FCC Test Report

Report No.:	RF190912E02E-1
FCC ID:	2AHBN-AP33
Test Model:	AP32E
Series Model:	AP32, AP33
Received Date:	Mar. 17, 2020
Test Date:	May 17 to June 12, 2020
Issued Date:	Juen 29, 2020
Applicant:	Juniper Networks, Inc.
Address:	1133 Innovation Way Sunnyvale, CA 94089 USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RF190912E02E-1	Original release.	Juen 29, 2020

1 Certificate of Conformity

Product:	Wi-Fi & BLE Array AP
Brand:	Mist
Test Model:	AP32E
Series Model:	AP32, AP33
Applicant:	Juniper Networks, Inc.
Test Date:	May 17 to June 12, 2020
Standard:	47 CFR FCC Part 15, Subpart E (Section 15.407) ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Juen 29, 2020

Claire Kuan / Specialist

Approved by : _____ , **Date:** Juen 29, 2020

Clark Lin / Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)			
FCC Clause	Test Item	Result	Remarks
15.407(b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -7.73dB at 0.42344MHz.
15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.1dB at 5150.00MHz.
15.407(a)(1/2/3)	Max Average Transmit Power	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	-	Reference only.
15.407(a)(1/2/3)	Peak Power Spectral Density	Pass	Meet the requirement of limit.
15.407(e)	6dB bandwidth	Pass	Meet the requirement of limit. (U-NII-3 Band only)
15.407(g)	Frequency Stability	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is Ipex and RPSMA Plug not a standard connector.

Note:

1. For U-NII-3 band compliance with rule part 15.407(b)(4)(i), the OOBE test plots were recorded in Annex A.
2. For U-NII-1 band compliance with rule 15.407(b) of the band-edge items, the test plots were recorded in Annex B. Test Procedures refer to report 4.1.3.
3. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.9 dB
Conducted emissions	-	2.5 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.4 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.0 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (U-NII-1 & 3 Band)

Product	Wi-Fi & BLE Array AP
Brand	Mist
Test Model	AP32E
Series Model	AP32, AP33
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	55Vdc from PoE
Modulation Type	64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode 1024QAM for OFDMA in 11ax HE mode
Modulation Technology	DSSS, OFDM, OFDMA
Transfer Rate	802.11a: up to 54Mbps 802.11n: up to 600Mbps 802.11ac: up to 1733.3Mbps 802.11ax: up to 2401.9Mbps
Operating Frequency	5.18~ 5.24GHz, 5.745 ~ 5.825GHz
Number of Channel	802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 9 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 4 802.11ac (VHT80), 802.11ax (HE80): 2
Output Power	**Non-Beamforming Mode:** **For 4TX** **5.18 ~ 5.24GHz:** 194.172 mW **5.745 ~ 5.825GHz:** 393.419 mW **Beamforming Mode:** **For 4TX** **5.18 ~ 5.24GHz:** 98.434 mW **5.745 ~ 5.825GHz:** 97.659 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. This report is prepared for FCC Class II permissive change. The difference compared with the Report No.: RF190912E02A-1 design is as the following information:
   - Add DFS band <5250~5350 MHz & 5470~5725 MHz> by software.
   - Add external antenna (Model: ATS-OP-245-810-4RPSP-36) for model AP32E (New antenna only used for WLAN Radio, Scanning Radio and Bluetooth are no impact).
2. According to above condition, all test has to be performed. And all data are verified to meet the requirements. This report is record NII (U-NII-1 and U-NII-3) band test, DTS-WLAN band test is record in Report No.: RF190912E02E and NII (U-NII-2A and U-NII-2C) band test is record in Report No.: RF190912E02C-1.

3. All models are listed as below.

Brand	Model	Difference
Mist	AP32	For marketing request 1) Internal antenna 2) BT with omnidirectional antenna
	AP33	For marketing request 1) Internal antenna 2) BT with directional antenna
	AP32E	For marketing request 1) External antenna 2) BT with omnidirectional antenna
Note: Output power is same for all three models except for the AP32E model collocate new antenna (ATS-OP-245-810-4RPSP-36), and only antenna configurations are different.		

