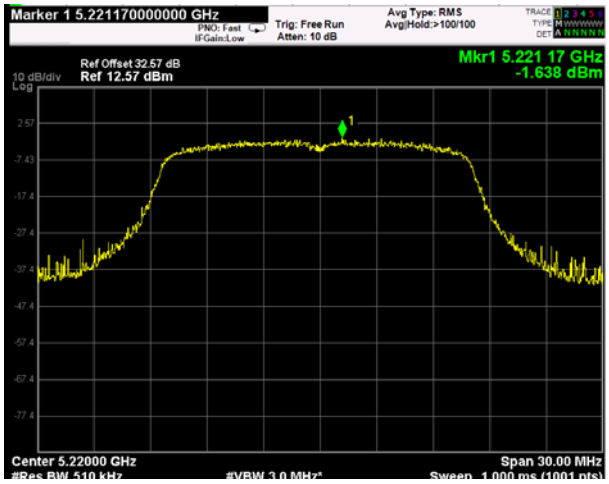
Port1 / 802.11a / CH High



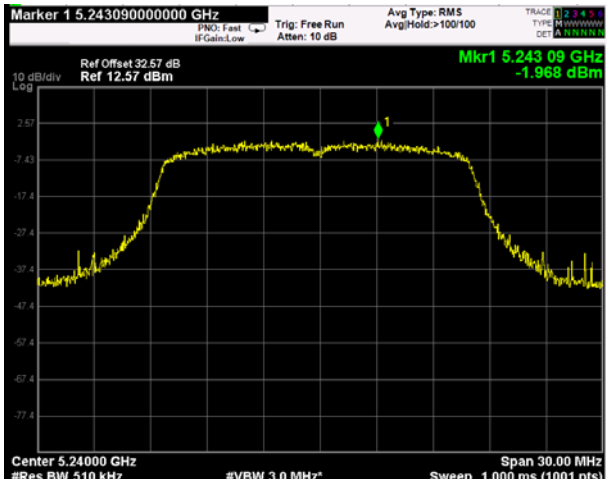
Port2 / 802.11a / CH Low



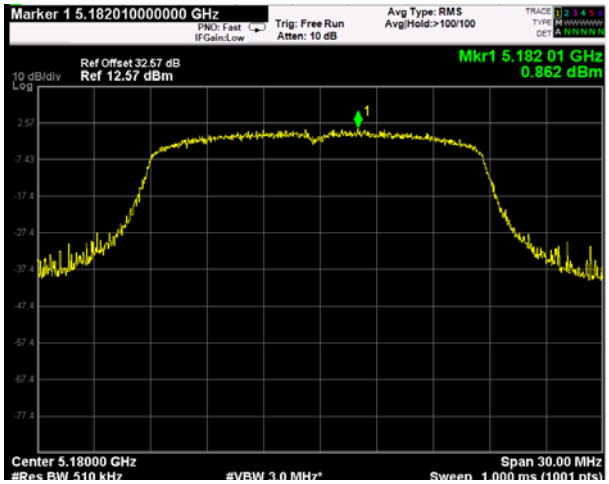
Port2 / 802.11a / CH Middle



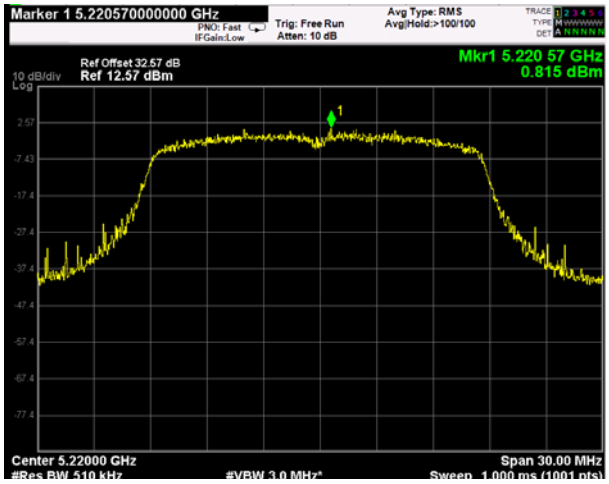
Port2 / 802.11a / CH High



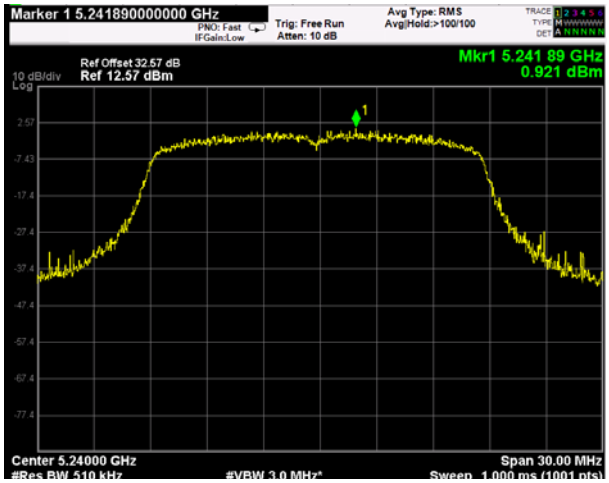
Port1 / 802.11n(HT120) / CH Low



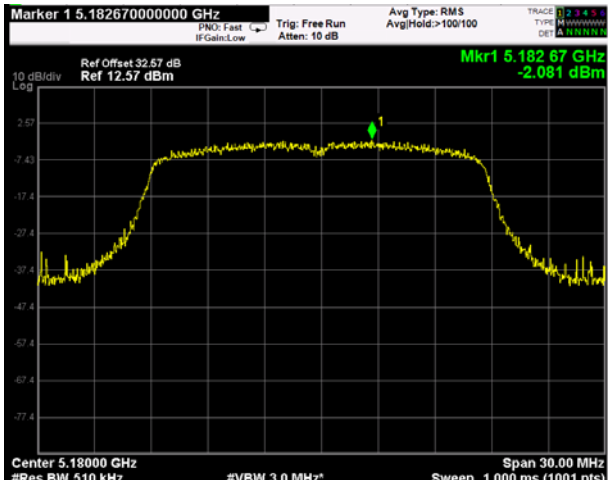
Port1 / 802.11n(HT120) / CH Middle



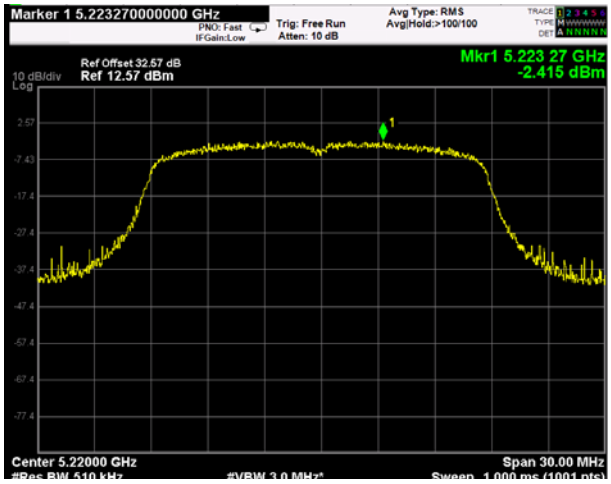
Port1 / 802.11n(HT120) / CH High



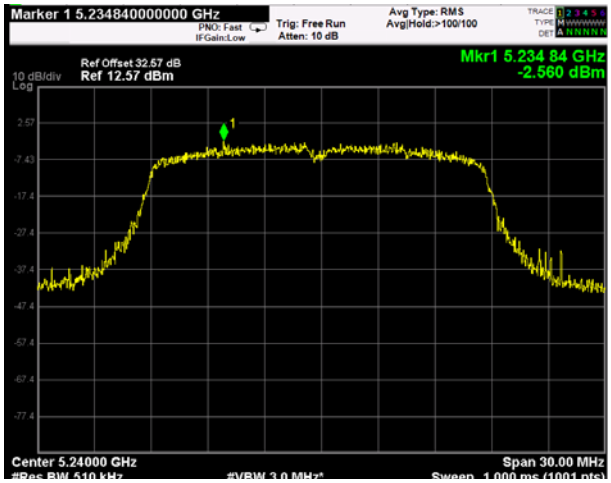
Port2 / 802.11n(HT120) / CH Low



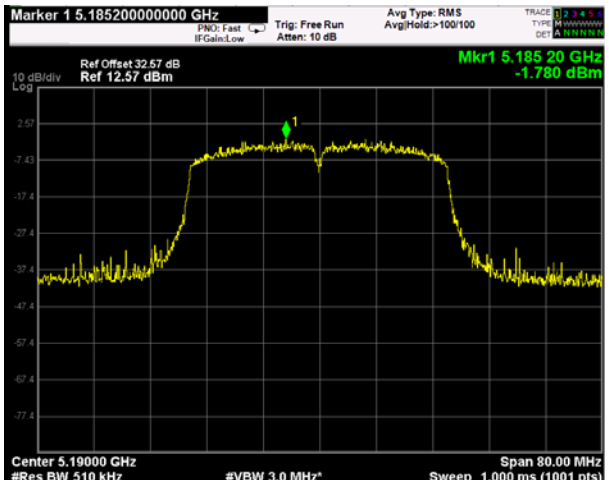
Port2 / 802.11n(HT120) / CH Middle



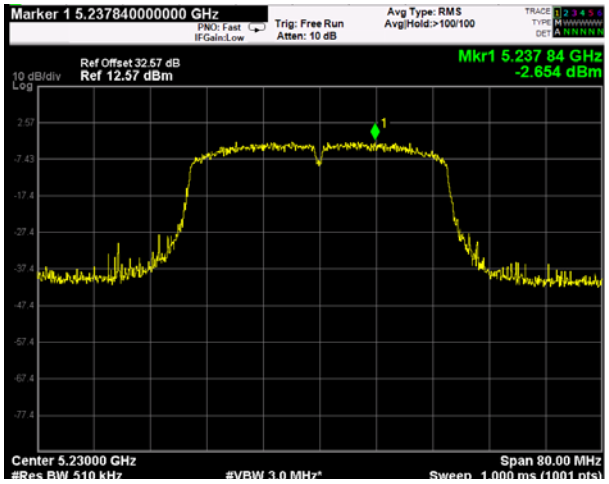
Port2 / 802.11n(HT20) / CH High



Port1 / 802.11n(HT40) / CH Low



Port1 / 802.11n(HT40) / CH High



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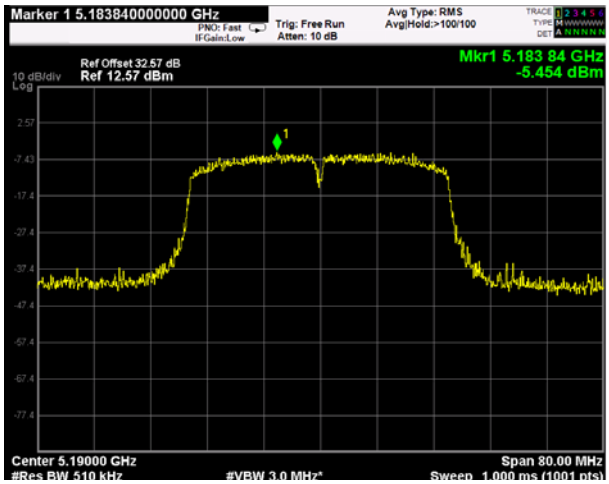
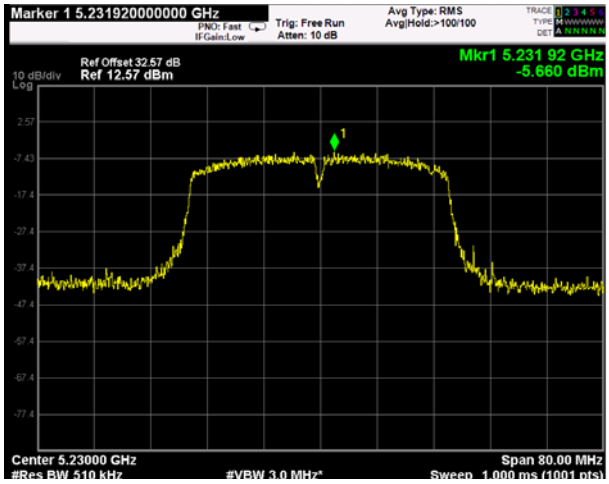
Port2 / 802.11n(HT40) / CH Low



