RADIO TEST REPORT

Product	:	802.11ac/b/g/n WiFi + Bluetooth M.2 Card
Model Name	:	WNFQ-258ACN(BT)
FCC ID	:	2AVP7-K3V1
Test Regulation	:	FCC 47 CFR Part 15 Subpart E (Section 15.407)
Received Date	:	Mar. 25, 2020
Test Date	:	Apr. 1, 2020 ~ Apr 30, 2020
Issued Date	:	Jul. 17, 2020
Applicant	:	Bizerba SE & Co. KG Wilhelm-Kraut-Straße 65, 72336 Balingen, Germany
Issued By	:	Underwriters Laboratories Taiwan Co., Ltd. Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Testing Laboratory
3398

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REVISION HISTORY

Original Test Report No.: 4789431832-US-R1-V0

Rev.	Test report No.	Date	Page revised	Contents
Original	4789431832-US-R1-V0	Jul. 17, 2020	-	Initial issue

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1. Attestation of Test Results

APPLICANT:	Bizerba SE & Co. KG Wilhelm-Kraut-Straße 65, 72336 Balingen, Germany
MANUFACTURER	SparkLAN Communications, Inc. 8F., No.257, Sec. 2, Tiding Blvd., Neihu District, Taipei City 11493, Taiwan (R.O.C.)
EUT DESCRIPTION:	802.11ac/b/g/n WiFi + Bluetooth M.2 Card
MODEL:	WNFQ-258ACN(BT)
SAMPLE STAGE:	Identical Prototype
DATE of TESTED:	Apr. 1, 2020 ~ Apr. 30, 2020

APPLICABLE STANDARDS	
STANDARD	**Test Results**
FCC 47 CFR PART 15 Subpart E (Section 15.407)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Cindy Hsin Date : Jul. 17, 2020
Project Handler

Approved and Authorized By:

Howard Kao Date : Jul. 17, 2020
Project Engineer

2. Summary of Test Results

Summary of Test Results		
FCC Clause	**Test Items**	**Result**
15.407(e)	6dB Bandwidth	PASS
15.403(i)	26dB Bandwidth	PASS
2.1049	Occupied Bandwidth	See Note2
15.407(a)(1/2/3)	Conducted Output Power	PASS
15.407(a)(1/2/3)	Power Spectral Density	PASS
15.407(g)	Frequency Stability	PASS
15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions and Band Edge Measurement	PASS
15.407(b)(6)	AC Power Conducted Emission	PASS
15.203	Antenna Requirement	PASS
15.407(h)	Dynamic Frequency Selection	See Note3

Note:
1. For the Radiated Band Edge and OOBE test plots were recorded in Appendix I, the Radiated Emissions test plots were recorded in Appendix II.
2. The Occupied Bandwidth was reference only.
3. The "Dynamic Frequency Selection measurement" was recorded in Report No.: 4789431832-US-R2-V0.

3. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB 789033 D02 General UNII Test Procedure New Rules v02r01, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013 and KDB 662911 D01 Multiple Transmitter Output v02r01.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398. The full scope of accreditation can be viewed at http://accreditation.taftw.org.tw/taf/public/basic/viewApplyItems.action?unitNo=3398

5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor k=2.

Test Item	Measurement Frequency Range	K	U(dB)
Conducted disturbance at mains terminals ports	0.15MHz ~ 30MHz	2	1.7
RF Conducted	9 kHz - 40GHz	2	1.0
Radiated disturbance below 30MHz	9 kHz - 30 MHz	2	2.2
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	2	5.3
Radiated disturbance above 1GHz	1GHz ~ 40GHz	2	4.8

6. Equipment under Test

6.1. Description of EUT

Product	802.11ac/b/g/n WiFi + Bluetooth M.2 Card	
Model Name	WNFQ-258ACN(BT)	
Operating Frequency	5180 ~ 5240 MHz, 5260 ~ 5320 MHz, 5500 ~ 5720 MHz, 5745 ~ 5825 MHz	
Modulation	256QAM, 64QAM, 16QAM, QPSK, BPSK	
Transfer Rate	802.11a: up to 54 Mbps 802.11n: up to MCS15 802.11ac: up to MCS9	
Number of Channel	5180 ~ 5240 MHz	4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)
		2 for 802.11n (HT40), 802.11 ac (VHT40)
		1 for 802.11ac (VHT80)
	5260 ~ 5320 MHz	4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)
		2 for 802.11n (HT40), 802.11 ac (VHT40)
		1 for 802.11ac (VHT80)
	5500 ~ 5720 MHz	12 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)
		6 for 802.11n (HT40), 802.11 ac (VHT40)
		3 for 802.11ac (VHT80)
	5745 ~ 5825 MHz	5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)
		2 for 802.11n (HT40), 802.11 ac (VHT40)
		1 for 802.11ac (VHT80)
Maximum Output Power	5180 ~ 5240 MHz: 16.84 dBm 5260 ~ 5320 MHz: 18.55 dBm 5500 ~ 5720 MHz: 18.80 dBm 5745 ~ 5825 MHz: 18.58 dBm	
Normal Voltage	3.3 Vdc	
S/N	1926012007465	
Hardware Version	WNFQ-258ACN(BT)	
Software Version	12.0.0.448	

Note:

1. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx,Rx Function
802.11a	2TX,2RX
802.11n (HT20)	2TX,2RX
802.11n (HT40)	2TX,2RX
802.11ac (VHT20)	2TX,2RX
802.11ac (VHT40)	2TX,2RX
802.11ac (VHT80)	2TX,2RX

* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for VHT20 / VHT40, therefore investigated worst case to representative mode in test report.

2. The EUT contains following accessory devices

Product	Brand	Model	Description
N/A	N/A	N/A	N/A

3. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

6.2. Channel List

FOR 5180 ~ 5240MHz

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210MHz

FOR 5260 ~ 5320MHz

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
52	5260 MHz	60	5300 MHz
56	5280 MHz	64	5320 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
54	5270 MHz	62	5310 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
58	5290MHz

FOR 5500 ~ 5720MHz

12 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
100	5500 MHz	124	5620 MHz
104	5520 MHz	128	5640 MHz
108	5540 MHz	132	5660 MHz
112	5560 MHz	136	5680 MHz
116	5580 MHz	140	5700 MHz
120	5600 MHz	144	5720 MHz

6 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
102	5510 MHz	126	5630 MHz
110	5550 MHz	134	5670 MHz
118	5590 MHz	142	5710 MHz

3 channels are provided for 802.11ac (VHT80):

Channel	Frequency	Channel	Frequency
106	5530MHz	138	5690MHz
122	5610MHz	-	-

FOR 5745 ~ 5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz	-	-

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775MHz

6.3. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	23~26°C / 63~68%RH	120Vac / 60 Hz	Apr. 1, 2020 ~ Apr. 30, 2020	Patrick Kuan
Radiated Spurious Emission	966-2	22~26°C / 62~68%RH	120Vac / 60 Hz	Apr. 8, 2020 ~ Apr. 29, 2020	Patrick Kuan
AC power Line Conducted Emission	SR1	23~25°C / 63~68%RH	120Vac / 60 Hz	Apr. 22, 2020 ~ Apr. 24, 2020	Patrick Kuan

FCC Test Firm Registration Number: 498077

6.4. Description Of Available Antennas

Product	Brand	Model	Antenna Type	Remark
Antenna 0	ethertronics	1000423	PIFA	4.5dBi
Antenna 1	ethertronics	1000423	PIFA	4.5dBi
IPEX cable	N/A	N/A	N/A	Length: 130mm cable
IPEX cable	N/A	N/A	N/A	Length: 60mm cable

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

6.5. Test Mode Applicability and Tested Channel Detail

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- For below 1 GHz radiated emission and AC power line conducted emission have performed all modes of operation were investigated and the worst-case emissions are reported.
- For Antenna Port Conducted Measurement, this item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- The fundamental of the EUT was investigated in three orthogonal axes X/Y/Z, it was determined that X axis was worst-case. Therefore, all final radiated testing was performed with the EUT in X axis.
- For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.
- For AC power line conducted emissions, the pre-scan has been determined by AC power 120Vac/60Hz (worst case)

Test item	Mode	Frequency Band (MHz)	Modulation Technology	Available Channel	Test Channel	Data Rate
Radiated Emissions (Above 1GHz)	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6.0
	802.11ac (VHT20)		OFDM	36 to 48	36, 44, 48	MCS0
	802.11ac (VHT40)		OFDM	38 to 46	38, 46	MCS0
	802.11ac (VHT80)		OFDM	42	42	MCS0
	802.11a	5260-5320	OFDM	52 to 64	52, 60, 64	6.0
	802.11ac (VHT20)		OFDM	52 to 64	52, 60, 64	MCS0
	802.11ac (VHT40)		OFDM	54 to 62	54, 62	MCS0
	802.11ac (VHT80)		OFDM	58	58	MCS0
	802.11a	5500-5720	OFDM	100 to 144	100, 116, 140, 144	6.0
	802.11ac (VHT20)		OFDM	100 to 144	100, 116, 140, 144	MCS0
	802.11ac (VHT40)		OFDM	102 to 142	102, 110, 134, 142	MCS0
	802.11ac (VHT80)		OFDM	106, 122, 138	106, 122, 138	MCS0
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6.0
	802.11ac (VHT20)		OFDM	149 to 165	149, 157, 165	MCS0
	802.11ac (VHT40)		OFDM	151 to 159	151, 159	MCS0
	802.11ac (VHT80)		OFDM	155	155	MCS0
Radiated Emissions (Below 1GHz)	802.11ac (VHT80)	5500-5720	OFDM	106, 122, 138	106	MCS0
AC Power Line Conducted Emission	802.11ac (VHT80)	5500-5720	OFDM	106, 122, 138	106	MCS0

Test item	Mode	Frequency Band (MHz)	Modulation Technology	Available Channel	Test Channel	Data Rate
Antenna Port Conducted Measurement	802.11a	5180-5240	OFDM	36 to 48	36, 44, 48	6.0
	802.11ac (VHT20)		OFDM	36 to 48	36, 44, 48	MCS0
	802.11ac (VHT40)		OFDM	38 to 46	38, 46	MCS0
	802.11ac (VHT80)		OFDM	42	42	MCS0
	802.11a	5260-5320	OFDM	52 to 64	52, 60, 64	6.0
	802.11ac (VHT20)		OFDM	52 to 64	52, 60, 64	MCS0
	802.11ac (VHT40)		OFDM	54 to 62	54, 62	MCS0
	802.11ac (VHT80)		OFDM	58	58	MCS0
	802.11a	5500-5720	OFDM	100 to 144	100, 116, 140, 144	6.0
	802.11ac (VHT20)		OFDM	100 to 144	100, 116, 140, 144	MCS0
	802.11ac (VHT40)		OFDM	102 to 142	102, 110, 134, 142	MCS0
	802.11ac (VHT80)		OFDM	106, 122, 138	106, 122, 138	MCS0
	802.11a	5745-5825	OFDM	149 to 165	149, 157, 165	6.0
	802.11ac (VHT20)		OFDM	149 to 165	149, 157, 165	MCS0
	802.11ac (VHT40)		OFDM	151 to 159	151, 159	MCS0
	802.11ac (VHT80)		OFDM	155	155	MCS0

6.6. Duty cycle

Duty cycle of test signal is < 98 %, duty factor is required.