4. There are WLAN and Bluetooth technology used for the EUT. The EUT has four radios as following table:

Radio 1	**Radio 2**	**Radio 3**	**Radio 4**
WLAN - 2.4GHz	(Scanning Radio) WLAN 2.4GHz + 5GHz	WLAN - 5GHz	Bluetooth

5. Simultaneously transmission condition.

Condition	Technology			
1	WLAN - 2.4GHz	(Scanning Radio) WLAN 2.4GHz + 5GHz	WLAN - 5GHz	Bluetooth
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.				

6. The EUT power needs to be supplied from a PoE (only for test, not for sale), the information is as below table:

Brand	Model No.	Spec.
PowerDsine	PD-9001GR/AC	Input: 100-240Vac, 50-60Hz, 0.67A Output: 55Vdc, 0.6A

7. The antennas provided to the EUT, please refer to the following table:

Model: AP32						
Antenna No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range	Antenna Type	Connector Type
Int Dual Ant 3 (WiFi 5G+BT)	-	-	5 6	2.4~2.4835GHz 5.15~5.85GHz	PIFA	Ipex
Int WiFi Dual Ant 1	-	-	4.5 5.4	2.4~2.4835GHz 5.15~5.85GHz	PIFA	Ipex
Int WiFi Dual Ant 0	-	-	4.6 5.7	2.4~2.4835GHz 5.15~5.85GHz	PIFA	Ipex
Int WiFi 5G Ant 2	-	-	5.8	5.15~5.85GHz	PIFA	Ipex
Scanning Ant	-	-	5 6	2.4~2.4835GHz 5.15~5.85GHz	PIFA	Ipex

Model: AP32E						
Original						
Antenna No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range	Antenna Type	Connector Type
Ext WiFi Dual Ant (2.4+5G)	AccelTex	ATS-OO-245-46-6RPSP-36	4 6	2.4~2.4835GHz 5.15~5.85GHz	omnidirectional	RPSMA Plug
Ext WiFi Dual Ant (2.4+5G)			4 6	2.4~2.4835GHz 5.15~5.85GHz	omnidirectional	RPSMA Plug
Ext WiFi Dual Ant (5G)			4 6	2.4~2.4835GHz 5.15~5.85GHz	omnidirectional	RPSMA Plug
Ext WiFi Dual Ant (5G)			4 6	2.4~2.4835GHz 5.15~5.85GHz	omnidirectional	RPSMA Plug
Ext WiFi Dual Ant (Scanning)			4 6	2.4~2.4835GHz (Scanning) 5.15~5.85GHz (Scanning)	omnidirectional	RPSMA Plug
Int Scanning Ant	-	-	5 6	2.4~2.4835GHz (Scanning) 5.15~5.85GHz (Scanning)	PIFA	Ipex
Int BT Ant	-	-	5	2.4~2.4835GHz	PIFA	Ipex
Newly						
Antenna No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range	Antenna Type	Connector Type
Ext WiFi PATCH Ant (2.4+5G)	AccelTex	ATS-OP-245-810-4RPSP-36	8 10	2.4~2.4835GHz 5.15~5.85GHz	PATCH	RPSMA Plug
Ext WiFi PATCH Ant (2.4+5G)			8 10	2.4~2.4835GHz 5.15~5.85GHz	PATCH	RPSMA Plug
Ext WiFi PATCH Ant (5G)			8 10	2.4~2.4835GHz 5.15~5.85GHz	PATCH	RPSMA Plug
Ext WiFi PATCH Ant (5G)			8 10	2.4~2.4835GHz 5.15~5.85GHz	PATCH	RPSMA Plug

Model: AP33						
Antenna No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range	Antenna Type	Connector Type
Int WiFi Dual Ant 0	-	-	3.7 6	2.4~2.4835GHz 5.15~5.85GHz	PIFA	Ipex
Int WiFi Dual Ant 1	-	-	4.6 6	2.4~2.4835GHz 5.15~5.85GHz	PIFA	Ipex
Int WiFi 5G Ant 2	-	-	6	5.15~5.85GHz	PIFA	Ipex
Int WiFi 5G Ant 3	-	-	5.9	5.15~5.85GHz	PIFA	Ipex
Scanning Ant	-	-	5 6	2.4~2.4835GHz 5.15~5.85GHz	PIFA	Ipex
BT Slot_Direct Antenna	-	-	6	2.402~2.480GHz	Slot_Direct	Ipex
BT Array Antenna	-	-	Beam 1 :3.9 Beam 2 :3.9 Beam 3 :4.7 Beam 4 :4.4 Beam 5 :4.8 Beam 6 :5.1 Beam 7 :5.1 Beam 8 :4.2	2.402~2.480GHz	Array Antenna	Ipex
Note: The max. antenna gain was selected for the final test of Antenna Port Conducted test items.						