Port2 / 802.11n(HT40) / CH High



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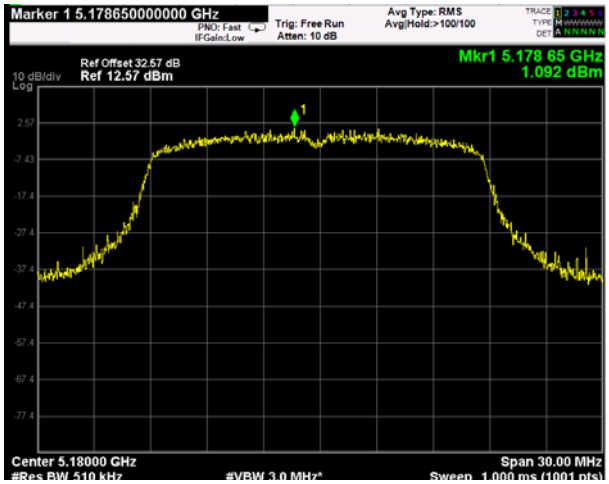
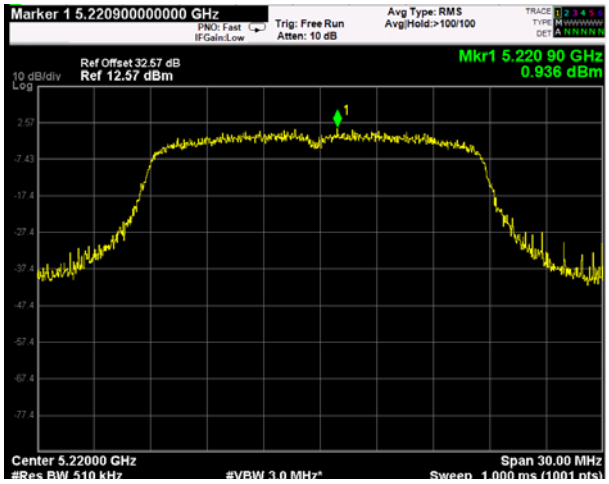
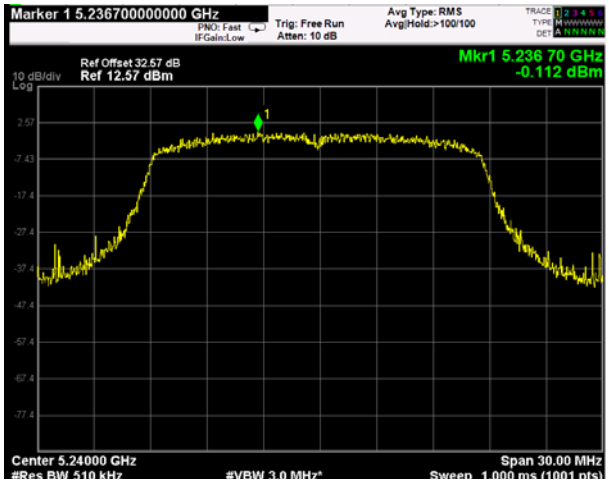
Port1 / 802.11ac(VHT20) / CH Low



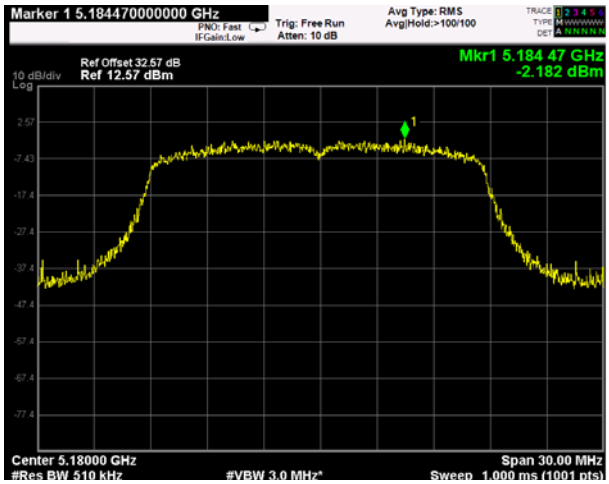
Port1 / 802.11ac(VHT20) / CH Middle



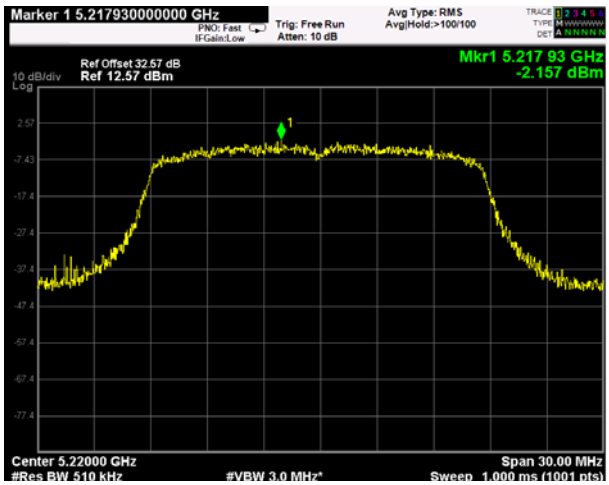
Port1 / 802.11ac(VHT20) / CH High



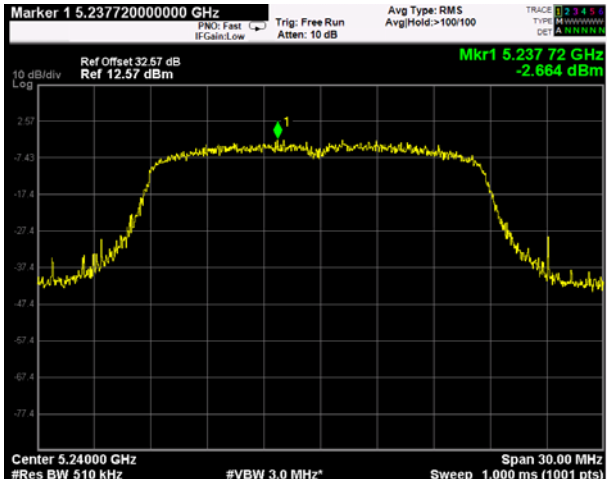
Port2 / 802.11ac(VHT20) / CH Low



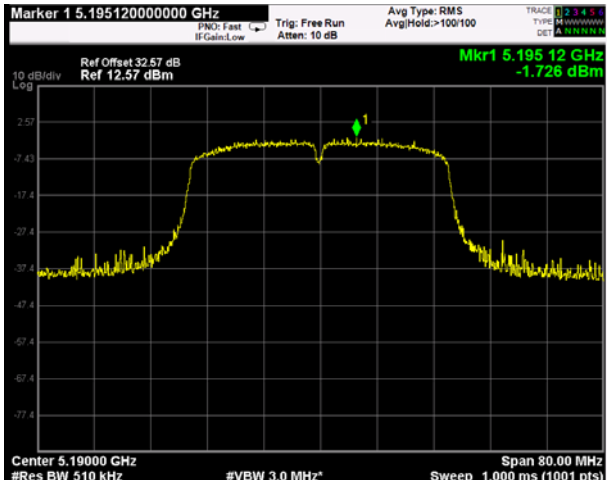
Port2 / 802.11ac(VHT20) / CH Middle



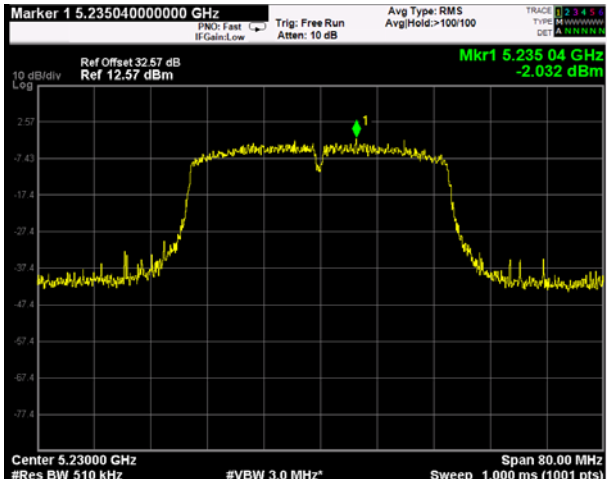
Port2 / 802.11ac(VHT20) / CH High



Port1 / 802.11ac(VHT40) / CH Low



Port1 / 802.11ac(VHT40) / CH High



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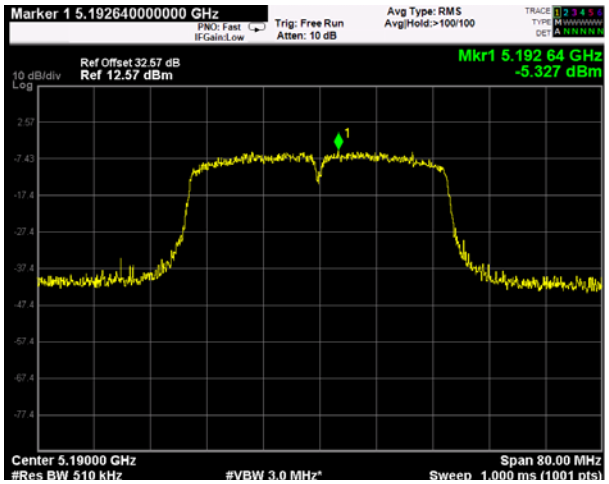
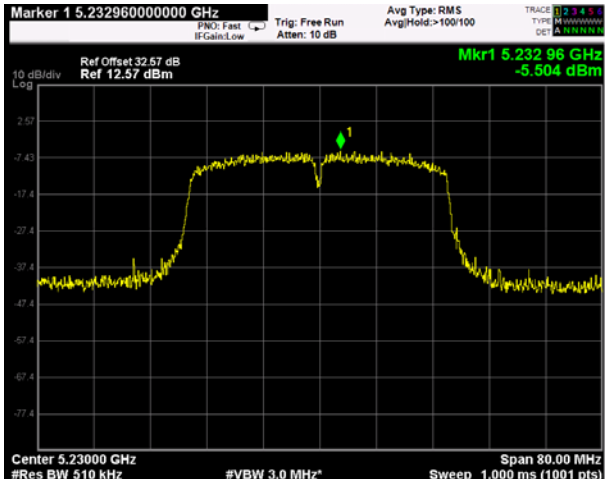
Port2 / 802.11ac(VHT40) / CH Low



Port2 / 802.11ac(VHT40) / CH High



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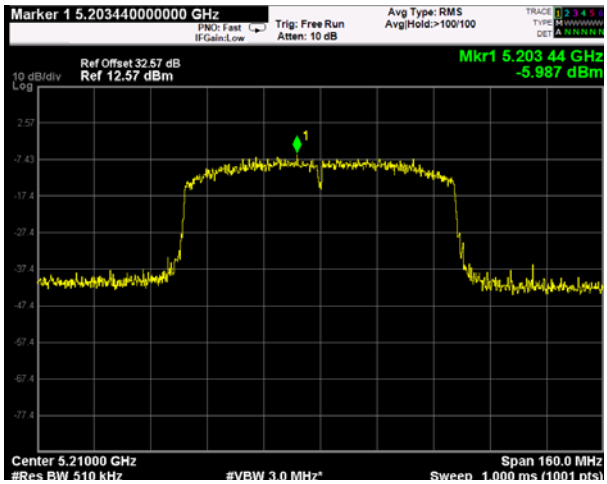
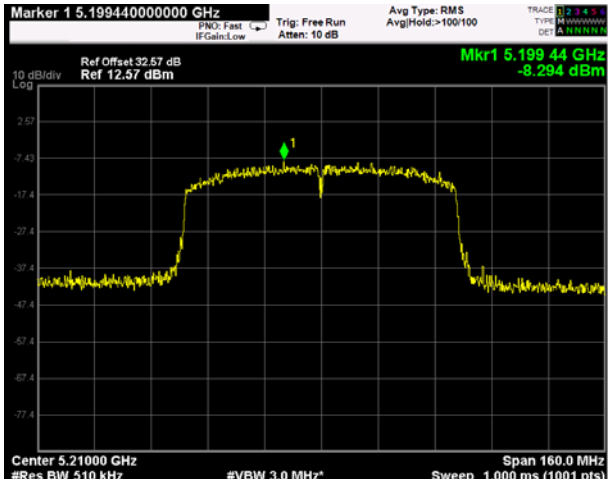
Port1 / 802.11ac(VHT80) / CH Middle



Port2 / 802.11ac(VHT80) / CH Middle



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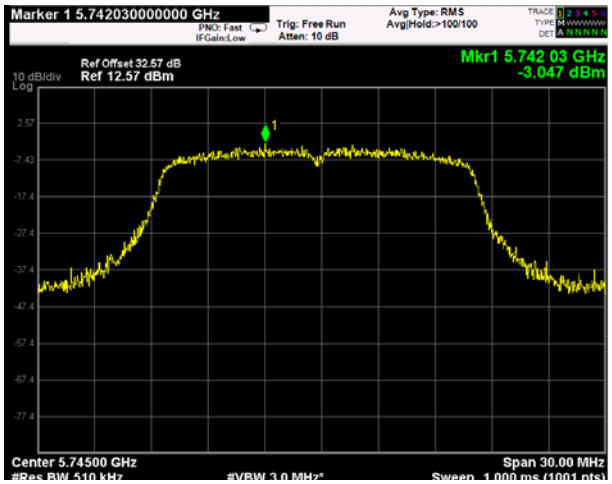
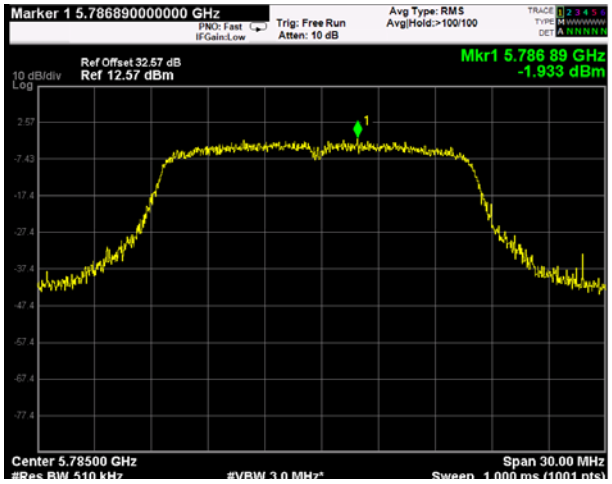
5 745 ~ 5 825 MHz