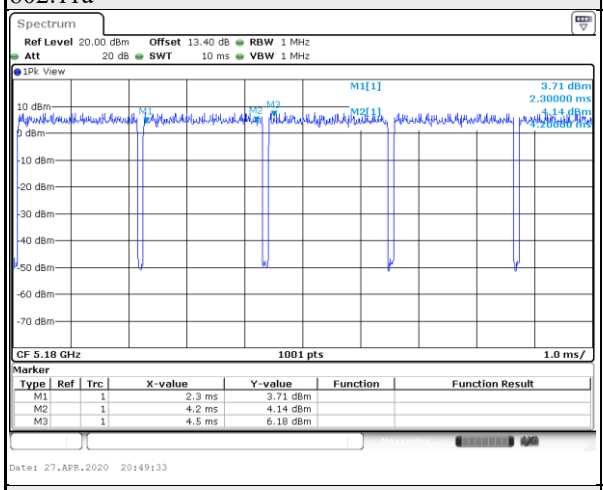
802.11a: Duty cycle = 1.9/2.2 = 0.864, Duty factor = 10 * log(1/0.864) = 0.64

802.11ac (VHT20): Duty cycle = 1.7/2 = 0.85, Duty factor = 10 * log(1/0.85) = 0.71

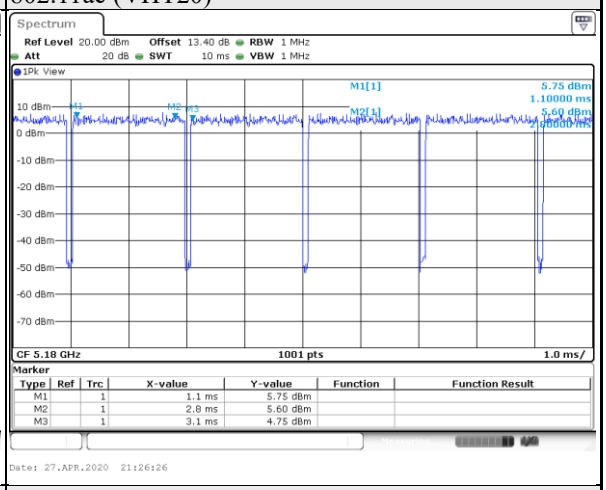
802.11ac (VHT40): Duty cycle = 0.91/1.06 = 0.858, Duty factor = 10 * log(1/0.858) = 0.66

802.11ac (VHT80): Duty cycle = 0.43/0.57 = 0.754, Duty factor = 10 * log(1/0.754) = 1.22

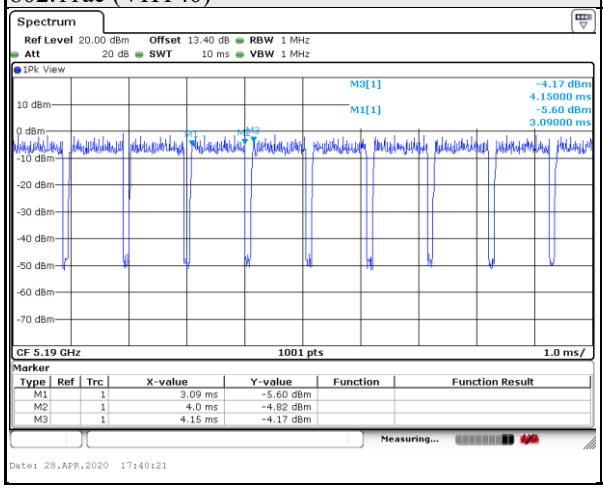
802.11a



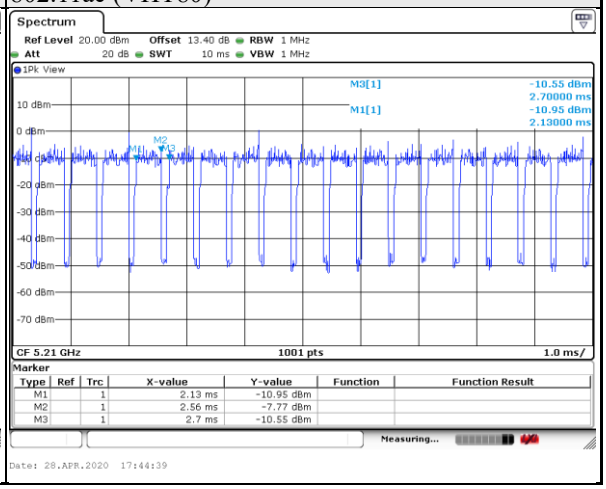
802.11ac (VHT20)



802.11ac (VHT40)



802.11ac (VHT80)



Note: T_{on} = Mark2-Mark1, T_{on} +T_{off} =Mark3-Mark1.

7. Test Equipment

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Interval**
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	Nov. 13, 2019	1 year
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	Dec. 17, 2019	1 year
Loop Antenna	ETS lindgren	6502	00213440	Dec. 19, 2019	1 year
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	Jan. 3, 2020	1 year
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	Jan. 3, 2020	1 year
Horn Antenna(18-40 GHz)	Schwarzbeck	BBHA 9170	781	Dec. 27, 2019	1 year
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	Feb. 4, 2020	1 year
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	Feb. 4, 2020	1 year
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	May. 8, 2019	1 year
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	Jan. 8, 2020	1 year
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	Jan. 8, 2020	1 year

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Interval**
Antenna Port Conducted Measurement					
Spectrum Analyzer	Keysight	N9010A	MY56070834	Nov. 6, 2019	1 year
FSV40 Signal Analyzer	Rohde & Schwarz	FSV40	101490	Sep. 24, 2019	1 year
Pulse Power Sensor	Anrisu	MA2411B	1531202	Dec. 23, 2019	1 year
Power Meter	Anrisu	ML2495A	1645002	Dec. 23, 2019	1 year
Temperature &Humidity Test Chamber	GIANT FORCE	GTH-150-40-CP-AR	MAA1701-010	Mar. 23,2020	1 year
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	Nov. 19, 2019	1 year
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	Aug. 8, 2019	1 year
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	Aug. 6, 2019	1 year
Cables	HARBOUR INDUSTRIES	LL142	170205-5000-1	Feb. 5, 2020	1 year

UL Software		
Description	**Name**	**Version**
Radiated measurement	E3	6.0
AC power Line Conducted Emission	EZ_EMC	1.1.4.2

8. Description of Test Setup

Support Equipment

Equipment	Brand Name	Model Name	S/N	Remark
USB Device	SP Widget	TOUCH T03	N/A	8GB
USB Device	SP Widget	TOUCH T03	N/A	8GB
USB Device	SP Widget	TOUCH T03	N/A	8GB

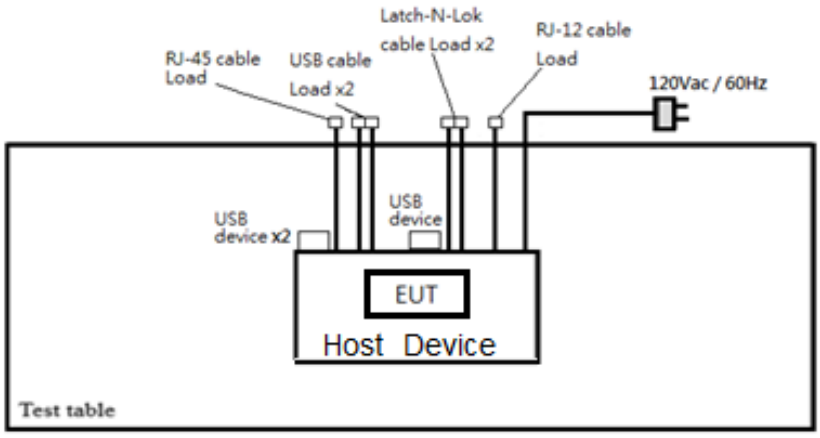
I/O Cables

Equipment	Brand Name	Model Name	S/N	Remark
RJ-45 cable	N/A	N/A	N/A	Length : 1.5m
RJ-12 cable	N/A	N/A	N/A	Length : 1m
USB cable	N/A	N/A	N/A	Type-C, Length:1.5m
USB cable	N/A	N/A	N/A	Type-C, Length:1.5m
Latch-N-Lok cable	N/A	N/A	N/A	Length : 1.5m
Latch-N-Lok cable	N/A	N/A	N/A	Length : 1.5m

Test Setup

Controlled using a bespoke application (QCARCT v3.0-00191) on a test Notebook. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

Setup Diagram for Test



9. Test Results

9.1. 6dB Bandwidth

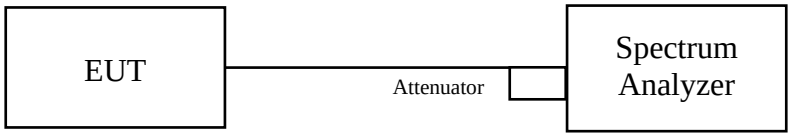
Requirements

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

802.11a

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
144 (U-NII-3 Band)	5720	2.4725	2.4725	0.5	Pass
149	5745	15.1049	15.1049	0.5	Pass
157	5785	15.1049	15.1049	0.5	Pass
165	5825	15.1049	15.1049	0.5	Pass

802.11ac (VHT20)

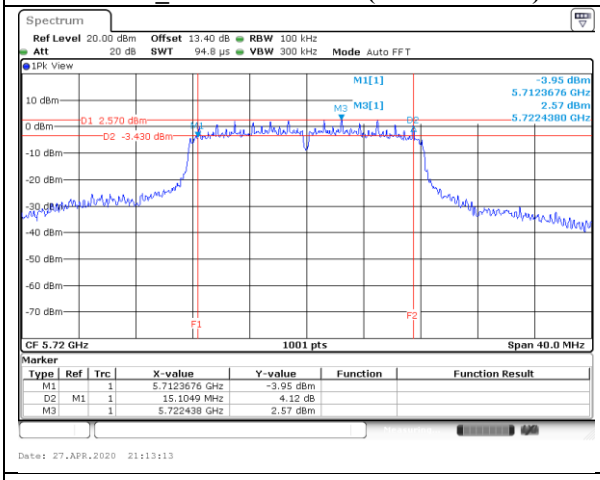
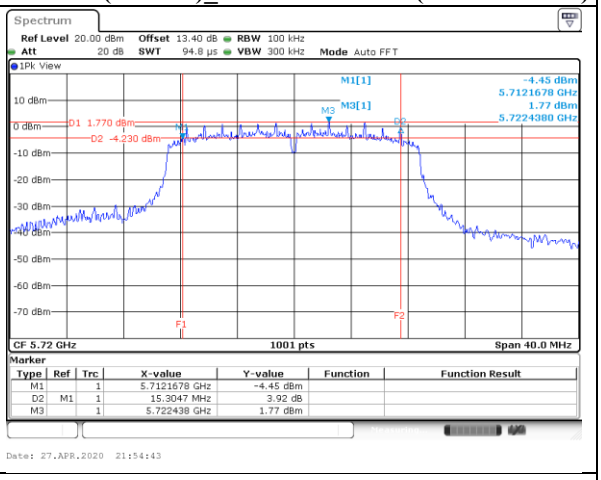
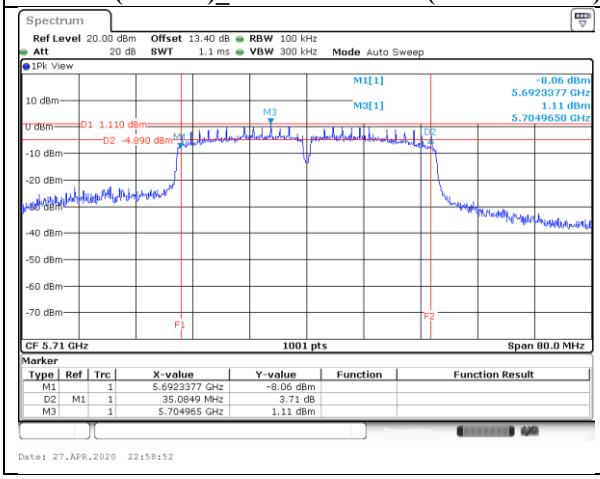
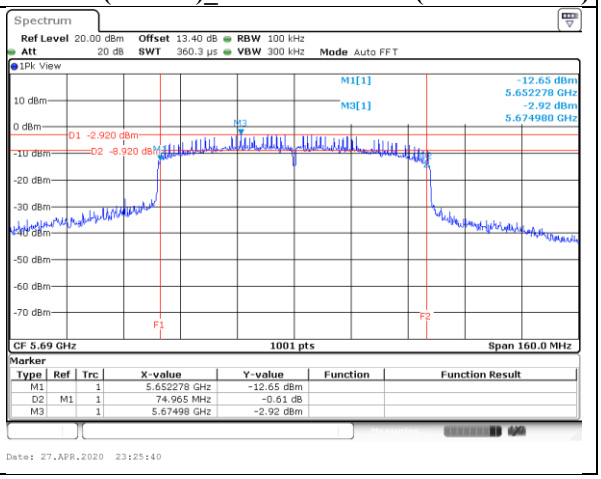
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
144 (U-NII-3 Band)	5720	2.4725	2.4725	0.5	Pass
149	5745	15.1449	15.1049	0.5	Pass
157	5785	15.1049	15.1049	0.5	Pass
165	5825	15.1449	15.1049	0.5	Pass