8. The newly external antenna for WLAN 2.4G only support 2Tx configuration / for WLAN 5G only support 4Tx configuration.

9. The EUT incorporates a MIMO function.

MODULATION MODE	Radio 1 - 2.4GHz Band		Radio 2 - 2.4GHz Band	
	TX & RX CONFIGURATION		TX & RX CONFIGURATION	
802.11b	2TX	2RX	1TX	1RX
802.11g	2TX	2RX	1TX	1RX
802.11n (HT20)	2TX	2RX	1TX	1RX
802.11n (HT40)	2TX	2RX	1TX	1RX
VHT20	2TX	2RX	1TX	1RX
VHT40	2TX	2RX	1TX	1RX
802.11ax (HE20)	2TX	2RX	1TX	1RX
802.11ax (HE40)	2TX	2RX	1TX	1RX
MODULATION MODE	Radio 3 - 5GHz Band		Radio 2 - 5GHz Band	
	TX & RX CONFIGURATION		TX & RX CONFIGURATION	
802.11a	4TX	4RX	1TX	1RX
802.11n (HT20)	4TX	4RX	1TX	1RX
802.11n (HT40)	4TX	4RX	1TX	1RX
802.11ac (VHT20)	4TX	4RX	1TX	1RX
802.11ac (VHT40)	4TX	4RX	1TX	1RX
802.11ac (VHT80)	4TX	4RX	1TX	1RX
802.11ax (HE20)	4TX	4RX	1TX	1RX
802.11ax (HE40)	4TX	4RX	1TX	1RX
802.11ax (HE80)	4TX	4RX	1TX	1RX

Note:
1. All of modulation mode support beamforming function except 802.11a/b/g modulation mode.
2. The EUT support Beamforming and non-beamforming mode, therefore both mode were investigated and the worst case scenario was identified. The worst case data were presented in test report.
3. The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz), 802.11ac mode for 20MHz (40MHz, 80MHz) and 802.11ax mode for 20MHz (40MHz, 80MHz), therefore the manufacturer will control the power for 802.11n/ac mode power for is the same as the 802.11ax or more lower than it and investigated worst case to representative mode in test report. (Final test mode refer to section 3.2.1)

10. The EUT was pre-tested under the following modes:

➢ **For Radiated Emission (Above 1GHz) test**

Pre-test Mode	Test item	Mode	Ant. Polarity (with ATS-OP-245-810-4RPSP-36 Ant.)	Remark
1	RSE above 1GHz	4Tx	Y-Z	-
2	**RSE above 1GHz**	**4Tx**	**X-Z**	**Worst-Test Results Mode 1**

➢ **For Radiated Emission (Below 1GHz) test**

Pre-test Mode	Test item	Mode	Ant. Polarity (with ATS-OP-245-810-4RPSP-36 Ant.)	Remark
1	RSE below 1GHz	4Tx	Y-Z	-
2	**RSE below 1GHz**	**4Tx**	**X-Z**	**Worst-Test Results Mode 1**

11. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

FOR 5180 ~ 5240MHz

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

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), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
42	5210 MHz

FOR 5745 ~ 5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

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

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
151	5755 MHz	159	5795 MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
155	5775 MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	Model: AP32E with 4TX

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

Radiated Emission Test (Above 1GHz):

☒ 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).
☒ Following channel(s) was (were) selected for the final test as listed below.

Non-Beamforming Mode						
Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter
802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6Mb/s
802.11ax (HE20)		36 to 48	36, 40, 48	OFDMA	BPSK	MCS0
802.11ax (HE40)		38 to 46	38, 46	OFDMA	BPSK	MCS0
802.11ax (HE80)		42	42	OFDMA	BPSK	MCS0
802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6Mb/s
802.11ax (HE20)		149 to 165	149, 157, 165	OFDMA	BPSK	MCS0
802.11ax (HE40)		151 to 159	151, 159	OFDMA	BPSK	MCS0
802.11ax (HE80)		155	155	OFDMA	BPSK	MCS0

Radiated Emission Test (Below 1GHz):

☒ 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).
☒ Following channel(s) was (were) selected for the final test as listed below.