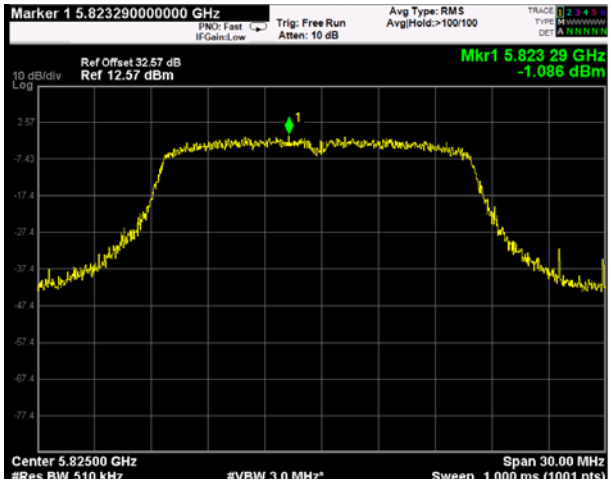
Port1 / 802.11a / CH Low



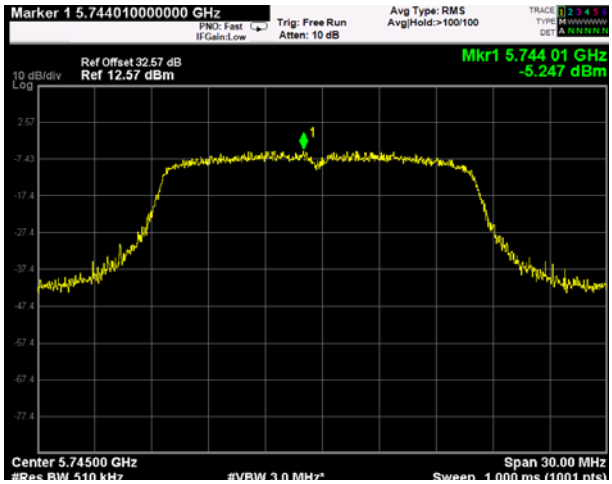
Port1 / 802.11a / CH Middle



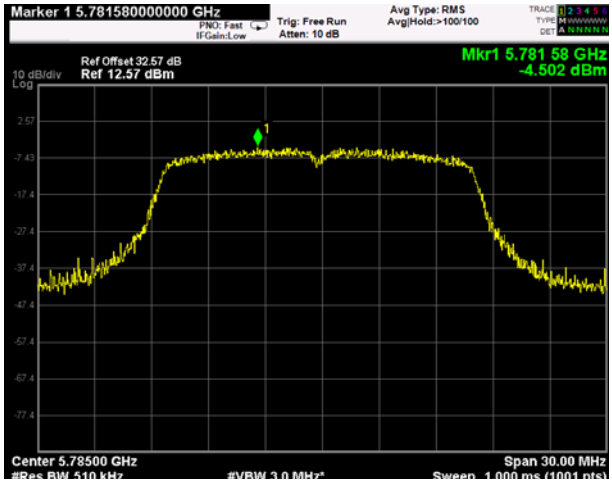
Port1 / 802.11a / CH High



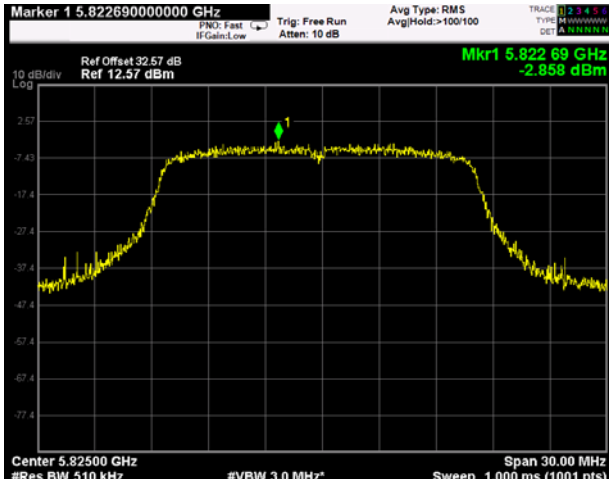
Port2 / 802.11a / CH Low



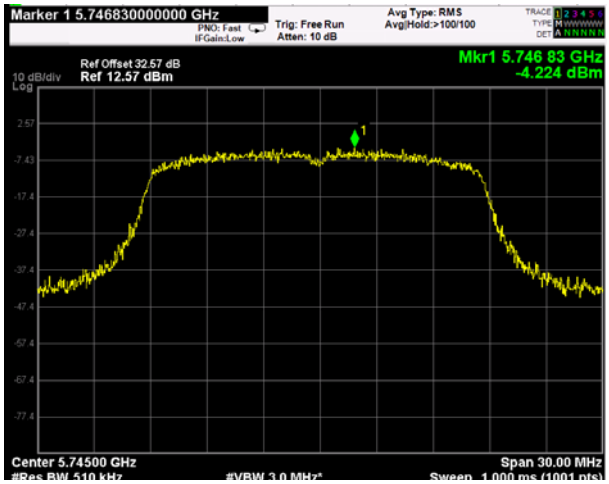
Port2 / 802.11a / CH Middle



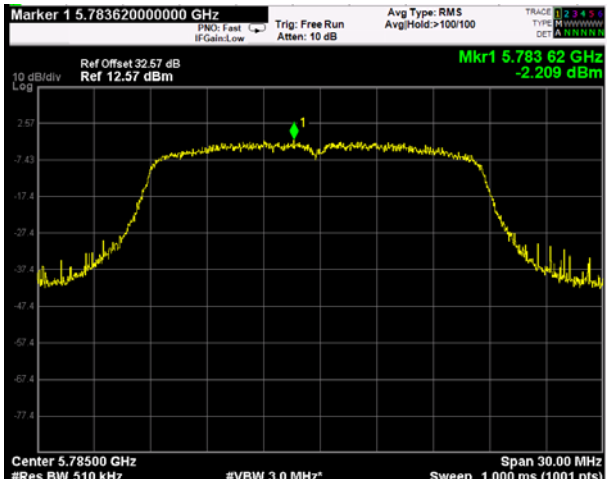
Port2 / 802.11a / CH High



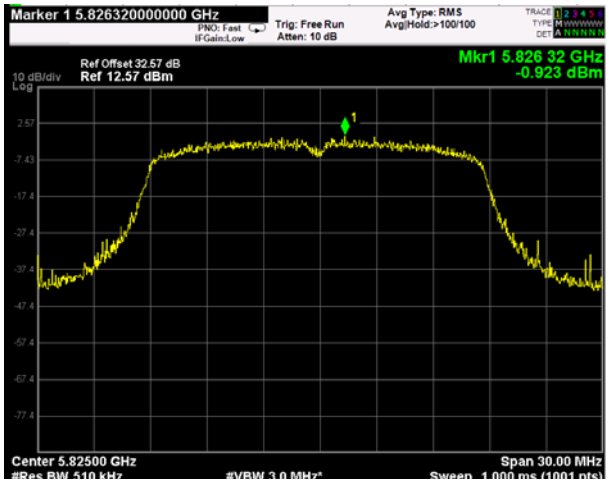
Port1 / 802.11n(HT120) / CH Low



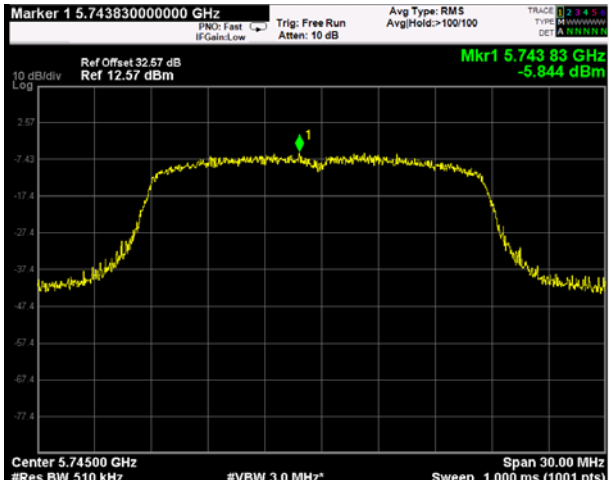
Port1 / 802.11n(HT120) / CH Middle



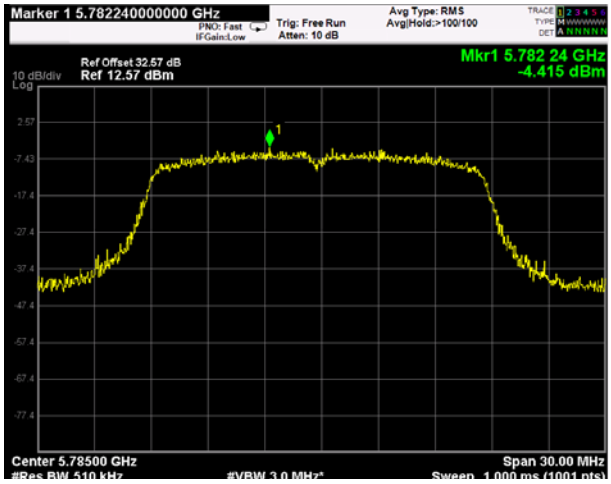
Port1 / 802.11n(HT120) / CH High



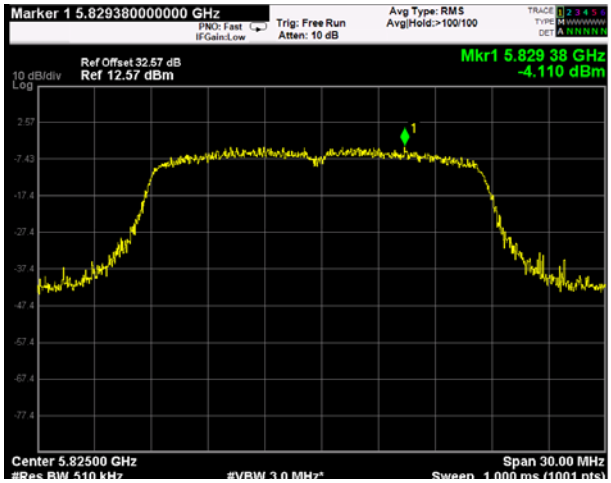
Port2 / 802.11n(HT120) / CH Low



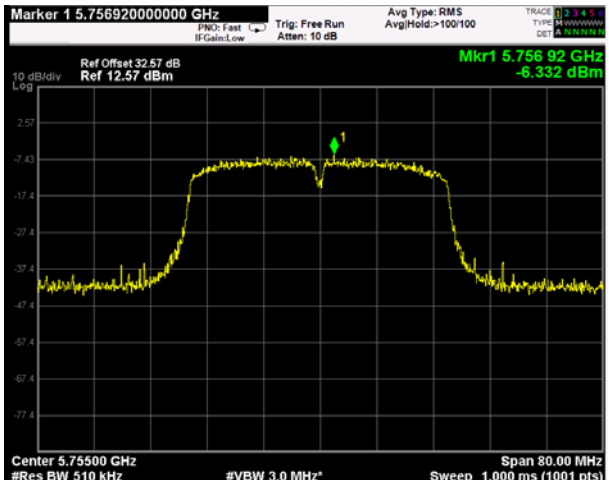
Port2 / 802.11n(HT120) / CH Middle



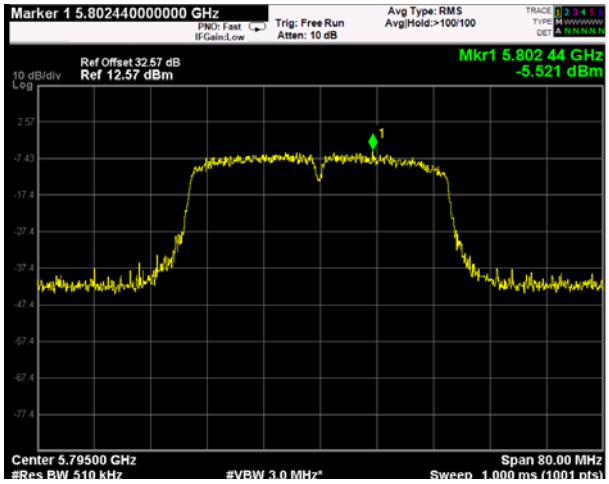
Port2 / 802.11n(HT20) / CH High



Port1 / 802.11n(HT40) / CH Low



Port1 / 802.11n(HT40) / CH High



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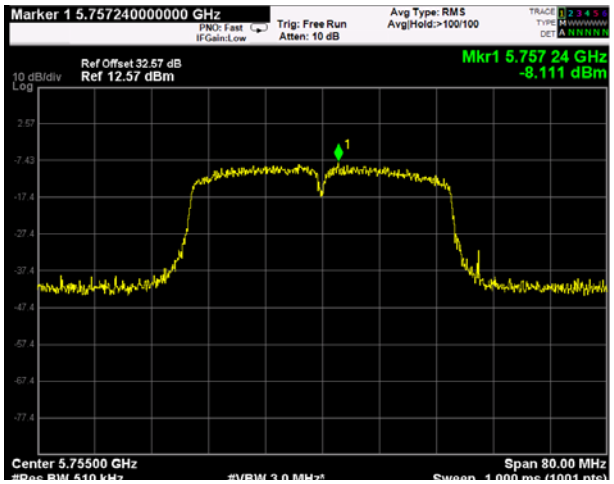
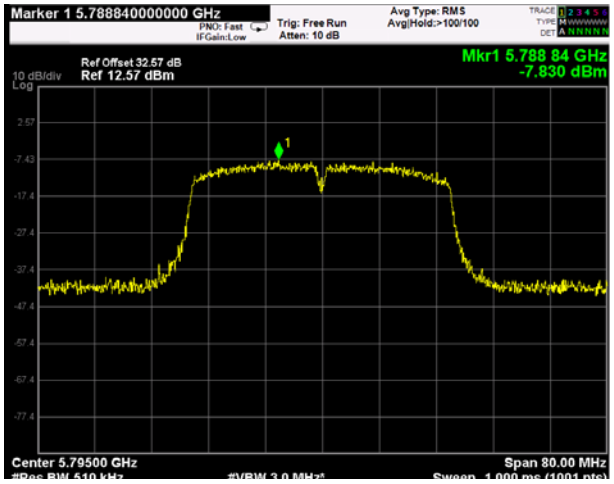
Port2 / 802.11n(HT40) / CH Low