802.11ac (VHT40)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
142 (U-NII-3 Band)	5710	2.4226	2.4226	0.5	Pass
151	5755	35.0849	35.0849	0.5	Pass
159	5795	35.0849	35.0849	0.5	Pass

802.11ac (VHT80)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
138 (U-NII-3 Band)	5690	2.243	2.243	0.5	Pass
155	5775	74.965	74.965	0.5	Pass

Spectrum Plot of Worst Value	
802.11a_Chain 0 / CH144 (U-NII-3 Band)	**802.11ac (VHT20)_Chain 0 / CH144 (U-NII-3 Band)**
	
802.11ac (VHT40)_Chain 0 / CH142 (U-NII-3 Band)	**802.11ac (VHT80)_Chain 0 / CH138 (U-NII-3 Band)**
	

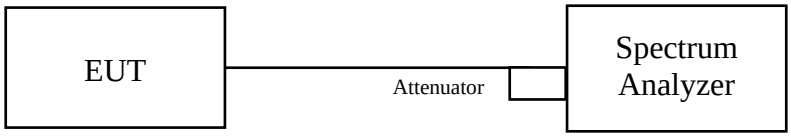
Note: The 6dB bandwidth above 5725MHz = Marker 1 + Delta 2 - 5725MHz

9.2. 26dB Bandwidth

Test procedure

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

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	26 dB Bandwidth (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
36	5180	19.2208	23.8162	PASS
44	5220	21.1389	22.7373	PASS
48	5240	18.981	19.2208	PASS
52	5260	27.2927	24.2957	PASS
60	5300	20.9391	26.014	PASS
64	5320	20.0599	22.5774	PASS
100	5500	19.98	19.7003	PASS
116	5580	27.6523	38.242	PASS
140	5700	19.2607	18.7812	PASS
144 (U-NII-2c Band)	5720	14.7502	14.95	PASS

802.11ac (VHT20)

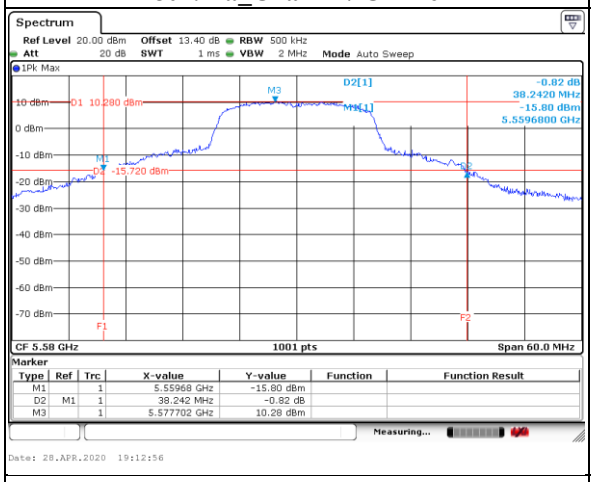
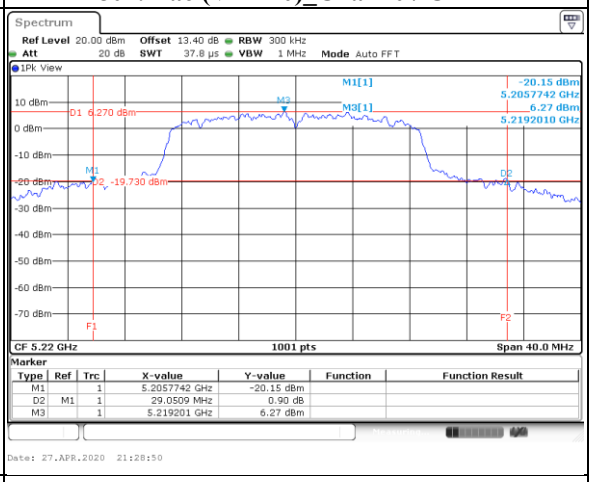
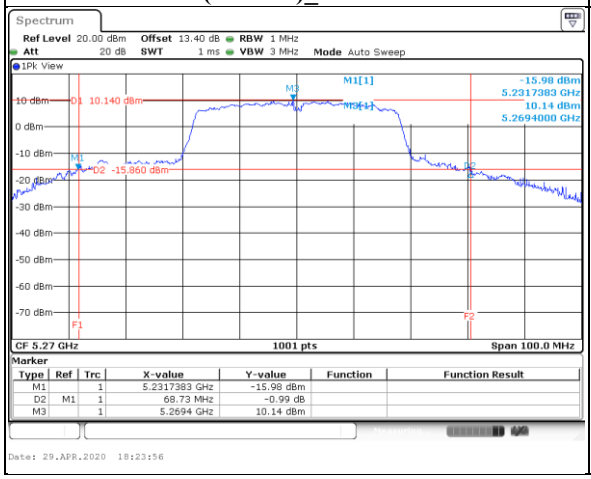
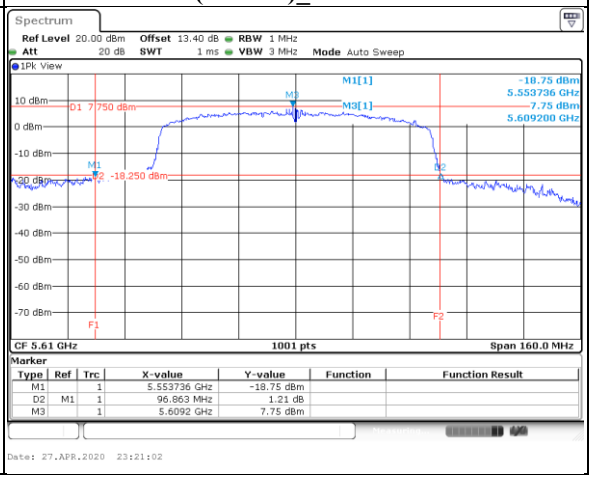
CHANNEL	CHANNEL FREQUENCY (MHz)	26 dB Bandwidth (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
36	5180	21.1788	24.5754	PASS
44	5220	29.0509	23.4565	PASS
48	5240	19.8601	20.8991	PASS
52	5260	20.8591	22.977	PASS
60	5300	21.6983	27.8921	PASS
64	5320	20.6993	24.7752	PASS
100	5500	20.4595	20.2997	PASS
116	5580	21.8182	22.4176	PASS
140	5700	20.2198	20.8192	PASS
144 (U-NII-2c Band)	5720	14.99	15.5894	PASS

802.11ac (VHT40)

CHANNEL	CHANNEL FREQUENCY (MHz)	26 dB Bandwidth (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
38	5190	52.6673	51.3087	PASS
46	5230	60.02	49.5504	PASS
54	5270	68.73	65.7742	PASS
62	5310	46.2737	56.024	PASS
102	5510	43.5564	44.8352	PASS
110	5550	55.1449	44.5155	PASS
134	5670	51.2288	48.4316	PASS
142 (U-NII-2c Band)	5710	50.7243	43.5315	PASS

802.11ac (VHT80)

CHANNEL	CHANNEL FREQUENCY (MHz)	26 dB Bandwidth (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
42	5210	80.4	81.039	PASS
58	5290	80.719	81.518	PASS
106	5530	81.678	81.998	PASS
122	5610	80.879	96.863	PASS
138 (U-NII-2c Band)	5690	76.558	76.399	PASS

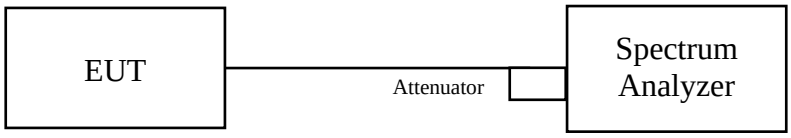
Spectrum Plot of Worst Value	
802.11a_Chain 1 / CH116	**802.11ac (VHT20)_Chain 0 / CH44**
	
802.11ac (VHT40)_Chain 0 / CH54	**802.11ac (VHT80)_Chain 1 / CH122**
	

9.3. Occupied Bandwidth

Test procedure

a. Set center frequency to the nominal EUT channel center frequency.
b. Set span = 1.5 times to 5.0 times the OBW.
c. Set RBW = 1% to 5% of the OBW
d. Set VBW ≥ 3 x RBW
e. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
f. Use the 99% power bandwidth function of the instrument (if available).
g. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

802.11a

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
36	5180	16.3437	16.4635
44	5220	16.3836	16.3437
48	5240	16.3037	16.3037
52	5260	16.5035	16.4635
60	5300	16.3836	16.5834
64	5320	16.3437	16.4635
100	5500	16.3437	16.3037
116	5580	16.5035	16.983
140	5700	16.3037	16.3437
144 (U-NII-2c Band)	5720	13.2717	13.2318
144 (U-NII-3 Band)	5720	3.2318	3.2717
149	5745	16.8232	16.5035
157	5785	16.983	16.6234
165	5825	16.7433	18.1419

802.11ac (VHT20)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
36	5180	17.4625	17.5025
44	5220	17.7023	17.5824
48	5240	17.4226	17.4226
52	5260	17.4625	17.5425
60	5300	17.5425	17.7822
64	5320	17.5025	17.5025
100	5500	17.4226	17.4625
116	5580	17.5425	17.5425
140	5700	17.4625	17.4625
144 (U-NII-2c Band)	5720	13.7912	13.7912
144 (U-NII-3 Band)	5720	3.7512	3.7512
149	5745	17.9021	17.5824
157	5785	17.8621	17.5425
165	5825	17.6623	17.982

802.11ac (VHT40)