Port2 / 802.11n(HT40) / CH High



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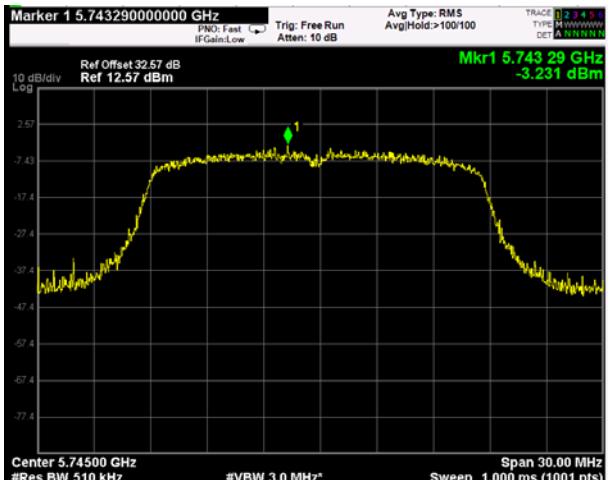
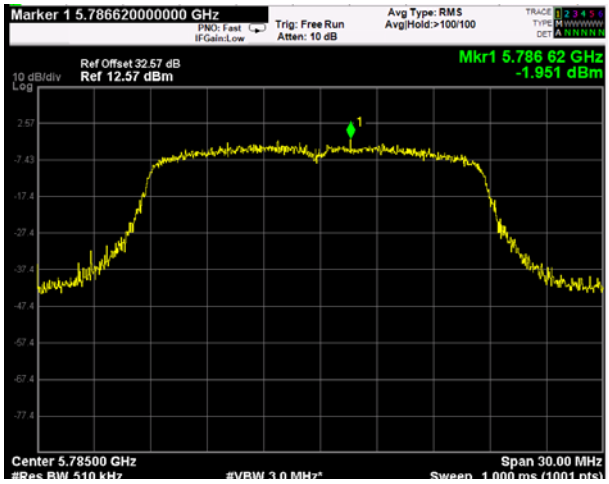
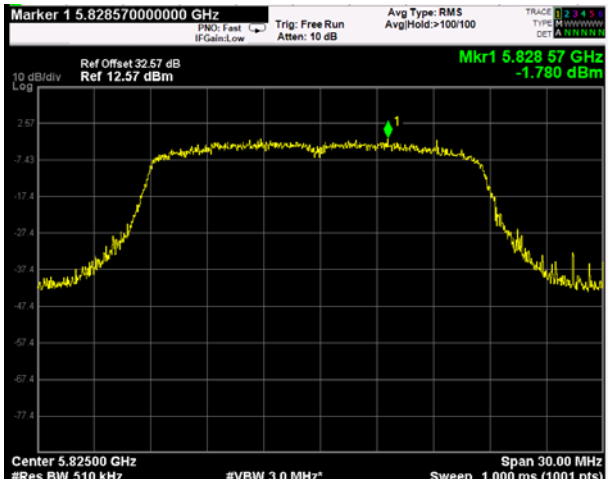
Port1 / 802.11ac(VHT20) / CH Low



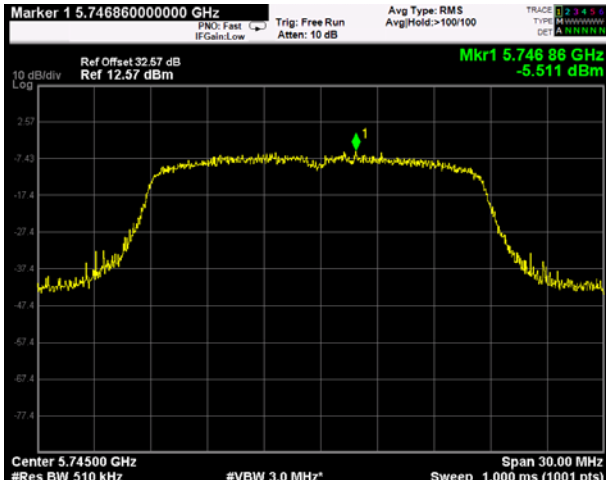
Port1 / 802.11ac(VHT20) / CH Middle



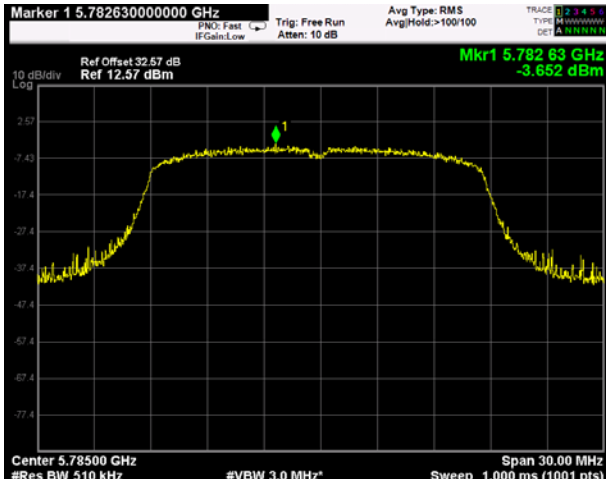
Port1 / 802.11ac(VHT20) / CH High



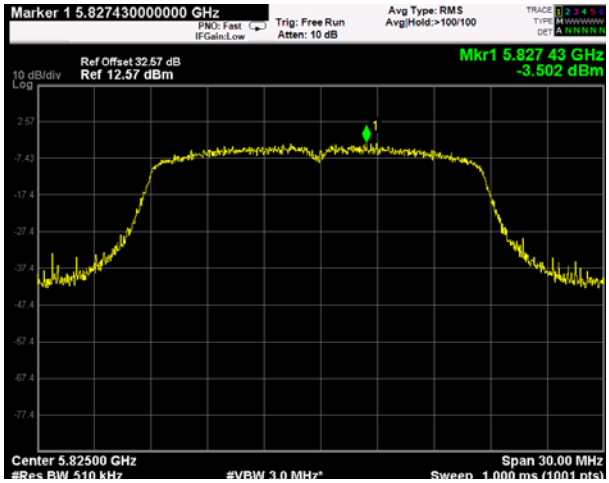
Port2 / 802.11ac(VHT20) / CH Low



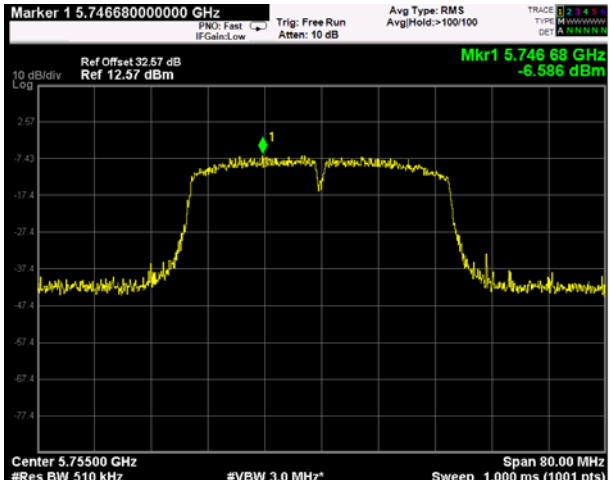
Port2 / 802.11ac(VHT20) / CH Middle



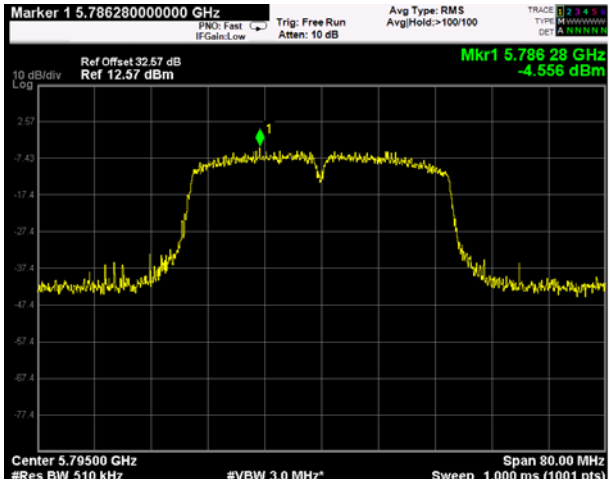
Port2 / 802.11ac(VHT20) / CH High



Port1 / 802.11ac(VHT40) / CH Low



Port1 / 802.11ac(VHT40) / CH High



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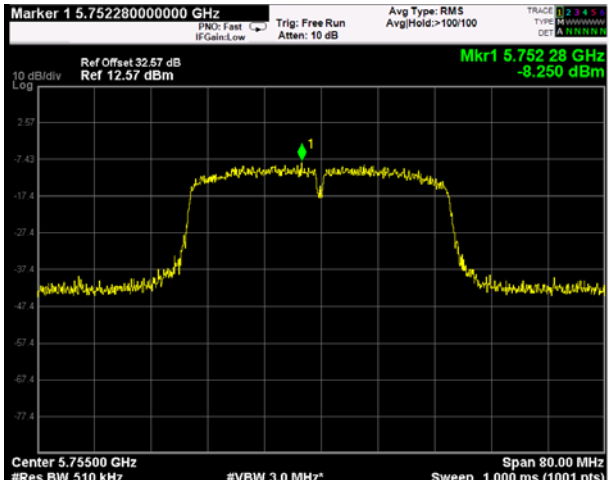
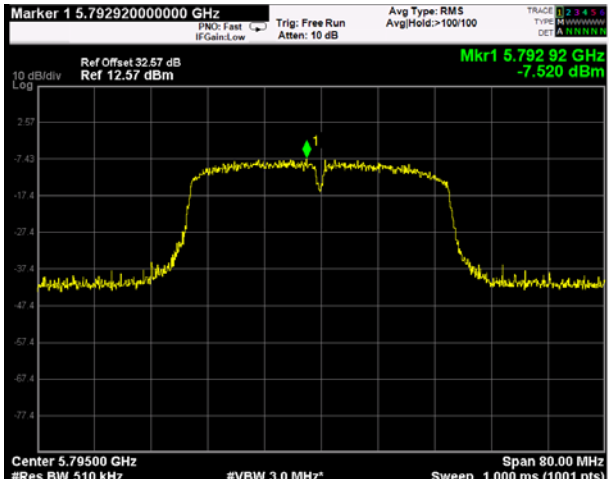
Port2 / 802.11ac(VHT40) / CH Low



Port2 / 802.11ac(VHT40) / CH High



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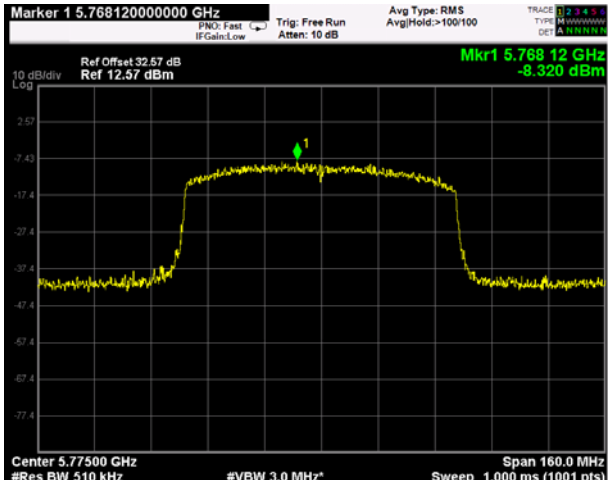
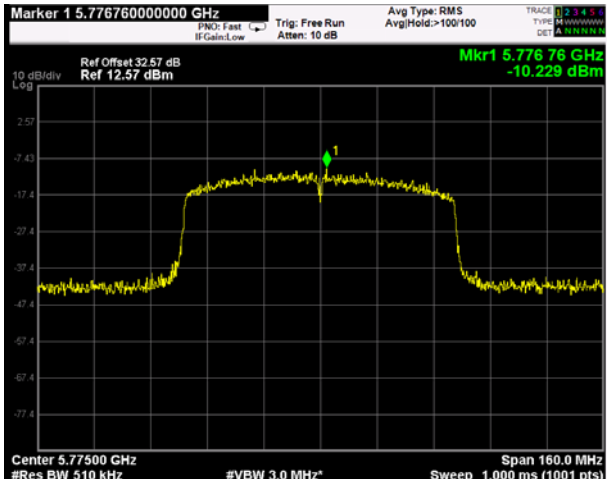
Port1 / 802.11ac(VHT80) / CH Middle



Port2 / 802.11ac(VHT80) / CH Middle



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5.3 Emission Bandwidth

5.3.1 Standard Applicable [FCC §15.407(a)(1)]

5.3.2 Test Environment conditions

• Ambient temperature : (24 ~ 25) ℃ • Relative Humidity : (49 ~ 55) % R.H.

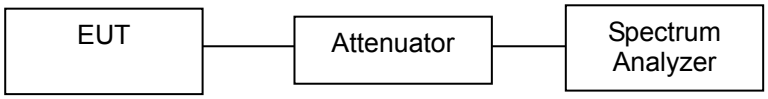
5.3.3 Measurement Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. 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%.
3. The minimum of 6dB Bandwidth Measurement is 0.5MHz.