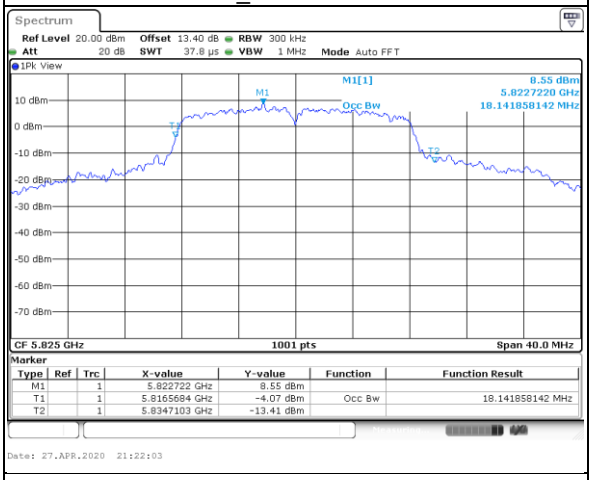
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
38	5190	36.1239	36.1239
46	5230	36.5235	36.3636
54	5270	36.9231	37.0829
62	5310	36.1239	36.2837
102	5510	35.964	36.044
110	5550	35.964	36.1239
134	5670	36.2038	36.3636
142 (U-NII-2c Band)	5710	33.5415	33.2218
142 (U-NII-3 Band)	5710	2.982	3.0619
151	5755	35.8042	36.1239
159	5795	35.8841	35.8841

802.11ac (VHT80)

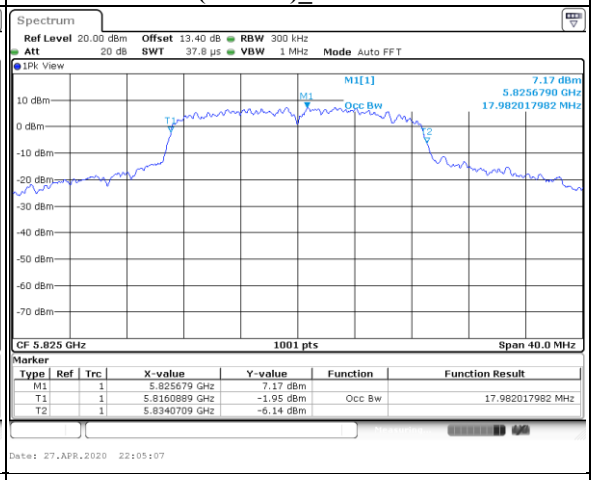
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	
		CHAIN 0	CHAIN 1
42	5210	74.8052	74.6454
58	5290	74.6454	74.8052
106	5530	74.4855	74.6454
122	5610	74.965	75.2847
138 (U-NII-2c Band)	5690	72.562	72.562
138 (U-NII-3 Band)	5690	2.403	2.403
155	5775	74.965	75.2847

Spectrum Plot of Worst Value

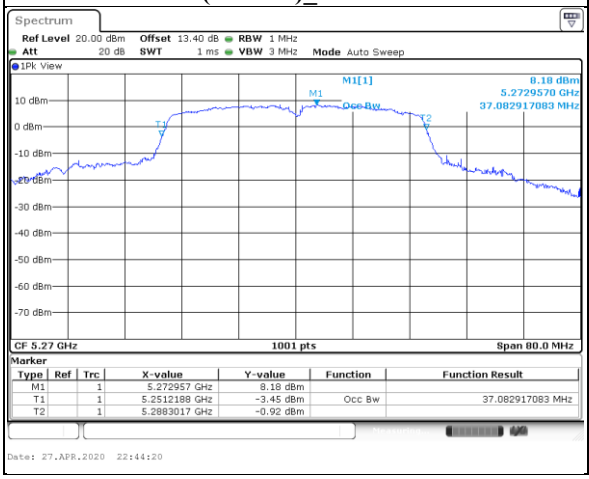
802.11a_Chain 1 / CH165



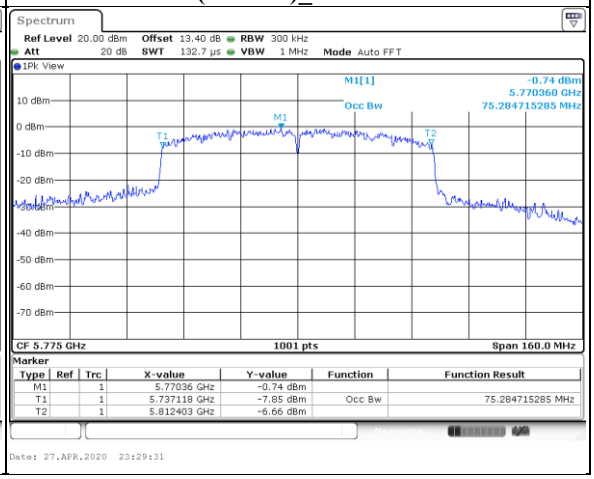
802.11ac (VHT20)_Chain 1 / CH165



802.11ac (VHT40)_Chain 1 / CH54

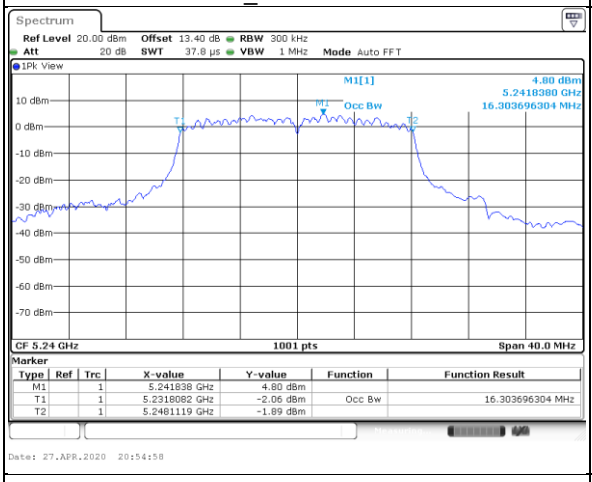


802.11ac (VHT80)_Chain 1 / CH155

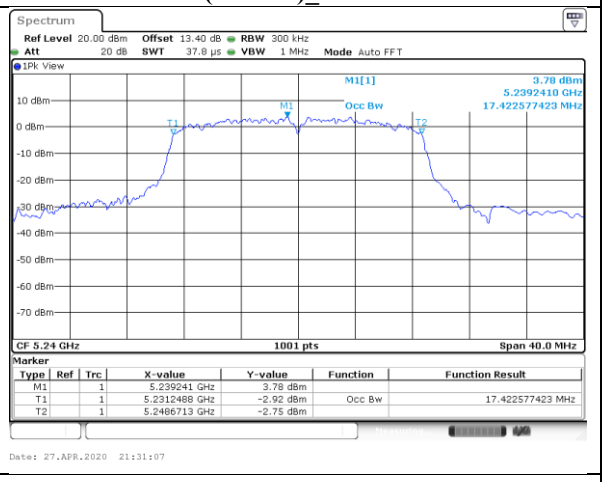


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2A band)

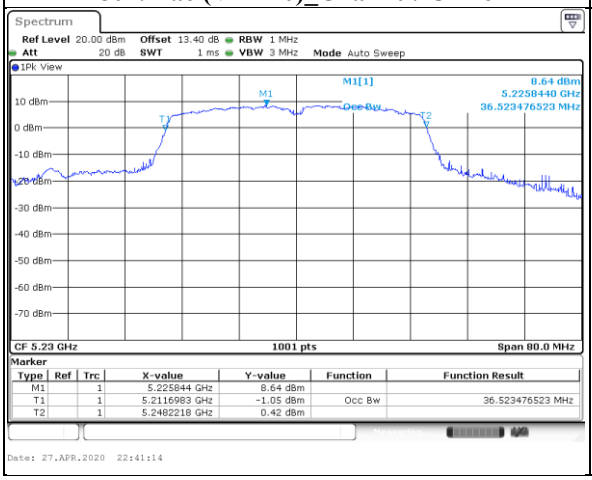
802.11a_Chain 0 / CH48



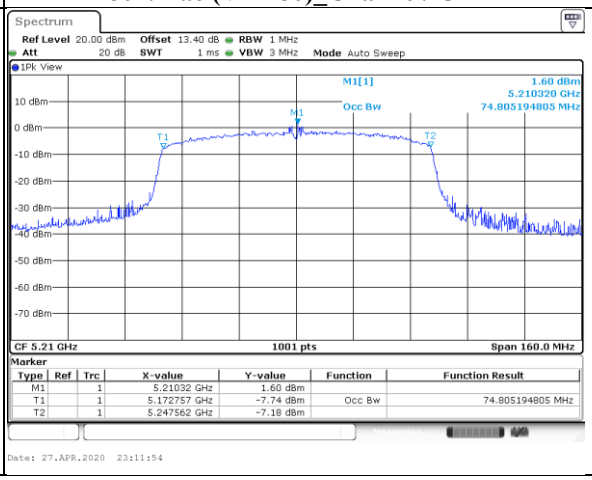
802.11ac (VHT20)_Chain 0 / CH48



802.11ac (VHT40)_Chain 0 / CH46

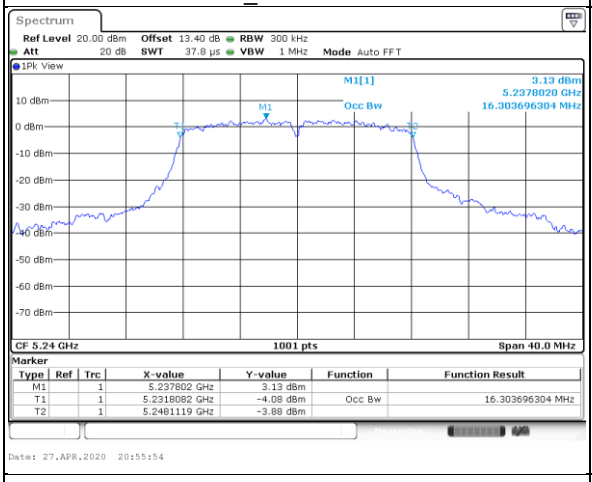


802.11ac (VHT80)_Chain 0 / CH42

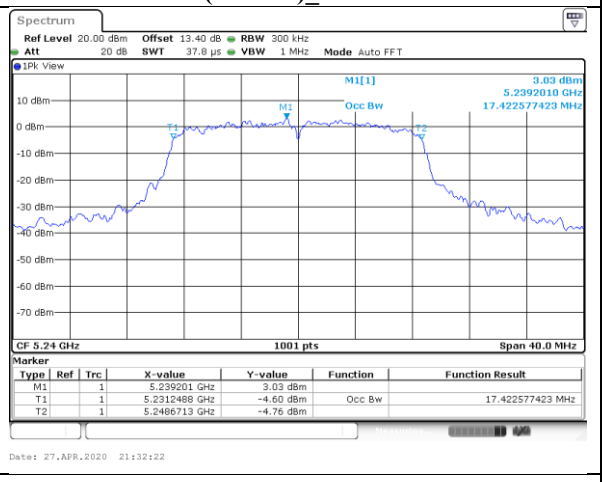


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2A band)

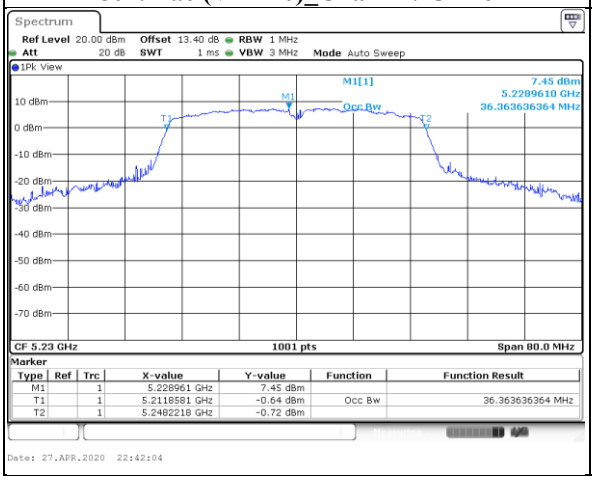
802.11a_Chain 1 / CH48



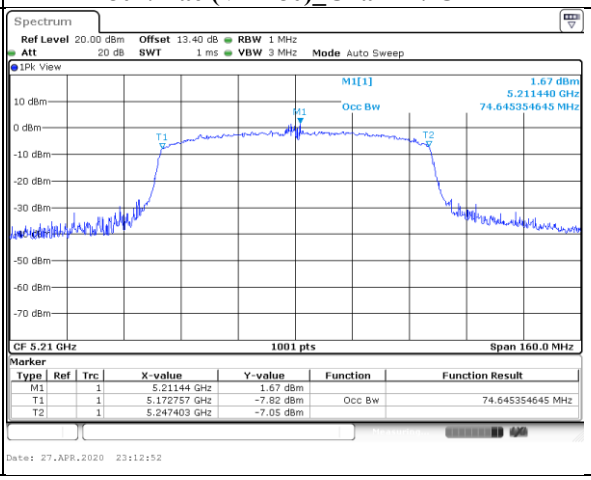
802.11ac (VHT20)_Chain 1 / CH48



802.11ac (VHT40)_Chain 1 / CH46



802.11ac (VHT80)_Chain 1 / CH42



9.4. Conducted output power

Requirements

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) Max. e.i.r.p ≦ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6)
		Fixed point-to-point Access Point	1 Watt (30 dBm) If G_{TX} > 23 dBi, then P_{Out} = 30 – (G_{TX} – 23)
		Indoor Access Point	1 Watt (30 dBm) If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6)
	V	Client device	250mW (24 dBm) If G_{TX} > 6 dBi, then P_{Out} = 24 – (G_{TX} – 6)
U-NII-2A	---		250mW (24 dBm) or 11 dBm+10 log B* If G_{TX} > 6 dBi, then P_{Out} = 24 – (G_{TX} – 6)
U-NII-2C	---		250mW (24 dBm) or 11 dBm+10 log B* If G_{TX} > 6 dBi, then P_{Out} = 24 – (G_{TX} – 6)
U-NII-3	---		For Point-to-multipoint systems (P2M): 1 Watt (30 dBm). If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6) For Point-to-point systems (P2P): 1 Watt (30 dBm)

Note:
1. P_{Out} = maximum conducted output power in dBm,
2. G_{TX} = the maximum transmitting antenna directional gain in dBi.
3. Directional Gain = G_{ant} + 10 log (Nant) dBi.

   Nαnt: Number of Transmit Antennas
   G1, G2,..., Gn: Gain of Individual Antennas (Same for Each Antenna)

4. B is the 26 dB emission bandwidth in megahertz

   Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

   Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
   Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
   Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

   For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

Test Procedure

For Average Power Measurement

Test method PM-G

For 802.11a, 802.11ac (VHT20), 802.11ac (VHT40)

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst and set the detector to AVERAGE. Duty factor is not added to measured value.

Test method SA-1

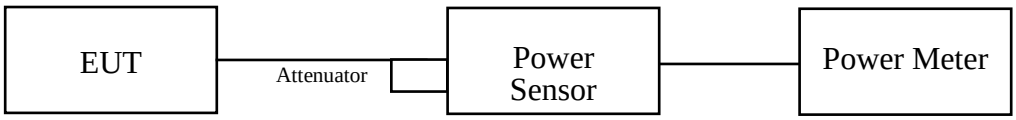
For 802.11ac (VHT80), Channel Straddling (802.11a, 802.11ac (VHT20/ VHT40/ VHT80))

a. Set span to encompass the entire EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
b. Set RBW = 1 MHz.
c. Set VBW ≥ 3 MHz
d. Number of points in sweep ≥ 2 Span / RBW.
e. Sweep time = auto.
f. Detector = RMS.
g. Trace average at least 100 traces in power averaging mode.
h. Compute power by integrating the spectrum across the EBW of the signal.

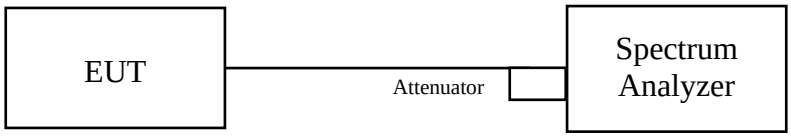
* If transmit duty cycle < 98%, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."

Test Setup

For Average Power Measurement



The loss between RF output port of the EUT and the input port of the Power Meter has been taken into consideration.



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

802.11a

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		chain 0	chain 1				
36	5180	13.22	11.73	35.883	15.55	24	PASS
44	5220	13.2	12.92	40.481	16.07	24	PASS
48	5240	10.8	9.46	20.854	13.19	24	PASS
52	5260	15.68	14.72	66.631	18.24	24	PASS
60	5300	14.46	14.54	56.37	17.51	24	PASS
64	5320	14.01	13.81	49.221	16.92	24	PASS
100	5500	14.29	13.67	50.134	17.00	23.94	PASS
116	5580	15.5	15.34	69.679	18.43	24	PASS
140	5700	13.65	13.34	44.751	16.51	23.73	PASS
144 (U-NII-2c Band)	5720	10.37	10.95	23.334	13.68	22.68	PASS
144 (U-NII-3 Band)	5720	2.17	2.24	3.323	5.22	30	PASS
149	5745	15.75	14.69	67.028	18.26	30	PASS
157	5785	15.86	14.72	68.196	18.34	30	PASS
165	5825	15.68	15.45	72.058	18.58	30	PASS

For Reference only – Power meter value

The power value was measured by power meter with average sensor.

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		chain 0	chain 1		
144	5720	15.63	14.75	66.413	18.22
Note: The total power was calculated through formula and record the value for reference only.					

802.11ac (VHT20)

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		chain 0	chain 1				
36	5180	13.16	12.79	39.712	15.99	24	PASS
44	5220	13.46	13.1	42.599	16.29	24	PASS
48	5240	10.27	8.88	18.368	12.64	24	PASS
52	5260	15.52	15.56	71.62	18.55	24	PASS
60	5300	14.61	14.62	57.88	17.63	24	PASS
64	5320	14.44	14.36	55.087	17.41	24	PASS
100	5500	13.34	13.12	42.089	16.24	24	PASS
116	5580	15.81	15.77	75.864	18.80	24	PASS
140	5700	13.77	12.97	43.638	16.40	24	PASS
144 (U-NII-2c Band)	5720	9.63	9.65	18.409	12.65	22.75	PASS
144 (U-NII-3 Band)	5720	2.88	2.62	3.769	5.76	30	PASS
149	5745	15.03	14.47	59.832	17.77	30	PASS
157	5785	15.9	14.87	69.595	18.43	30	PASS
165	5825	15.56	15.32	70.016	18.45	30	PASS

For Reference only – Power meter value

The power value was measured by power meter with average sensor.

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		chain 0	chain 1		
144	5720	16.06	15.55	76.257	18.82
Note: The total power was calculated through formula and record the value for reference only.					

802.11ac (VHT40)

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		chain 0	chain 1				
38	5190	8.50	8.17	13.64	11.35	24	PASS
46	5230	14.62	12.87	48.337	16.84	24	PASS
54	5270	14.37	13.12	47.865	16.80	24	PASS
62	5310	11.54	10.60	25.738	14.11	24	PASS
102	5510	9.41	8.76	16.246	12.11	24	PASS
110	5550	14.80	14.44	57.997	17.63	24	PASS
134	5670	14.00	13.72	48.669	16.87	24	PASS
142 (U-NII-2c Band)	5710	9.76	9.83	19.078	12.81	24	PASS
142 (U-NII-3 Band)	5710	-3.96	-3.83	0.8158	-0.88	30	PASS
151	5755	14.10	13.81	49.748	16.97	30	PASS
159	5795	13.92	13.16	45.361	16.57	30	PASS

For Reference only – Power meter value

The power value was measured by power meter with average sensor.

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		chain 0	chain 1		
142	5710	14.70	14.08	55.098	17.41
Note: The total power was calculated through formula and record the value for reference only.					

802.11ac (VHT80)

CHAN.	CHAN. FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		chain 0	chain 1				
42	5210	7.44	6.78	10.31	10.13	24	PASS
58	5290	10.07	10.19	20.609	13.14	24	PASS
106	5530	10.20	9.50	19.384	12.87	24	PASS
122	5610	13.96	13.43	46.918	16.71	24	PASS
138 (U-NII-2c Band)	5690	8.89	8.96	15.615	11.94	24	PASS
138 (U-NII-3 Band)	5690	-10.46	-10.73	0.1744	-7.58	30	PASS
155	5775	13.86	13.52	46.813	16.70	30	PASS

CHAN.	FREQ. (MHz)	MAXIMUM CONDUCTED POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		chain 0	chain 1		
138	5690	13.95	14.27	51.561	17.12
Note: The total power was calculated through formula and record the value for reference only.					

9.5. Power Spectral Density

Requirements

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	17dBm/ MHz If G_{TX} > 6 dBi, then PSD = 17 – (G_{TX} – 6)
		Fixed point-to-point Access Point	17dBm/ MHz If G_{TX} > 23 dBi, then PSD = 17 – (G_{TX} – 23)
		Indoor Access Point	17dBm/ MHz If G_{TX} > 6 dBi, then PSD = 17 – (G_{TX} – 6)
	√	Client device	11dBm/ MHz If G_{TX} > 6 dBi, then PSD = 11 – (G_{TX} – 6)
U-NII-2A	---		11dBm/ MHz If G_{TX} > 6 dBi, then PSD = 11 – (G_{TX} – 6)
U-NII-2C	---		11dBm/ MHz If G_{TX} > 6 dBi, then PSD = 11 – (G_{TX} – 6)
U-NII-3	---		For Point-to-multipoint systems (P2M): 30dBm/ 500kHz. If G_{TX} > 6 dBi, then PSD = 30 – (G_{TX} – 6) For Point-to-point systems (P2P): 30dBm/ 500kHz

Note:
1. PSD = power spectral density that he same method as used to determine the conducted output power shall be used to determine the power spectral density. And power spectral density in dBm/MHz
2. G_{TX} = the maximum transmitting antenna directional gain in dBi.
3. Directional Gain = G_{ant} + 10 log (Nant) dBi.

   N*a*nt: Number of Transmit Antennas
   G1, G2,..., Gn: Gain of Individual Antennas (Same for Each Antenna)

Test procedure

For U-NII-1, U-NII-2A, U-NII-2C band:

Using method SA-2_with Duty cycle <98 %

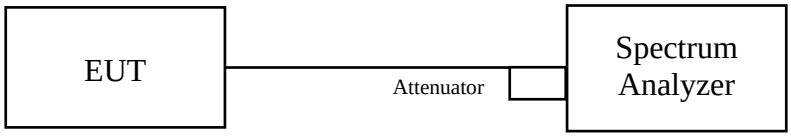
a. Set span to encompass the entire emission bandwidth (EBW) of the signal.
b. Set RBW = 1 MHz, Set VBW ≥ 3 RBW, Detector = RMS
c. Sweep time = auto, trigger set to "free run".
d. Trace average at least 100 traces in power averaging mode.
e. Record the max value and add 10 log (1/duty cycle)

For U-NII-3 band:

with Duty cycle <98 %

a. Set span to encompass the entire emission bandwidth (EBW) of the signal.
b. Set RBW = 500 kHz, Set VBW ≥ 3 RBW, Detector = RMS
c. Use the peak marker function to determine the maximum power level in any 500 kHz band segment within the fundamental EBW.
d. Sweep time = auto, trigger set to "free run".
e. Trace average at least 100 traces in power averaging mode.
f. Record the max value and add 10 log (1/duty cycle)

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

For U-NII-1, U-NII-2A, U-NII-2C band

802.11a

CHAN.	FREQ. (MHz)	PSD (dBm)		TOTAL PSD with duty factor (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
36	5180	1.55	1.76	5.30	9.49	PASS
44	5220	3.22	2.92	6.72	9.49	PASS
48	5240	1.73	0.44	4.78	9.49	PASS
52	5260	4.16	3.80	7.63	9.49	PASS
60	5300	3.94	4.25	7.74	9.49	PASS
64	5320	3.95	4.05	7.65	9.49	PASS
100	5500	2.67	3.42	6.71	9.49	PASS
116	5580	4.41	4.83	8.27	9.49	PASS
140	5700	2.20	2.53	6.01	9.49	PASS
144 (U-NII-2c Band)	5720	3.73	3.11	7.08	9.49	PASS

Note:

1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 7.51 dBi > 6 dBi , so the limit shall be reduced.
3. Refer to section 6.6 for duty cycle spectrum plot.