The spectrum analyzer is set to the as follows :

- RBW : >1% of the emission bandwidth
- VBW : >3 x RBW
- Sweep : auto
- Detector function : peak
- Trace : max hold

5.3.4 Test setup



5.3.5 Measurement Result

5 180 ~ 5 240 MHz

Port1 802.11a

Channel	Frequency [㎒]	26 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
36	5 180	18.24	16.25	-	Compliance
44	5 220	17.81	16.30	-	Compliance
48	5 240	19.24	16.28	-	Compliance

Port2 802.11 a

Channel	Frequency [㎒]	26 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
36	5 180	17.64	16.27	-	Compliance
44	5 220	18.09	16.28	-	Compliance
48	5 240	18.24	16.26		Compliance

Port1 802.11n(HT20)

Channel	Frequency [㎒]	26 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
36	5 180	18.75	17.42	-	Compliance
44	5 220	19.09	17.43	-	Compliance
48	5 240	19.19	17.42	-	Compliance

Port2 802.11n(HT20)

Channel	Frequency [㎒]	26 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
36	5 180	18.81	17.40	-	Compliance
44	5 220	18.89	17.44	-	Compliance
48	5 240	18.68	17.43	-	Compliance

Port1 802.11n(HT40)

Channel	Frequency [㎒]	26 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
38	5 190	37.69	35.79	-	Compliance
46	5 230	38.48	35.89	-	Compliance

Port2 802.11n(HT40)

Channel	Frequency [㎒]	26 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
38	5 190	38.21	35.79	-	Compliance
46	5 230	38.33	35.74	-	Compliance

Port1 802.11ac(VHT20)

Channel	Frequency [㎒]	26 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
36	5 180	19.20	17.47	-	Compliance
44	5 220	19.22	17.36	-	Compliance
48	5 240	19.13	17.42	-	Compliance

Port2 802.11ac(VHT20)

Channel	Frequency [㎒]	26 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
36	5 180	18.69	17.47	-	Compliance
44	5 220	19.12	17.45	-	Compliance
48	5 240	18.81	17.46	-	Compliance

Port1 802.11ac(VHT40)

Channel	Frequency [㎒]	26 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
38	5 190	38.40	35.74	-	Compliance
46	5 230	38.29	35.79	-	Compliance

Port2 802.11ac(VHT40)

Channel	Frequency [㎒]	26 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
38	5 190	37.86	35.84	-	Compliance
46	5 230	38.02	35.84	-	Compliance

Port1 802.11ac(VHT80)

Channel	Frequency [㎒]	26 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
42	5 210	78.03	74.65	-	Compliance

Port2 802.11ac(VHT80)

Channel	Frequency [㎒]	26 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
42	5 210	77.86	74.88	-	Compliance

5 745 ~ 5 825 MHz

Port1 802.11a

Channel	Frequency [㎒]	6 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
149	5 745	14.20	16.28	-	Compliance
157	5 785	14.82	16.28	-	Compliance
165	5 825	15.95	16.30	-	Compliance

Port2 802.11 a

Channel	Frequency [㎒]	6 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
149	5 745	14.42	16.25	-	Compliance
157	5 785	15.08	16.26	-	Compliance
165	5 825	13.58	16.28	-	Compliance

Port1 802.11n(HT20)

Channel	Frequency [㎒]	6 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
149	5 745	14.20	17.44	-	Compliance
157	5 785	17.18	17.47	-	Compliance
165	5 825	15.65	17.45	-	Compliance

Port2 802.11n(HT20)

Channel	Frequency [㎒]	6 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
149	5 745	15.08	17.42	-	Compliance
157	5 785	15.31	17.43	-	Compliance
165	5 825	12.96	17.45	-	Compliance

Port1 802.11n(HT40)

Channel	Frequency [㎒]	6 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
151	5 755	35.24	35.84	-	Compliance
159	5 795	32.48	35.74	-	Compliance

Port2 802.11n(HT40)

Channel	Frequency [㎒]	6 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
151	5 755	35.17	35.75	-	Compliance
159	5 795	35.14	35.72	-	Compliance

Port1 802.11ac(VHT20)

Channel	Frequency [㎒]	6 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
149	5 745	14.76	17.43	-	Compliance
157	5 785	11.87	17.45	-	Compliance
165	5 825	15.68	17.47	-	Compliance

Port2 802.11ac(VHT20)

Channel	Frequency [㎒]	6 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
149	5 745	11.37	17.45	-	Compliance
157	5 785	15.17	17.42	-	Compliance
165	5 825	15.18	17.46	-	Compliance

Port1 802.11ac(VHT40)

Channel	Frequency [㎒]	6 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
151	5 755	33.01	35.88	-	Compliance
159	5 795	29.07	35.81	-	Compliance

Port2 802.11ac(VHT40)

Channel	Frequency [㎒]	6 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
151	5 755	35.17	35.75	-	Compliance
159	5 795	35.14	35.72	-	Compliance

Port1 802.11ac(VHT80)

Channel	Frequency [㎒]	6 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
155	5 775	73.91	75.06	-	Compliance

Port2 802.11ac(VHT80)

Channel	Frequency [㎒]	6 dB Bandwidth [㎒]	99% Bandwidth [㎒]	Limit [㎒]	Test Results
155	5 775	63.98	74.68	-	Compliance

5.4 Frequency Stability

5.4.1 Standard Applicable [FCC §15.407(g)]

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

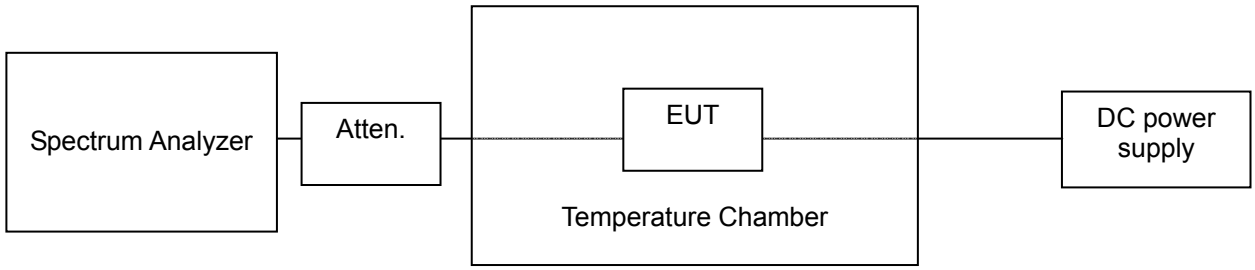
5.4.2 Test Environment conditions

• Ambient temperature : (24 ~ 25) ℃ • Relative Humidity : (49 ~ 55) % R.H.

5.4.3 Measurement Procedure

1. The EUT is installed in an environment test chamber with external power source.
2. Set the chamber to operate at 50 centigrade and external power source to output at nominal voltage of EUT
3. A sufficient stabilization period at each temperature is used prior to each frequency measurement.
4. When temperature is stabled, measure the frequency stability after 2, 5, and 10 minutes.
5. The test shall be performed under -30 to 50 centigrade and 85 to 115 percent of the nominal voltage. Change setting of chamber and external power source to complete all conditions.

5.4.4 Test setup



5.4.5 Measurement Result

Operating Frequency: 5 180 ㎒

Temp (℃)	Power Supply	0 minute	2 minutes	5 minutes	10 minutes
		Freq Drift(ppm)	Freq Drift(ppm)	Freq Drift(ppm)	Freq Drift(ppm)
50	5.0 V_{dc}(Vnom)	6.45	6.44	6.45	6.44
40	5.0 V_{dc}(Vnom)	6.46	6.41	6.44	6.43
30	5.0 V_{dc}(Vnom)	6.44	6.41	6.41	6.42
20	5.0 V_{dc}(Vnom)	6.45	6.45	6.43	6.45
10	5.0 V_{dc}(Vnom)	6.45	6.44	6.42	6.44
0	5.0 V_{dc}(Vnom)	6.44	6.41	6.41	6.45
-10	5.0 V_{dc}(Vnom)	6.45	6.45	6.45	6.42
-20	5.0 V_{dc}(Vnom)	3.46	3.46	3.41	3.43
22	4.5 V_{dc}(Vmin)	6.46	6.44	6.43	6.44
22	5.5 V_{dc}(Vmax)	6.45	6.43	6.44	6.45

5.5 Spurious RF Radiated emissions

5.5.1 Standard Applicable [FCC §15.407(b)(1)]

Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209.

§15.209 and RSS-Gen limits for radiated emissions measurements (distance at 3 m)

Frequency Band [MHz]	DISTANCE [Meters]	Limit [㎶/m]	Limit [dB㎶/m]	Detector
0.009 ~ 0.490	300	2400/F(kHz)	67.6-20log(F)	Peak
0.490 ~ 1.705	30	24000/F(kHz)	87.6-20log(F)	Peak
1.705 ~ 30.0	30	30	29.54	Peak
30 - 88	3	100 **	40.00	Quasi peak
88 - 216	3	150 **	43.52	Quasi peak
216 - 960	3	200 **	46.02	Quasi peak
Above 960	3	500	54.00	Average
Above 1000	3	74.0 dB㎶/m (Peak), 54.0 dB㎶/m (Average)		

** fundamental emissions from intentional radiators operation under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz, or 470-806 MHz. However, operation within these Frequency bands is permitted under other
sections of this Part Section 15.231 and 15.241

§15.205. Restrict Band of Operation for FCC

[MHz]	[MHz]	[MHz]	[GHz]
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505**	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 – 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 – 1 427	8.025 - 8.
4.177 25 - 4.177 75	37.5 -38.25	1 435 – 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 – 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 – 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 -1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 – 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 – 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 – 2 500	17.7 - 21.4
8.376 25 - 8.38 6 75	156.7 - 156.9	2 690 – 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 – 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 – 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 – 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 – 4 400	Above 38.6
13.36 - 13.41			

** Until February 1, 1999, this restricted band shall be 0.490-0.510

§15.407 (b)(1) EIRP Limit Un-restricted band emissions above 1GHz Limit		
Operating Band	EIRP Limit(dBm)	EQUIVALENT FIELD STRENGTH AT 3m (dBμV/m)
5.15 - 5.25 GHz	-27	68.2
5.25 - 5.35 GHz	-27	68.2
5.47 - 5.725 GHz	-27	68.2
5.725 - 5.825 GHz	5.715 5.725 GHz: -17 5.825 5.835 GHz: -17 Other un-restricted band: -27	5.715 5.725 GHz: 78.2 5.825 5.835 GHz: 78.2 Other un-restricted band: 68.2
Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength: E = (1000000√30p)/3 μV/m, Where P is the EIRP in Watts Therefore: -27 dBm/MHz = 68.23 dBμV/m		

5.5.2 Test Environment conditions

• Ambient temperature : (24 ~ 25) ℃ • Relative Humidity : (49 ~ 55) % R.H.

5.5.3 Measurement Procedure

The measurements procedure of the transmitter radiated E-field is as following describe method.
The test is performed in a Shield chamber to determine the accurate frequencies, after maximum emissions level will be checked on a test chamber and measuring distance is 3 m from EUT to test antenna. (The chamber is ensured that comply with at least 6 dB above the ambient noise level)

① The EUT was powered ON with continuously operating mode and placed on a 0.8 meter high non-conductive table on the reference ground plane.

② The test antenna was used on Horn antenna for above 1 GHz, and if the below 1 GHz, broad-band antenna and Loop antenna were used for below 30 MHz and it's antenna positioned in both the horizontal and vertical plane was location at EUT during the test for maximized the emission measurement.

③ The output of the test antenna will be connected to a measuring receiver, and it is set to tuned over the frequency range according to required standard

④ The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure(according ANSI C63.10:2009 clause 4.2.3.2.3 procedure for average measure). Both PK and AV level test, PK detector is used.

⑤ The fundamental frequency at which a relevant radiated signal component is detected, the test antenna will be raised and lowered through the specified range of heights in horizontal and vertical polarized orientation, until an maximum signal level is detected on the measuring receiver.

⑥ The transmitter is position x, y, z axis on rotating through 360 degrees, until the maximum signal level is detected by the measuring receiver.

⑦ The receiver is scanned from requested measuring frequency band and then the maximum meter reading is recorded. The radiated emissions were measured with required standard.

• The measurement results are obtained as described below:
Result(dBμV/m) = Reading(dBμV) + Antenna factor(dB/m)+ CL(dB) + other applicable factor (dB)

• According to §15.33 (a)(1), Frequency range of radiated measurement is performed the tenth harmonic.

For the transmitter unwanted emissions shall be measured using following options below:
Refer as FCC KDB 789033 D02, clause G)2) for unwanted emissions into non-restricted bands.
Refer as FCC KDB 789033 D02, clause G)1) for unwanted emissions into restricted bands.

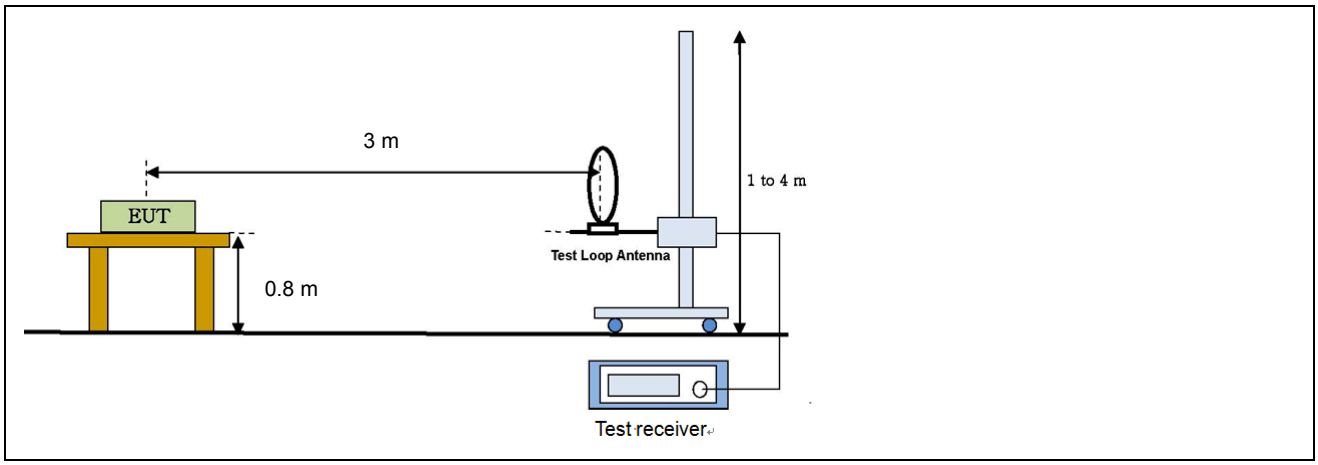
For the transmitter bandedge emissions shall be measured using following options below:
Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements.

5.5.4 Measurement Uncertainty

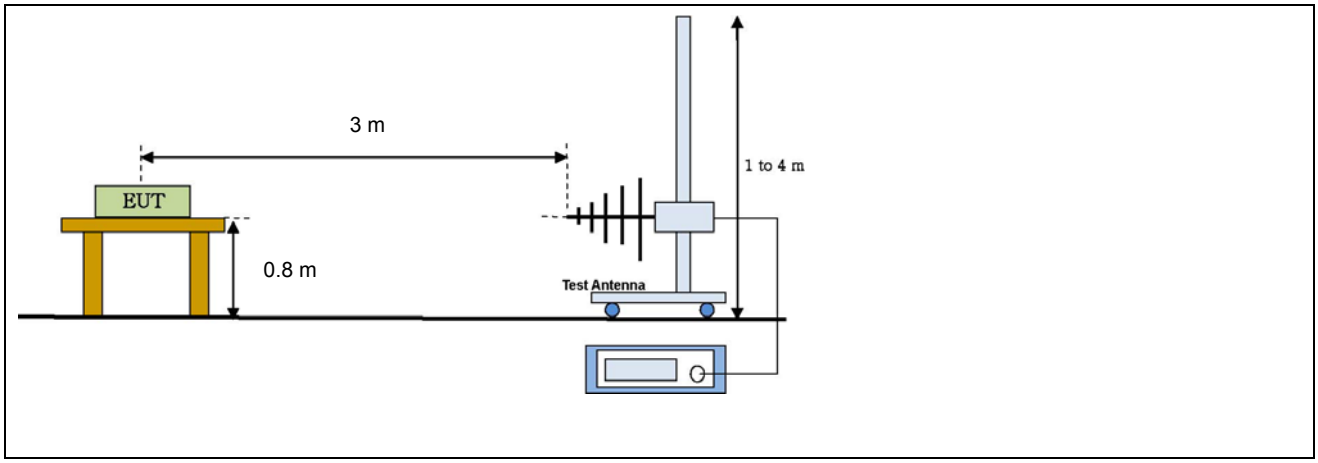
All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are test receiver, Cable loss, Antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, Antenna frequency interpolation, measurement distance variation, Site imperfection, mismatch, and system repeatability based on NIS 80,81, The measurement uncertainty level with a 95 % confidence level were apply to Uncertainty of a radiation emissions measurement at Chamber of KOSTEC is ± 6.0 dB

5.5.5 Test Configuration

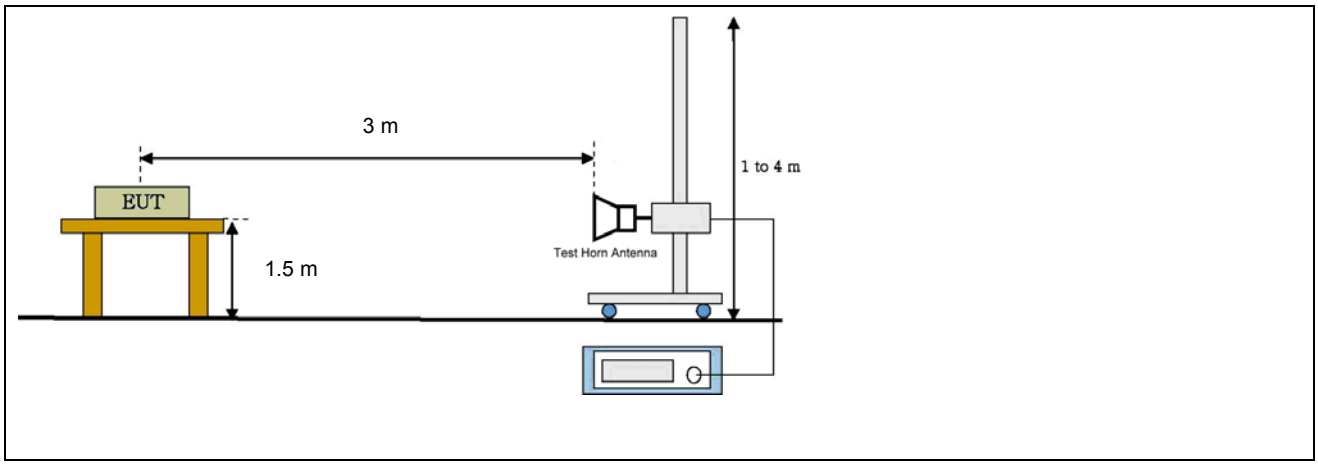
Radiated emission setup, Below 30 MHz



Radiated emission setup, Below 1 000 MHz



Radiated emission setup, Above 1 GHz



5.5.6 Measurement Result

▣ Un-restricted Band Emissions

5 180 ~ 5 240 MHz

802.11a CH 36(5 180 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.151	15.56	4.35	120	1.0	V	33.65	-26.93	22.27	11.06	68.2	48.5	45.93	37.59	Compliance

802.11a CH 48(5 240 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.263	15.32	4.75	120	1.0	V	33.85	-27.70	21.48	10.91	68.2	48.5	46.72	37.59	Compliance

802.11n(HT20) CH 36(5 180 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.155	16.75	7.32	120	1.0	V	33.65	-26.97	23.42	13.99	68.2	48.5	44.78	34.51	Compliance

802.11n(HT20) CH 48(5 240 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.261	15.81	5.23	120	1.0	V	33.84	-27.69	21.97	11.39	68.2	48.5	46.23	37.11	Compliance

802.11n(HT40) CH 38(5 190 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.153	14.48	3.32	120	1.0	V	33.65	-26.96	21.17	10.01	68.2	48.5	47.03	38.49	Compliance

802.11n(HT40) CH 46(5 230 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.272	13.12	3.65	120	1.0	V	33.89	-27.75	19.26	9.79	68.2	48.5	48.94	38.71	Compliance

802.11ac(VHT20) CH 36(5 180 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.151	15.43	4.02	120	1.0	V	33.65	-26.94	22.14	10.73	68.2	48.5	46.06	37.77	Compliance

802.11ac(VHT20) CH 48(5 240 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.262	15.47	4.23	120	1.0	V	33.85	-27.69	21.63	10.39	68.2	48.5	46.57	38.11	Compliance

802.11ac(VHT40) CH 38(5 190 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.153	16.83	7.27	120	1.0	V	33.65	-26.96	23.52	13.96	68.2	48.5	44.68	34.54	Compliance

802.11ac(VHT40) CH 46(5 230 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.263	15.42	5.36	120	1.0	V	33.85	-27.70	21.58	11.52	68.2	48.5	46.62	36.98	Compliance

802.11ac(VHT80) CH 42(5 210 ㎒)

Freq. (㎓))	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.154	14.47	3.51	120	1.0	V	33.65	-26.96	21.15	10.19	68.2	48.5	47.05	38.31	Compliance

802.11 ac(VHT80) CH 42(5 210 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.273	13.64	3.15	120	1.0	V	33.89	-27.75	19.78	9.29	68.2	48.5	48.42	39.21	Compliance

5 745 ~ 5 825 MHz

802.11a CH 149(5 745 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.723	15.56	4.30	120	1.0	V	34.25	-27.79	22.03	10.77	68.2	48.5	46.17	37.73	Compliance

802.11a CH 165(5 825 ㎒)

Restricted Band (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.861	15.23	4.12	120	1.0	V	34.34	-27.64	21.93	10.82	68.2	48.5	46.27	37.68	Compliance

802.11n(HT20) CH 149(5 745 ㎒)

Restricted Band (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.721	16.64	7.32	120	1.0	V	34.26	-27.80	23.10	13.78	68.2	48.5	45.10	34.72	Compliance

802.11n(HT20) CH 165(5 825 ㎒)

Restricted Band (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.862	15.65	5.74	120	1.0	V	34.35	-27.65	22.35	12.44	68.2	48.5	45.85	36.06	Compliance

802.11n(HT40) CH 151(5 755 ㎒)

Restricted Band (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.721	14.54	3.15	120	1.0	V	34.26	-27.80	21.00	9.61	68.2	48.5	47.20	38.89	Compliance

802.11n(HT40) CH 159(5 795 ㎒)

Restricted Band (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.863	13.23	3.67	120	1.0	V	34.35	-27.66	19.93	10.37	68.2	48.5	48.27	38.13	Compliance

802.11ac(VHT20) CH 149(5 745 ㎒)

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.722	15.54	4.53	120	1.0	V	34.26	-27.79	22.00	10.99	68.2	48.5	46.20	37.51	Compliance

802.11ac(VHT20) CH 165(5 825 ㎒)

Restricted Band (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.861	15.68	4.46	120	1.0	V	34.34	-27.64	22.38	11.16	68.2	48.5	45.82	37.34	Compliance

802.11ac(VHT40) CH 151(5 755 ㎒)

Restricted Band (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.724	16.92	7.45	120	1.0	V	34.25	-27.78	23.39	13.92	68.2	48.5	44.81	34.58	Compliance

802.11ac(VHT40) CH 159(5 795 ㎒)

Restricted Band (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.863	15.48	5.59	120	1.0	V	34.35	-27.66	22.18	12.29	68.2	48.5	46.02	36.21	Compliance

802.11ac(VHT80) CH 155(5 775 ㎒)

Restricted Band (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.721	14.85	3.23	120	1.0	V	34.26	-27.80	21.31	9.69	68.2	48.5	46.89	38.81	Compliance

802.11 ac(VHT80) CH 155(5 775 ㎒)

Restricted Band (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
5.862	13.45	3.56	120	1.0	V	34.35	-27.65	20.15	10.26	68.2	48.5	48.05	38.24	Compliance

▣ Unwanted Emissions

Above 1 ㎓

Freq. (㎓)	Reading (dB㎶/m)		Table (Deg)	Antenna			CL+Pre AMP (dB)	Meas Result (dB㎶/m)		Limit (dB㎶/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)		PK	AV	PK	AV	PK	AV	
-	-	-	-	-	-	-	-	-	-	74	54	-	-	Compliance
There are no spurious emissions.														

Below 1 ㎓

Freq. (MHz)	Reading (dB㎶/m)	Table (Deg)	Antenna			CL (dB)	AMP (dB)	Meas Result (dB㎶/m)	Limit (dB㎶/m)	Mgn (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
54.13	66.34	120	1.0	V	8.36	0.97	-42.43	33.24	40.00	6.76	Compliance
69.64	59.42	120	1.0	V	6.44	1.15	-42.33	24.68	40.00	15.32	Compliance
250.02	56.45	100	2.0	H	12.50	2.14	-41.41	29.68	46.00	16.32	Compliance
350.00	52.46	100	1.0	H	15.70	2.60	-41.12	29.64	46.00	16.36	Compliance
550.50	46.23	150	1.0	V	19.51	3.15	-40.24	28.65	46.00	17.35	Compliance
750.02	46.65	150	2.0	V	22.60	3.96	-38.94	34.27	46.00	11.73	Compliance
790.01	42.35	150	1.0	V	22.68	4.02	-38.75	30.30	46.00	15.70	Compliance

※Note

- Above 1 ㎓ is measured average and peak detector mode on Spectrum analyzer in accordance with FCC Rule15.35
- Limit: 54 ㏈㎶/m(Average), 74 ㏈㎶/m(Peak), Attenuated more than 20 ㏈ below the permissible value.
- It is not recorded on the report that the reading of emissions are attenuated more than 20 ㏈ below the permissible limits or the field strength is too small to measured.
- For the below 30 ㎒, measured any other signal is not detected on test receiver
- The transmitter radiated spectrum was investigated from 9 ㎑ to 40 ㎓.

Freq.(㎒) : Measurement frequency, Reading(㏈㎶/m) : Indicated value for test receiver,

Table (Deg) : Directional degree of Turn table,

Antenna (Height, Pol, Fctr) : Antenna Height, Polarization and Factor

Cbl(㏈) : Cable loss, Pre AMP(㏈) : Preamplifier gain(㏈)

Meas Result (㏈㎶/m) :Reading(㏈㎶/m)+ Antenna factor.(㏈/m)+ CL(㏈) - Pre AMP(㏈)

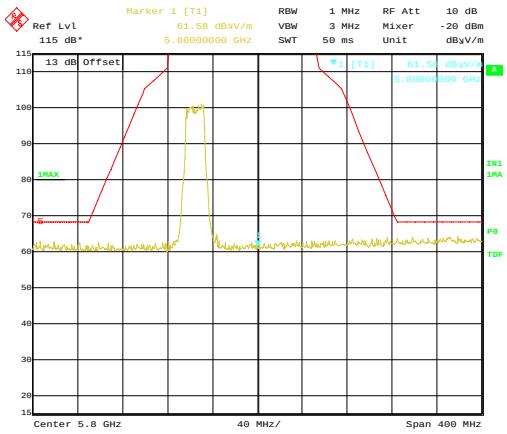
Limit(㏈㎶/m): Limit value specified with FCC Rule, Mgn(㏈) : FCC Limit (㏈㎶/m) − Meas Result(㏈㎶/m)

Radiated Out of Band Emission (OOBE) Measurement (For U-NII-3 band)

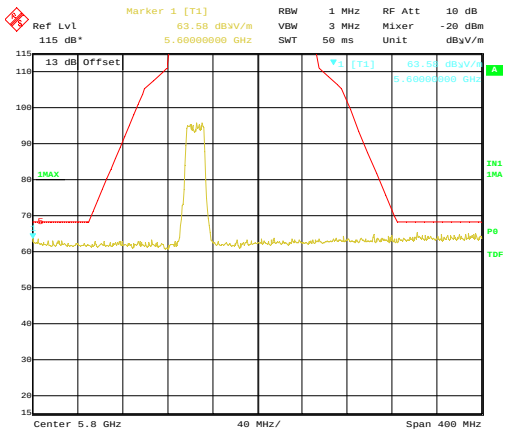
802.11a

CH Low(5 745 MHz)