802.11ac (VHT20)

CHAN.	FREQ. (MHz)	PSD (dBm)		TOTAL PSD with duty factor (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
36	5180	2.18	2.31	5.96	9.49	PASS
44	5220	3.57	4.16	7.59	9.49	PASS
48	5240	1.31	0.01	4.42	9.49	PASS
52	5260	2.83	2.87	6.57	9.49	PASS
60	5300	3.72	3.82	7.49	9.49	PASS
64	5320	3.94	3.56	7.47	9.49	PASS
100	5500	2.69	2.69	6.41	9.49	PASS
116	5580	4.13	4.36	7.96	9.49	PASS
140	5700	2.38	2.24	6.03	9.49	PASS
144 (U-NII-2c Band)	5720	1.38	2.21	5.53	9.49	PASS

Note:

1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 7.51 dBi > 6 dBi , so the limit shall be reduced.
3. Refer to section 6.6 for duty cycle spectrum plot.

802.11ac (VHT40)

CHAN.	FREQ. (MHz)	PSD (dBm)		TOTAL PSD with duty factor (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
38	5190	-6.54	-5.60	-2.37	9.49	PASS
46	5230	-0.31	-1.11	2.98	9.49	PASS
54	5270	0.71	-0.40	3.87	9.49	PASS
62	5310	-3.25	-3.77	0.17	9.49	PASS
102	5510	-5.20	-5.09	-1.47	9.49	PASS
110	5550	-0.80	-0.59	2.98	9.49	PASS
134	5670	-1.37	0.43	3.30	9.49	PASS
142 (U-NII-2c Band)	5710	-0.83	-0.57	2.98	9.49	PASS

Note:

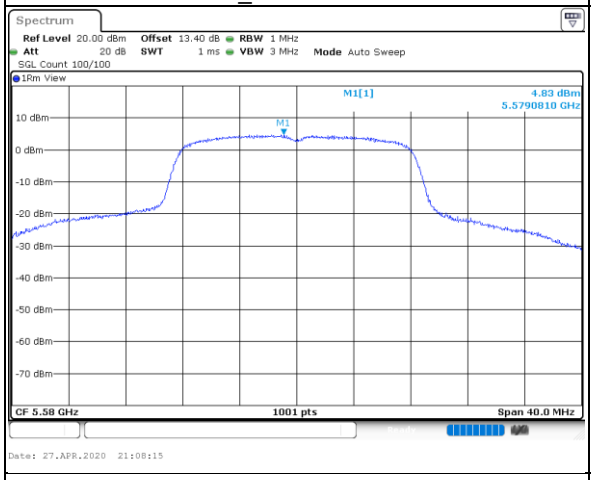
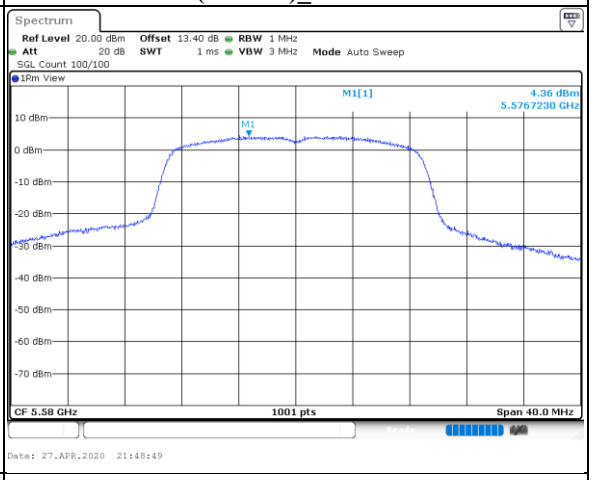
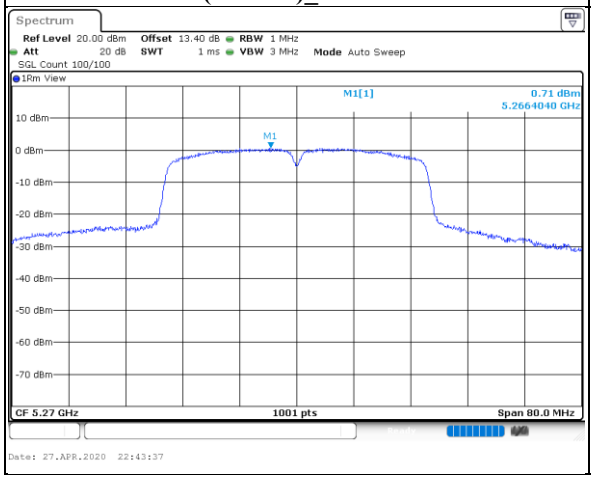
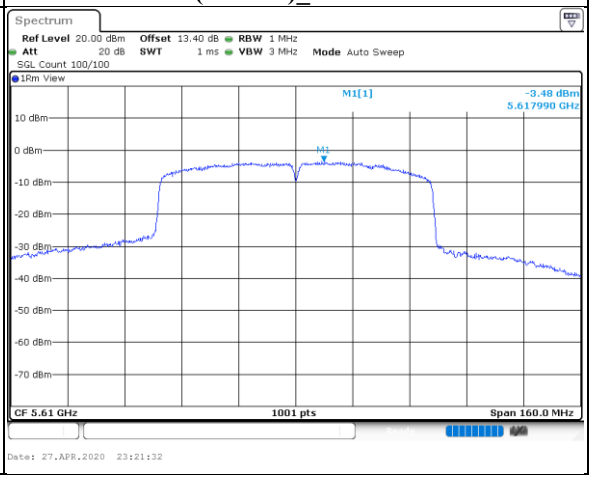
1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 7.51 dBi > 6 dBi , so the limit shall be reduced.
3. Refer to section 6.6 for duty cycle spectrum plot.

802.11ac (VHT80)

CHAN.	FREQ. (MHz)	PSD (dBm)		TOTAL PSD with duty factor (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
42	5210	-10.51	-10.44	-6.24	9.49	PASS
58	5290	-6.70	-7.00	-2.61	9.49	PASS
106	5530	-7.52	-7.95	-3.49	9.49	PASS
122	5610	-4.27	-3.48	0.38	9.49	PASS
138 (U-NII-2c Band)	5690	-4.36	-4.53	-0.21	9.49	PASS

Note:

1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 7.51 dBi > 6 dBi , so the limit shall be reduced.
3. Refer to section 6.6 for duty cycle spectrum plot.

Spectrum Plot of Worst Value	
802.11a_Chain 1 / CH116	**802.11ac (VHT20)_Chain 1 / CH116**
	
802.11ac (VHT40)_Chain 0 / CH54	**802.11ac (VHT80)_Chain 1 / CH122**
	

For U-NII-3 band

802.11a

TX Chain	Channel	Frequency (MHz)	PSD w/o duty factor (dBm/500 kHz)	10 log (N=2) dB	Total PSD with Duty Factor (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	144 (U-NII-3 Band)	5720	-1.36	3.01	2.29	28.49	Pass
	149	5745	0.39	3.01	4.04	28.49	Pass
	157	5785	2.12	3.01	5.77	28.49	Pass
	165	5825	2.33	3.01	5.98	28.49	Pass
1	144 (U-NII-3 Band)	5720	-0.91	3.01	2.74	28.49	Pass
	149	5745	0.86	3.01	4.51	28.49	Pass
	157	5785	0.83	3.01	4.48	28.49	Pass
	165	5825	2.28	3.01	5.93	28.49	Pass

Note:

1. Directional gain = 7.51 dBi > 6 dBi , so the limit shall be reduced.
2. Refer to section 6.6 for duty cycle spectrum plot.

802.11ac (VHT20)

TX Chain	Channel	Frequency (MHz)	PSD w/o duty factor (dBm/500 kHz)	10 log (N=2) dB	Total PSD with Duty Factor (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	144 (U-NII-3 Band)	5720	-2.88	3.01	0.84	28.49	Pass
	149	5745	0.94	3.01	4.66	28.49	Pass
	157	5785	1.53	3.01	5.25	28.49	Pass
	165	5825	0.91	3.01	4.63	28.49	Pass
1	144 (U-NII-3 Band)	5720	-1.97	3.01	1.75	28.49	Pass
	149	5745	0.74	3.01	4.46	28.49	Pass
	157	5785	1.05	3.01	4.77	28.49	Pass
	165	5825	1.66	3.01	5.38	28.49	Pass

Note:

1. Directional gain = 7.51 dBi > 6 dBi , so the limit shall be reduced.
2. Refer to section 6.6 for duty cycle spectrum plot.

802.11ac (VHT40)

TX Chain	Channel	Frequency (MHz)	PSD w/o duty factor (dBm/500 kHz)	10 log (N=2) dB	Total PSD with Duty Factor (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	142 (U-NII-3 Band)	5710	-6.20	3.01	-2.53	28.49	Pass
	151	5755	-4.71	3.01	-1.04	28.49	Pass
	159	5795	-2.98	3.01	0.69	28.49	Pass
1	142 (U-NII-3 Band)	5710	-6.33	3.01	-2.66	28.49	Pass
	151	5755	-3.18	3.01	0.49	28.49	Pass
	159	5795	-3.88	3.01	-0.21	28.49	Pass

Note:

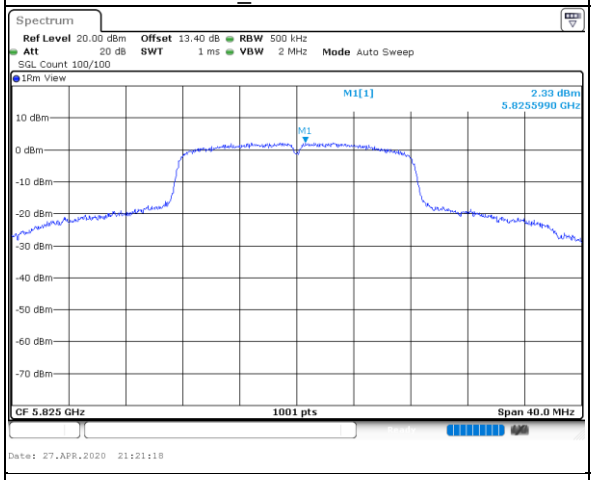
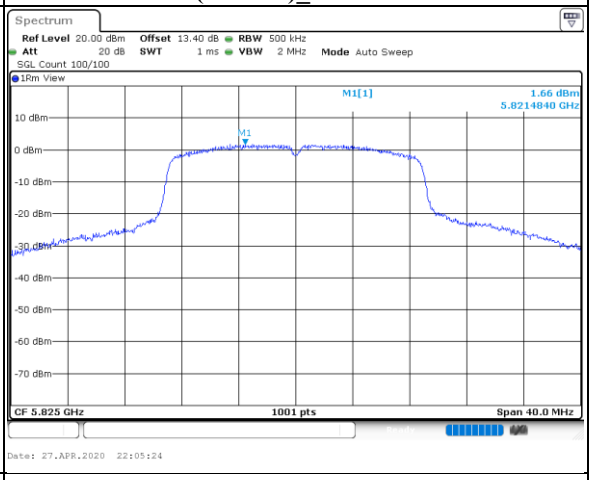
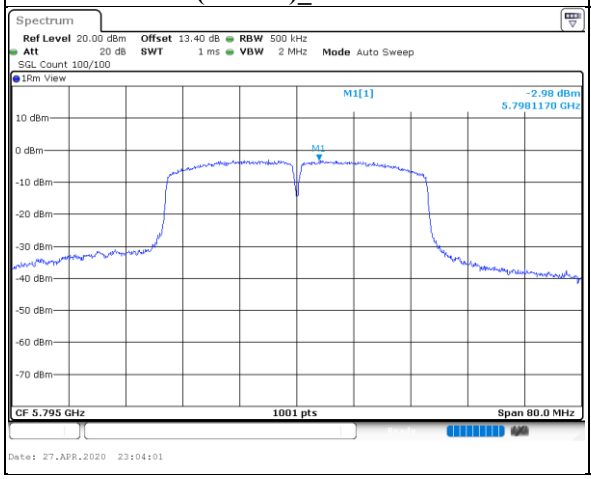
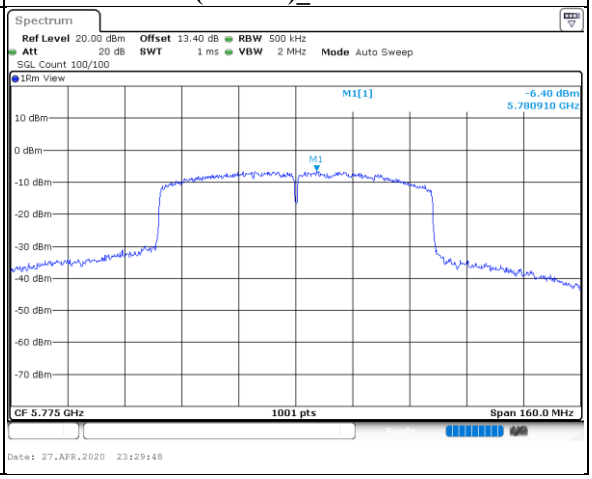
1. Directional gain = 7.51 dBi > 6 dBi , so the limit shall be reduced.
2. Refer to section 6.6 for duty cycle spectrum plot.

802.11ac (VHT80)

TX Chain	Channel	Frequency (MHz)	PSD w/o duty factor (dBm/500 kHz)	10 log (N=2) dB	Total PSD with Duty Factor (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	138 (U-NII-3 Band)	5690	-12.24	3.01	-8.01	28.49	Pass
	155	5775	-7.28	3.01	-3.05	28.49	Pass
1	138 (U-NII-3 Band)	5690	-11.62	3.01	-7.39	28.49	Pass
	155	5775	-6.40	3.01	-2.17	28.49	Pass

Note:

1. Directional gain = 7.51 dBi > 6 dBi , so the limit shall be reduced.
2. Refer to section 6.6 for duty cycle spectrum plot.

Spectrum Plot of Worst Value	
802.11a_Chain 0 / CH165	**802.11ac (VHT20)_Chain 1 / CH165**
	
802.11ac (VHT40)_Chain 0 / CH159	**802.11ac (VHT80)_Chain 1 / CH155**
	

9.6. Frequency Stability

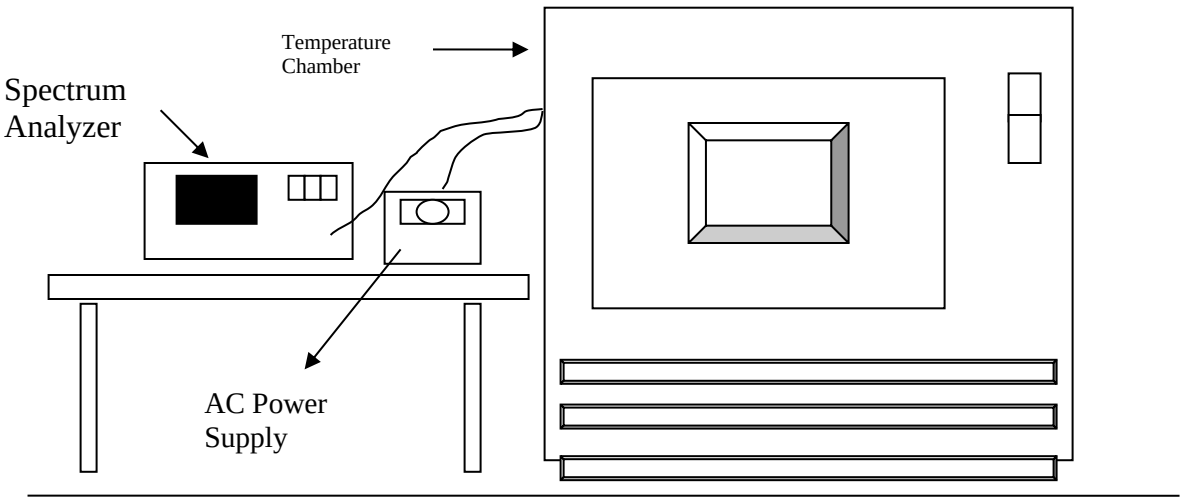
Requirements

The frequency of the carrier signal shall be maintained within band of operation.

Test procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
b. Turn the EUT on and couple its output to a spectrum analyzer.
c. Turn the EUT off and set the chamber to the highest temperature specified.
d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 Minutes.
e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 Minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

Test Setup



Test Data

Frequency Stability Versus Temp.									
Operating Frequency: 5180 MHz									
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)
50	120	5180.0009	0.18	5180.0049	0.95	5180.0082	1.58	5180.0068	1.30
40	120	5180.0046	0.90	5180.0038	0.74	5180.0087	1.67	5180.0050	0.97
30	120	5180.0010	0.20	5180.0010	0.20	5180.0079	1.52	5180.0042	0.81
20	120	5180.0064	1.24	5180.0085	1.64	5180.0039	0.75	5180.0082	1.58
10	120	5180.0094	1.82	5180.0001	0.02	5179.9999	-0.02	5180.0052	1.00
0	120	5180.0057	1.09	5180.0008	0.16	5179.9996	-0.07	5180.0020	0.39
-10	120	5180.0051	0.99	5180.0050	0.96	5180.0062	1.21	5180.0016	0.31
-20	120	5179.9993	-0.14	5180.0038	0.74	5180.0022	0.42	5179.9990	-0.19
-30	120	5180.0064	1.24	5179.9992	-0.15	5180.0053	1.02	5180.0061	1.17
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)
20	102	5180.0039	0.76	5180.0067	1.29	5180.0005	0.10	5180.0006	0.11
20	138	5180.0075	1.45	5180.0059	1.15	5180.0057	1.11	5180.0073	1.41

9.7. Radiated Spurious Emission

Requirements

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequency(MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

Applicable To		Limit	
789033 D02 General UNII Test Procedure New Rules v02r01		Field Strength at 3m	
		PK:74 (dBµV/m)	AV:54 (dBµV/m)
Frequency Band	**Applicable To**	**EIRP Limit**	**Equivalent Field Strength at 3m**
5150~5250 MHz	15.407(b)(1)	PK:-27 (dBm/MHz)	PK:68.2(dBµV/m)
5250~5350 MHz	15.407(b)(2)		
5470~5725 MHz	15.407(b)(3)		
5725~5850 MHz	15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBµV/m) *1 PK:105.2 (dBµV/m) *2 PK: 110.8(dBµV/m) *3 PK:122.2 (dBµV/m) *4
*1 beyond 75 MHz or more above of the band edge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.			

Note:
The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$E = \frac{1000000\sqrt{30P}}{3}$ µV/m, where P is the eirp (Watts).

Test Procedures

[For 9 kHz ~ 30 MHz]

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
b. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.

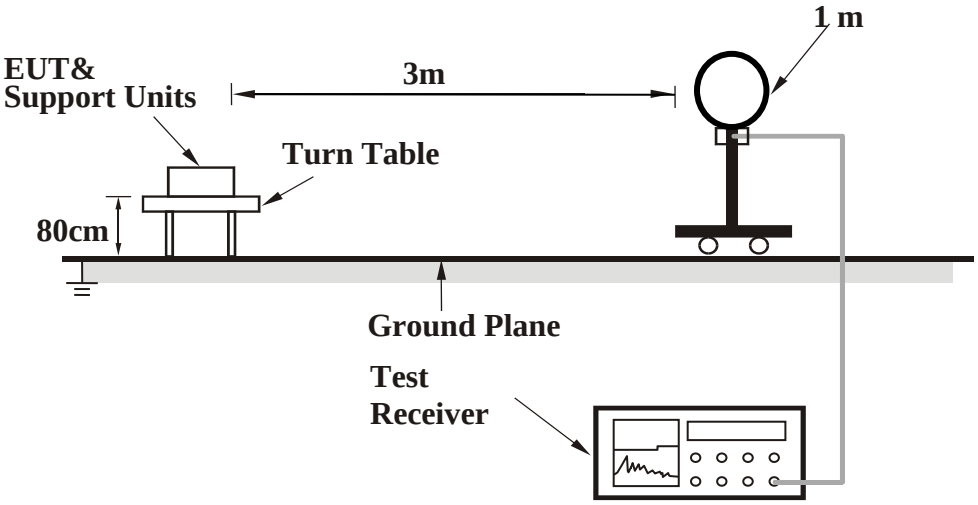
Configuration	Average	
	RBW	VBW
802.11a	1MHz	1 kHz
802.11n (HT20)		1 kHz
802.11n (HT40)		2 kHz
802.11ac (VHT80)		3 kHz

Note: Refer to section 6.6 for duty cycle.

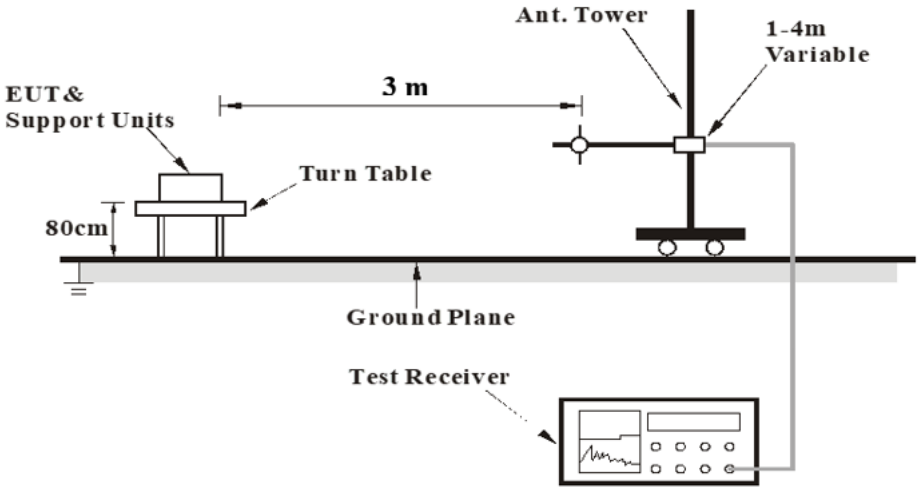
d. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported.