Horizontal

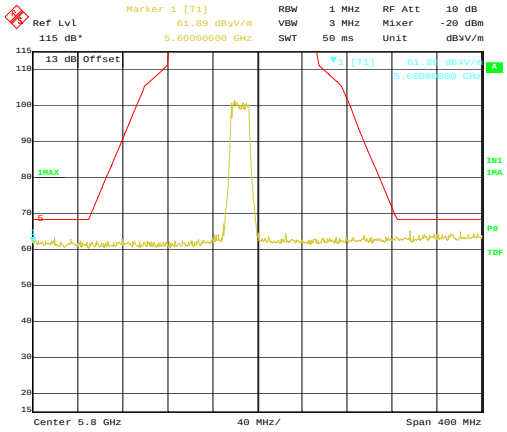


Vertical

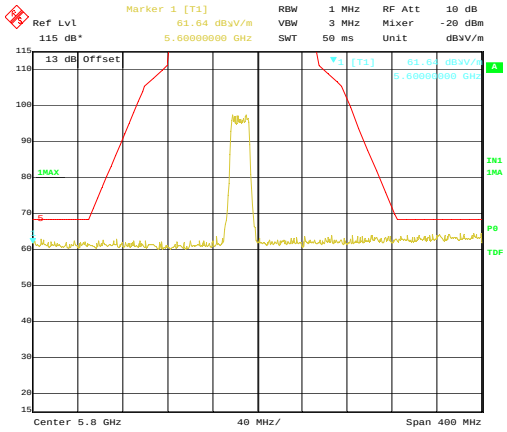


CH Middle(5 785 MHz)

Horizontal

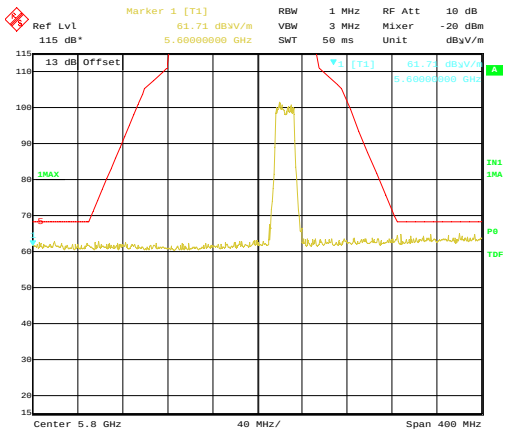


Vertical

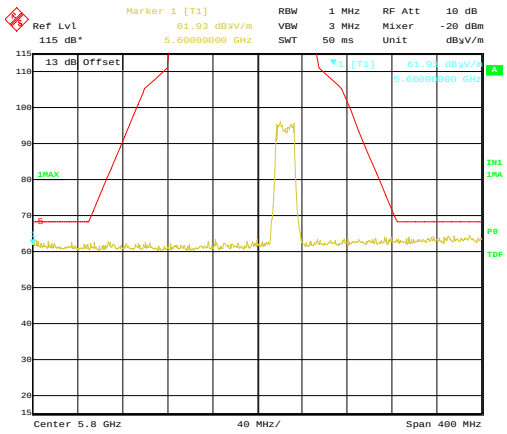


CH High(5 825 MHz)

Horizontal



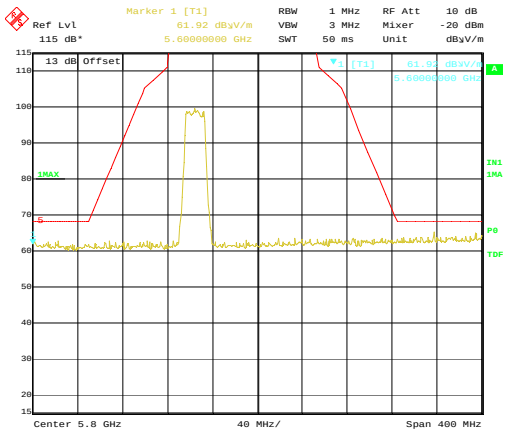
Vertical



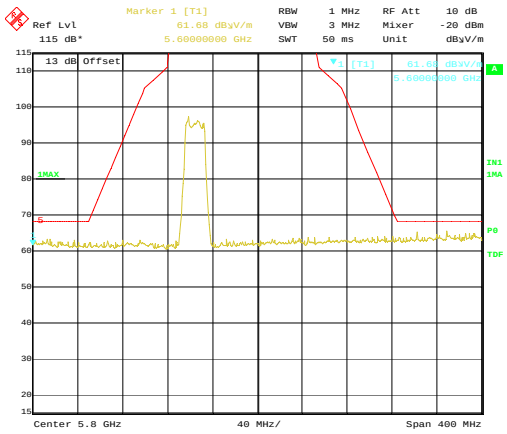
802.11n(HT20)

CH Low(5 745 MHz)

Horizontal

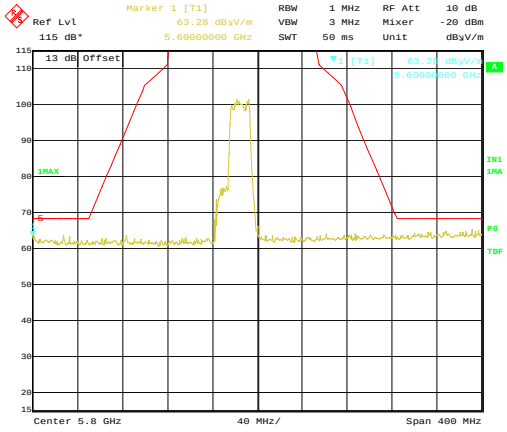


Vertical

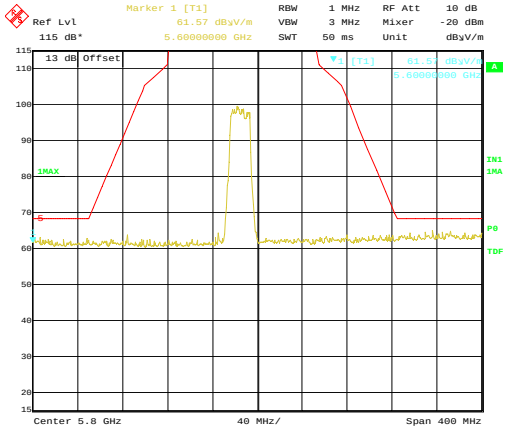


CH Middle(5 785 MHz)

Horizontal

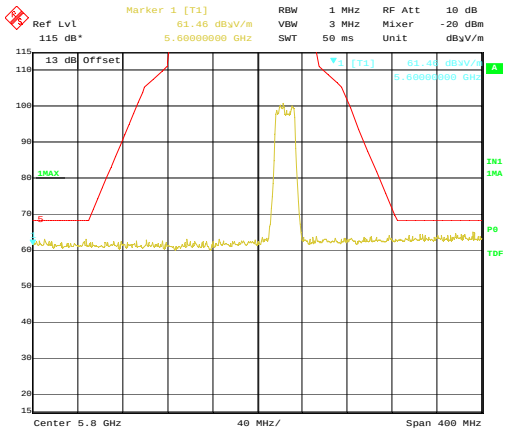


Vertical

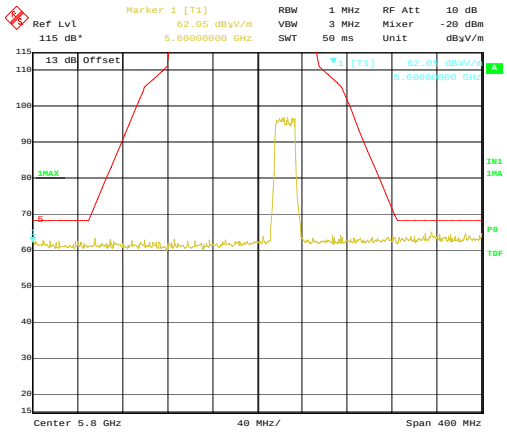


CH High(5 825 MHz)

Horizontal



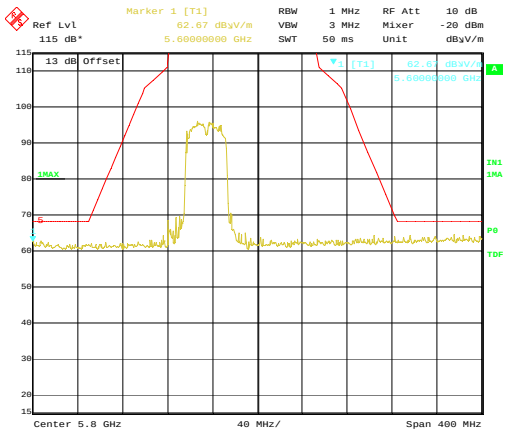
Vertical



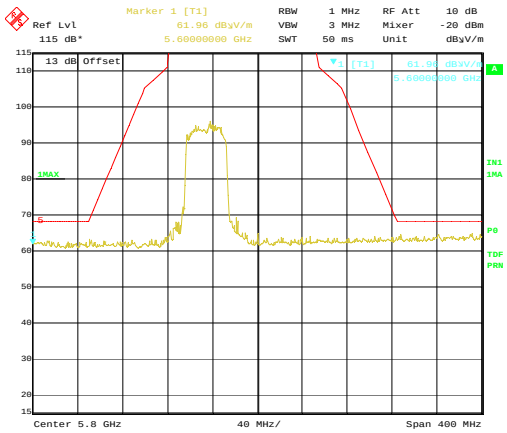
802.11n(HT40)

CH Low(5 755 MHz)

Horizontal

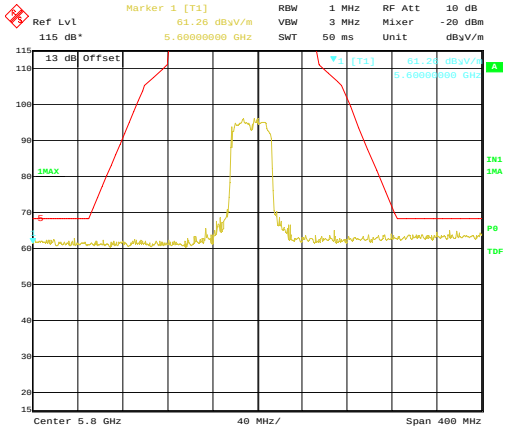


Vertical

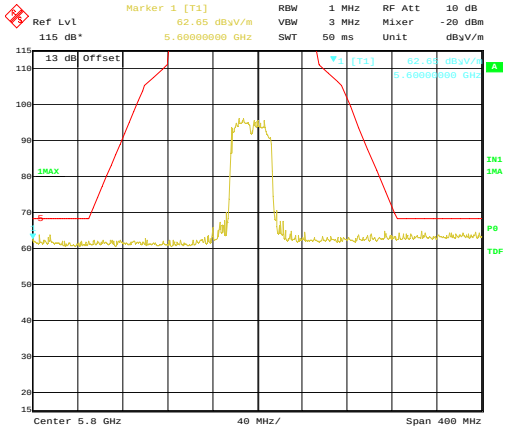


CH High(5 795 MHz)

Horizontal



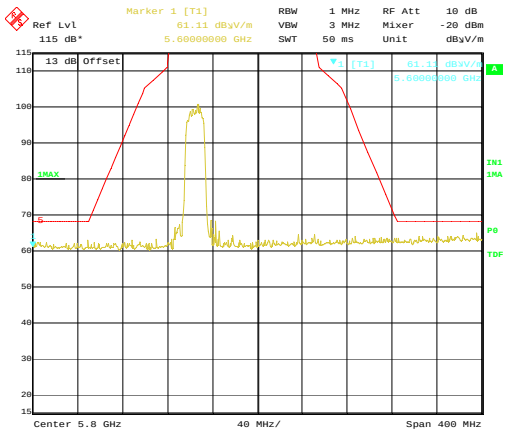
Vertical



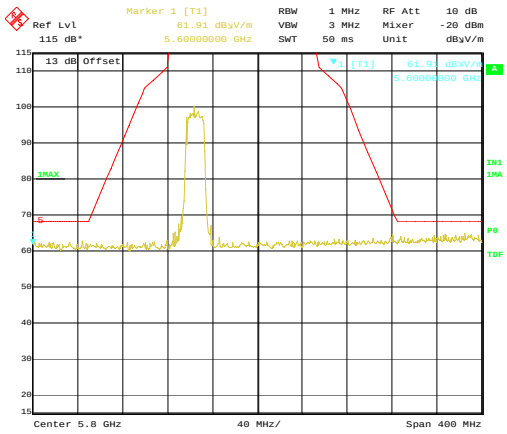
802.11ac(VHT20)

CH Low(5 745 MHz)

Horizontal

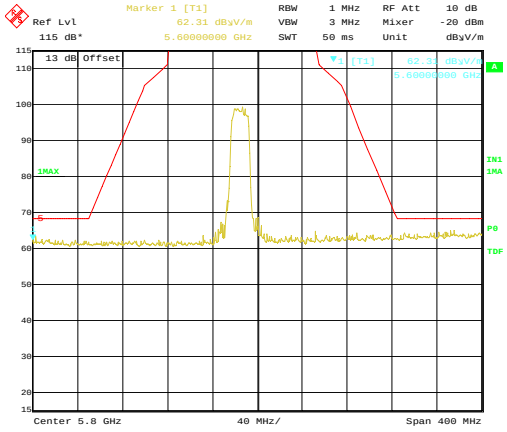


Vertical

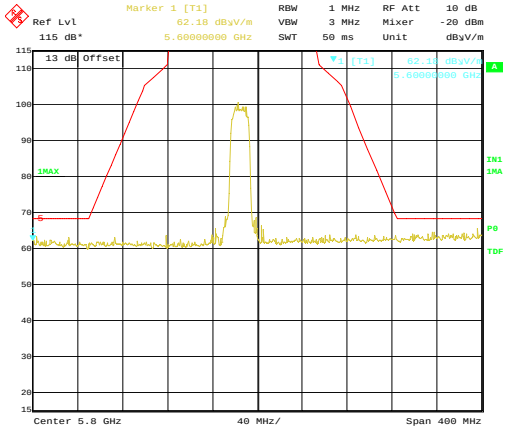


CH Middle(5 785 MHz)