Test Setup

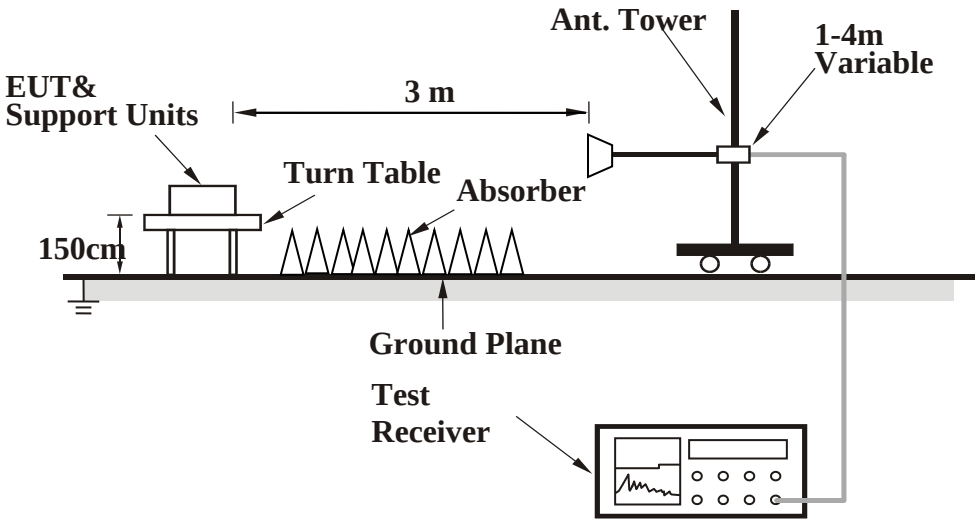
<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



<Frequency Range above 1 GHz>



For the actual test configuration, please refer to the Setup Configurations.

Test Data

Above 1GHz Data

802.11a

EUT Test Condition		Measurement Detail	
Channel	Channel 36	Frequency Range	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5148.8	59.55	10.16	69.71	74	-4.29	Peak
@	5180	100.09	10.11	110.2	-	-	Peak
-	5150	40.31	10.16	50.47	54	-3.53	Average
@	5180	92.03	10.11	102.14	-	-	Average
#	10360	37.85	12.16	50.01	68.2	-18.19	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	5147.6	54.3	10.16	64.46	74	-9.54	Peak
@	5180	99.46	10.11	109.57	-	-	Peak
-	5150	39.27	10.16	49.43	54	-4.57	Average
@	5180	90.93	10.11	101.04	-	-	Average
#	10360	41.17	12.16	53.33	68.2	-14.87	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 44	**Frequency Range**	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
-	5115.2	43.5	10.07	53.57	74	-20.43	Peak
@	5220	101.43	9.9	111.33	-	-	Peak
-	5145.8	31.56	10.15	41.71	54	-12.29	Average
@	5220	93.48	9.9	103.38	-	-	Average
#	10440	36.37	12.46	48.83	68.2	-19.37	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
-	5149.4	42.75	10.16	52.91	74	-21.09	Peak
@	5220	99.56	9.9	109.46	-	-	Peak
-	5141.3	31.49	10.13	41.62	54	-12.38	Average
@	5220	91.77	9.9	101.67	-	-	Average
#	10440	38.26	12.46	50.72	68.2	-17.48	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 48	**Frequency Range**	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
-	5143.4	42.7	10.15	52.85	74	-21.15	Peak
@	5240	98.53	9.7	108.23	-	-	Peak
-	5087.9	31.47	9.98	41.45	54	-12.55	Average
@	5240	90.78	9.7	100.48	-	-	Average
#	10480	33.18	12.6	45.78	68.2	-22.42	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
-	5139.8	43.65	10.14	53.79	74	-20.21	Peak
@	5240	98.41	9.7	108.11	-	-	Peak
-	5115.5	31.5	10.07	41.57	54	-12.43	Average
@	5240	89.61	9.7	99.31	-	-	Average
#	10480	37.44	12.6	50.04	68.2	-18.16	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 52	**Frequency Range**	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
@	5260	101.53	9.6	111.13	-	-	Peak
-	5352	43.08	9.67	52.75	74	-21.25	Peak
@	5260	93.18	9.6	102.78	-	-	Average
-	5350.2	30.2	9.66	39.86	54	-14.14	Average
#	10520	34.22	12.66	46.88	68.2	-21.32	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
@	5260	100.65	9.6	110.25	-	-	Peak
-	5447.4	41.29	10.09	51.38	74	-22.62	Peak
@	5260	92.03	9.6	101.63	-	-	Average
-	5351.7	30.81	9.67	40.48	54	-13.52	Average
#	10520	38.27	12.66	50.93	68.2	-17.27	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 60	**Frequency Range**	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
@	5300	101	9.53	110.53	-	-	Peak
-	5352.3	52.59	9.67	62.26	74	-11.74	Peak
@	5300	91.43	9.53	100.96	-	-	Average
-	5350.5	34.23	9.66	43.89	54	-10.11	Average
*	10600	34.06	12.55	46.61	74	-27.39	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
@	5300	100.53	9.53	110.06	-	-	Peak
-	5352.3	47.07	9.67	56.74	74	-17.26	Peak
@	5300	91.08	9.53	100.61	-	-	Average
-	5350.2	32.5	9.66	42.16	54	-11.84	Average
*	10600	36.72	12.55	49.27	74	-24.73	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
6. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 64	**Frequency Range**	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
@	5320	100.66	9.58	110.24	-	-	Peak
-	5352.9	63.94	9.68	73.62	74	-0.38	Peak
@	5320	92.2	9.58	101.78	-	-	Average
-	5350.2	43.7	9.66	53.36	54	-0.64	Average
*	10640	34.42	12.61	47.03	74	-26.97	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
@	5320	99.31	9.58	108.89	-	-	Peak
-	5354.1	57.77	9.68	67.45	74	-6.55	Peak
@	5320	91.03	9.58	100.61	-	-	Average
-	5350.2	41.85	9.66	51.51	54	-2.49	Average
*	10640	38.77	12.61	51.38	74	-22.62	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
6. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 100	**Frequency Range**	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
-	5459.85	42.13	10.12	52.25	54	-1.75	Average
-	5459.85	46.94	10.12	57.06	74	-16.94	Peak
#	5468.6	52.43	10.15	62.58	68.2	-5.62	Peak
@	5500	93.67	10.22	103.89	-	-	Average
@	5500	104.09	10.22	114.31	-	-	Peak
*	11000	34.83	13.08	47.91	74	-26.09	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
-	5458.8	30.12	10.12	40.24	54	-13.76	Average
-	5458.8	42.83	10.12	52.95	74	-21.05	Peak
#	5469.3	44.87	10.15	55.02	68.2	-13.18	Peak
@	5500	86.13	10.22	96.35	-	-	Average
@	5500	97.03	10.22	107.25	-	-	Peak
*	11000	38.5	13.08	51.58	74	-22.42	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 116	**Frequency Range**	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
-	5438.85	29.02	10.07	39.09	54	-14.91	Average
-	5438.85	41.1	10.07	51.17	74	-22.83	Peak
#	5463.35	42.62	10.13	52.75	68.2	-15.45	Peak
@	5580	95.37	10.3	105.67			Average
@	5580	106.33	10.3	116.63			Peak
#	5741.25	41.76	10.69	52.45	68.2	-15.75	Peak
*	11160	39.66	13.02	52.68	74	-21.32	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
-	5442	28.99	10.08	39.07	54	-14.93	Average
-	5442	41.58	10.08	51.66	74	-22.34	Peak
#	5460.55	40.74	10.12	50.86	68.2	-17.34	Peak
@	5580	83.95	10.3	94.25	-	-	Average
@	5580	91.7	10.3	102	-	-	Peak
#	5743.7	40.84	10.7	51.54	68.2	-16.66	Peak
-	11160	36.49	13.02	49.51	54	-4.49	Average
-	11160	44.73	13.02	57.75	74	-16.25	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 140	**Frequency Range**	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
@	5700	90.67	10.4	101.07	-	-	Average
@	5700	102.63	10.4	113.03	-	-	Peak
#	5724.8	56.92	10.57	67.49	68.2	-0.71	Peak
*	11400	35.01	13.3	48.31	74	-25.69	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
@	5700	80.93	10.4	91.33	-	-	Average
@	5700	89.09	10.4	99.49	-	-	Peak
#	5727.95	44.68	10.6	55.28	68.2	-12.92	Peak
*	11400	37.85	13.3	51.15	74	-22.85	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 144	**Frequency Range**	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
*	11440	33.33	13.4	46.73	74	-27.27	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
*	11440	35.28	13.4	48.68	74	-25.32	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 149	**Frequency Range**	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
#	5600	42.86	10.31	53.17	68.2	-15.03	Peak
-	5723	69.78	10.56	80.34	117.64	-37.3	Peak
@	5745	93.83	10.72	104.55	-	-	Average
@	5745	104.77	10.72	115.49	-	-	Peak
*	11490	33.32	13.54	46.86	74	-27.14	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
-	5539.5	42.91	10.25	53.16	68.2	-15.04	Peak
#	5724	58.51	10.56	69.07	119.92	-50.85	Peak
@	5745	80.35	10.72	91.07	-	-	Average
@	5745	91.7	10.72	102.42	-	-	Peak
*	11490	34.87	13.54	48.41	74	-25.59	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 157	**Frequency Range**	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
#	5645	42.32	10.35	52.67	68.2	-15.53	Peak
-	5723.5	53.81	10.56	64.37	118.78	-54.41	Peak
@	5785	93.79	10.78	104.57	-	-	Average
@	5785	104.78	10.78	115.56	-	-	Peak
-	5854	52.37	11.06	63.43	113.08	-49.65	Peak
#	5969.5	42.21	11.4	53.61	68.2	-14.59	Peak
*	11570	33.83	13.33	47.16	74	-26.84	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
#	5554	43.21	10.27	53.48	68.2	-14.72	Peak
-	5725	45.1	10.57	55.67	122.2	-66.53	Peak
@	5785	82.1	10.78	92.88	-	-	Average
@	5785	92.93	10.78	103.71	-	-	Peak
-	5850	45.57	11.04	56.61	122.2	-65.59	Peak
#	5942.5	42.61	11.41	54.02	68.2	-14.18	Peak
*	11570	33.18	13.31	46.49	74	-27.51	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 165	**Frequency Range**	1 GHz ~ 40 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
@	5825	95.96	10.91	106.87	-	-	Average
@	5825	105.05	10.91	115.96	-	-	Peak
-	5852	70.54	11.05	81.59	117.64	-36.05	Peak
#	5926.5	45.84	11.39	57.23	68.2	-10.97	Peak
*	11650	34.51	13.1	47.61	74	-26.39	Peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	**Frequency**	**Reading**	**Correct**	**Result**	**Limit**	**Margin**	**Remark**
	(MHz)	**(dBuV/m)**	**dB/m**	**(dBuV/m)**	**(dBuV/m)**	**(dB)**	
@	5825	85.97	10.91	96.88	-	-	Average
@	5825	96.27	10.91	107.18	-	-	Peak
-	5852.5	63.41	11.05	74.46	116.5	-42.04	Peak
#	5974	42.97	11.38	54.35	68.2	-13.85	Peak
*	11650	36.68	13.09	49.77	74	-24.23	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " # ": The radiated frequency is out of the restricted band.
6. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.