Horizontal

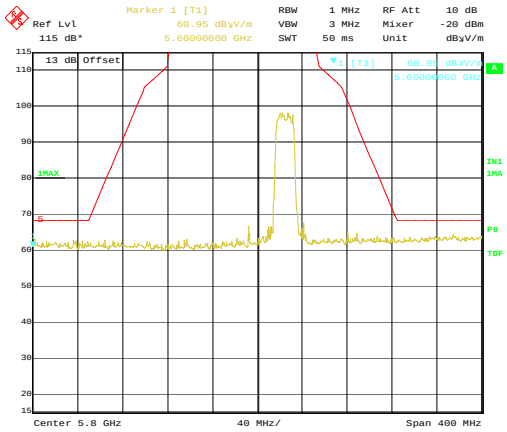


Vertical

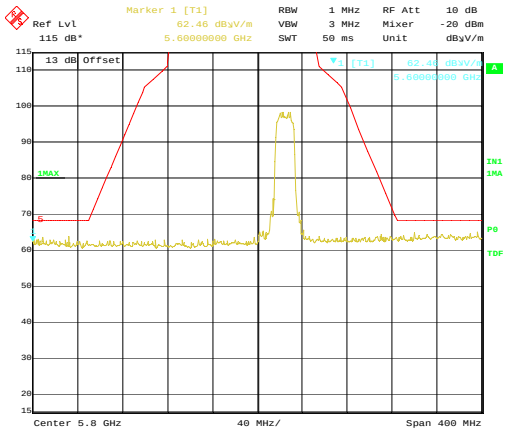


CH High(5 825 MHz)

Horizontal



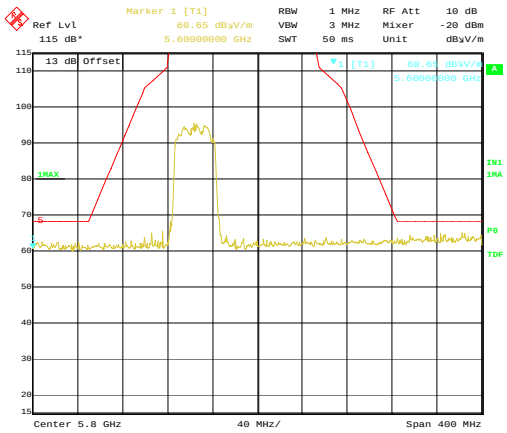
Vertical



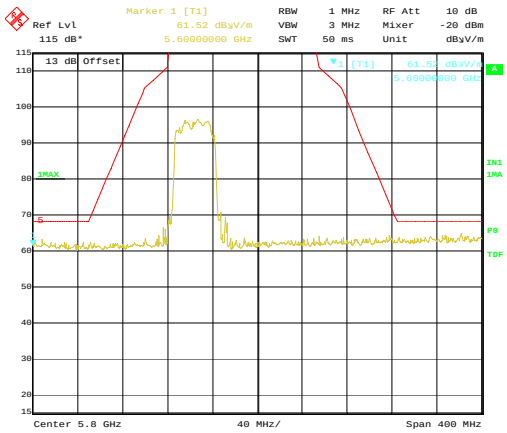
802.11ac(VHT40)

CH Low(5 755 MHz)

Horizontal

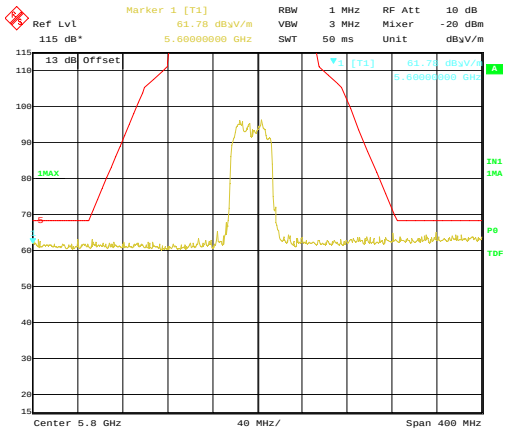


Vertical

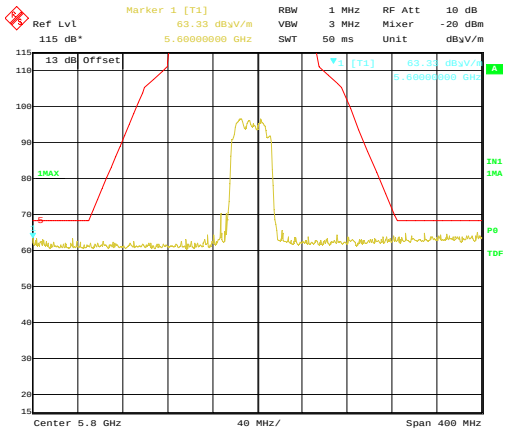


CH High(5 795 MHz)

Horizontal



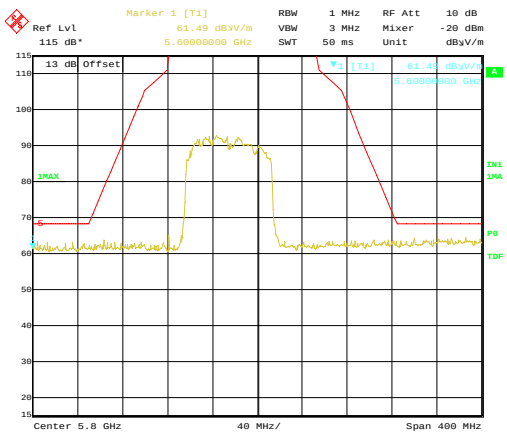
Vertical



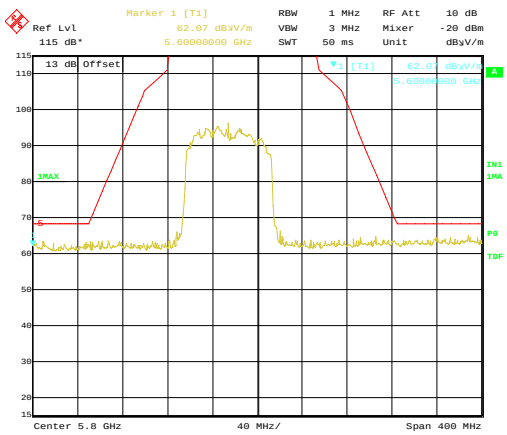
802.11ac(VHT80)

CH Middle(5 775 MHz)

Horizontal



Vertical



5.6 Antenna requirement

5.6.1 Standard applicable [FCC §15.203]

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by responsible party shall be used with the device.

The use of a permanently attached antenna or of an antenna that user a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The manufacturer may design the unit so that broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

5.6.2 Antenna details

Frequency Band	Gain [dBi]			Limit [dBi]	Results
	Ant 1	Ant 2	Total		
5 GHz Band1	2.36	2.34	5.36	≤ 6	Compliance
5 GHz Band4	1.08	-0.87	3.17	≤ 6	Compliance

Note: The EUT has two antennas

For 802.11b/g(1TX, 1RX) : only ant 1 could transmit/receive simultaneously.
For 802.11n(2TX,2RX): ant1 and ant 2 could transmit/receive simultaneously.

5.7 AC Power Conducted emissions

5.7.1 Standard Applicable [FCC §15.207(a)]

For intentional radiator that is designed to be connected to the public utility(AC)power line, the radio frequency. Voltage that is conducted back onto the AC power line on any frequencies hopping mode within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line Impedance stabilization network(LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

§15.207 limits for AC line conducted emissions;

Frequency of Emission(㎒)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

5.7.2 Test Environment conditions

• Ambient temperature : (24 ~ 25) ℃ • Relative Humidity : (49 ~ 55) % R.H.

5.7.3 Measurement Procedure

EUT was placed on a non- metallic table height of 0.8 m above the reference ground plane. Cables connected to EUT were fixed to cause maximum emission. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the Maximum signal strength.

5.7.4 Used equipment

Equipment	Model No.	Serial No.	Manufacturer	Next cal date	Cal interval	Used
Test receiver	ESCS30	100111	Rohde & Schwarz	2018. 01. 31	1 year	☒
LISN	ESH2-Z5	100044	R&S	2018. 01. 31	1 year	☐
	ESH3-Z5	100147	R&S	2018. 01. 31	1 year	☒

*Test Program: " ESXS-K1 V2.2"
Measurement uncertainty
Conducted Emission measurement: 4.48 dB (CL: Approx 95 %, *k*=2)

5.7.5 Measurement Result

Freq.	Factor [dB]		POL	QP			CISPR AV		
				Limit	Reading	Result	Limit	Reading	Result
[㎒]	LISN	CABLE +P/L		[dB㎶]	[dB㎶]	[dB㎶]	[dB㎶]	[dB㎶]	[dB㎶]
0.170	0.11	9.97	N	64.98	45.03	45.14	54.98	31.90	32.01
0.396	0.12	9.98	N	57.93	52.08	52.20	47.93	40.70	40.82
0.443	0.12	9.99	N	57.01	47.96	48.08	47.01	38.80	38.92
0.505	0.12	9.99	N	56.00	45.64	45.76	46.00	36.40	36.52
14.021	0.60	10.35	L	60.00	33.99	34.59	50.00	27.50	28.10
15.291	0.66	10.38	L	60.00	41.12	41.78	50.00	32.70	33.36
15.474	0.59	10.38	N	60.00	34.89	35.48	50.00	27.40	27.99
15.705	0.66	10.38	L	60.00	39.55	40.21	50.00	31.20	31.86
16.318	0.61	10.40	N	60.00	33.81	34.42	50.00	29.10	29.71
16.552	0.68	10.40	L	60.00	38.76	39.44	50.00	33.30	33.98
18.580	0.71	10.44	L	60.00	36.70	37.41	50.00	28.90	29.61
20.302	0.74	10.48	L	60.00	31.80	32.54	50.00	26.10	26.84

* LISN: LISN insertion Loss, Cable: Cable Loss, P/L:pulse limiter factor
* L: Line. Live, N: Line. Neutral
* Reading: test receiver reading value (with cable loss & pulse limiter factor)
* Result = LISN + Reading

Line. Live

Kostec Co.,Ltd

Conducted Emission

EUT: O-17-0260
Manuf:
Op Cond: AC 120V , 60Hz
Operator:
Test Spec: FCC
Comment: Live

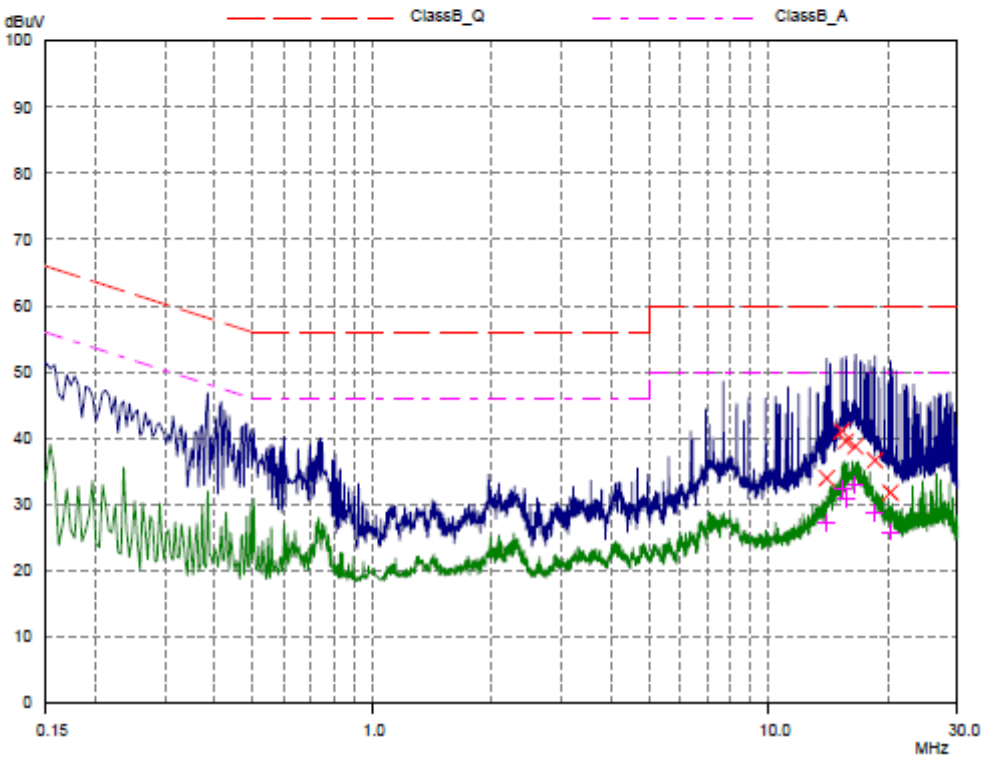
Result File: 0260_l.dat : New Measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	10msec	15 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	11	9kHz	30MHz	MAIN

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Peaks: 25
Acc Margin: 50 dB



Line. Neutral

Kostec Co.,Ltd

Conducted Emission

EUT:	O-17-0260
Manuf:	
Op Cond:	AC 120V , 60Hz
Operator:	
Test Spec:	FCC
Comment:	Neutral
Result File:	0260_n.dat : New Measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	10msec	15 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	11	9kHz	30MHz	MAIN

Final Measurement:		
	Detectors:	X QP / + AV
	Meas Time:	1sec
	Peaks:	25
	Acc Margin:	50 dB