Non-Beamforming Mode						
Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter
802.11ax (HE20)	5180-5240 5745-5825	36 to 48 149 to 165	149	OFDMA	BPSK	MCS0

Power Line Conducted Emission Test:

☒ 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).
☒ Following channel(s) was (were) selected for the final test as listed below.

Non-Beamforming Mode						
Mode	FREQ. Band (MHz)	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter
802.11ax (HE20)	5180-5240 5745-5825	36 to 48 149 to 165	149	OFDMA	BPSK	MCS0

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
☒ 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).
☒ Following channel(s) was (were) selected for the final test as listed below.

Non-Beamforming Mode (Other test items)						
Mode	**FREQ. Band (MHz)**	**Available Channel**	**Tested Channel**	**Modulation Technology**	**Modulation Type**	**Data Rate Parameter**
802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6Mb/s
802.11ac (VHT20) (Output power only)		36 to 48	36, 40, 48	OFDM	BPSK	MCS0
802.11ac (VHT40) (Output power only)		38 to 46	38, 46	OFDM	BPSK	MCS0
802.11ac (VHT80) (Output power only)		42	42	OFDM	BPSK	MCS0
802.11ax (HE20)		36 to 48	36, 40, 48	OFDMA	BPSK	MCS0
802.11ax (HE40)		38 to 46	38, 46	OFDMA	BPSK	MCS0
802.11ax (HE80)		42	42	OFDMA	BPSK	MCS0
802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	6Mb/s
802.11ac (VHT20) (Output power only)		149 to 165	149, 157, 165	OFDM	BPSK	MCS0
802.11ac (VHT40) (Output power only)		151 to 159	151, 159	OFDM	BPSK	MCS0
802.11ac (VHT80) (Output power only)		155	155	OFDM	BPSK	MCS0
802.11ax (HE20)		149 to 165	149, 157, 165	OFDMA	BPSK	MCS0
802.11ax (HE40)		151 to 159	151, 159	OFDMA	BPSK	MCS0
802.11ax (HE80)		155	155	OFDMA	BPSK	MCS0
Beamforming Mode (output power test only)						
Mode	**FREQ. Band (MHz)**	**Available Channel**	**Tested Channel**	**Modulation Technology**	**Modulation Type**	**Data Rate Parameter**
802.11ac (VHT20)	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	MCS0
802.11ac (VHT40)		38 to 46	38, 46	OFDM	BPSK	MCS0
802.11ac (VHT80)		42	42	OFDM	BPSK	MCS0
802.11ax (HE20)		36 to 48	36, 40, 48	OFDMA	BPSK	MCS0
802.11ax (HE40)		38 to 46	38, 46	OFDMA	BPSK	MCS0
802.11ax (HE80)		42	42	OFDMA	BPSK	MCS0
802.11ac (VHT20)	5745-5825	149 to 165	149, 157, 165	OFDM	BPSK	MCS0
802.11ac (VHT40)		151 to 159	151, 159	OFDM	BPSK	MCS0
802.11ac (VHT80)		155	155	OFDM	BPSK	MCS0
802.11ax (HE20)		149 to 165	149, 157, 165	OFDMA	BPSK	MCS0
802.11ax (HE40)		151 to 159	151, 159	OFDMA	BPSK	MCS0
802.11ax (HE80)		155	155	OFDMA	BPSK	MCS0

Test Condition:

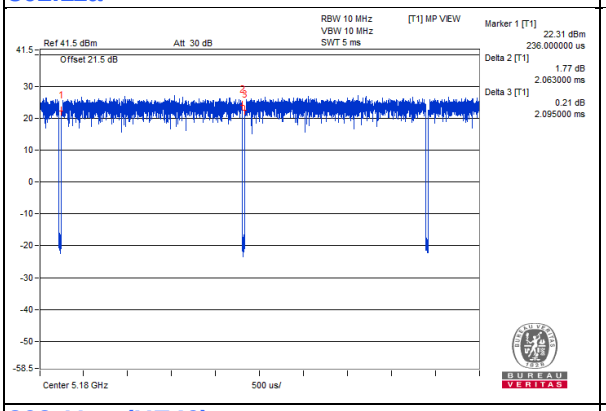
Applicable To	Environmental Conditions	Input Power (System)	Tested By
RE≥1G	24deg. C, 68%RH	120Vac, 60Hz	Tom Yang
RE<1G	22deg. C, 68%RH	120Vac, 60Hz	Ryan Du
PLC	21deg. C, 60%RH	120Vac, 60Hz	Nick Lo
APCM	25deg. C, 60%RH	120Vac, 60Hz	Jyunchun Lin

3.3 Duty Cycle of Test Signal

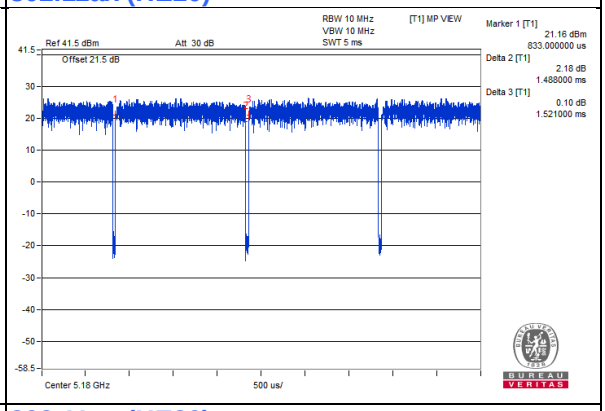
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11a: Duty cycle = 2.063 ms/2.095 ms = 0.985
802.11ax (HE20): Duty cycle = 1.488 ms/1.521 ms = 0.978, Duty factor = 10 * log (1/Duty cycle) = 0.10
802.11ax (HE40): Duty cycle = 0.771 ms/0.811 ms = 0.951, Duty factor = 10 * log (1/Duty cycle) = 0.22
802.11ax (HE80): Duty cycle = 0.399 ms/0.433 ms = 0.921, Duty factor = 10 * log (1/Duty cycle) = 0.36

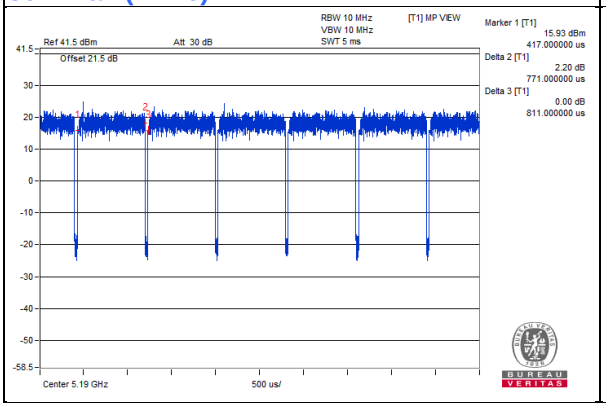
802.11a



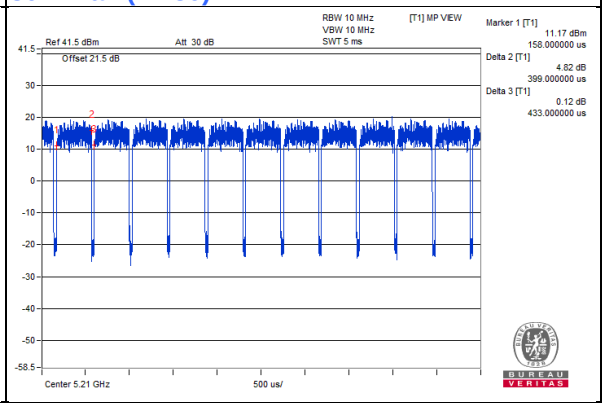
802.11ax (HE20)



802.11ax (HE40)



802.11ax (HE80)



3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
B.	Laptop	DELL	E6420	B92T3R1	FCC DoC	Provided by Lab
C.	PoE Adapter	PowerDsine	PD-9001GR/AC	NA	NA	Supplied by client
D.	Ipod	Apple	MC749TA/A	CC4DN25WDFDM	NA	Provided by Lab

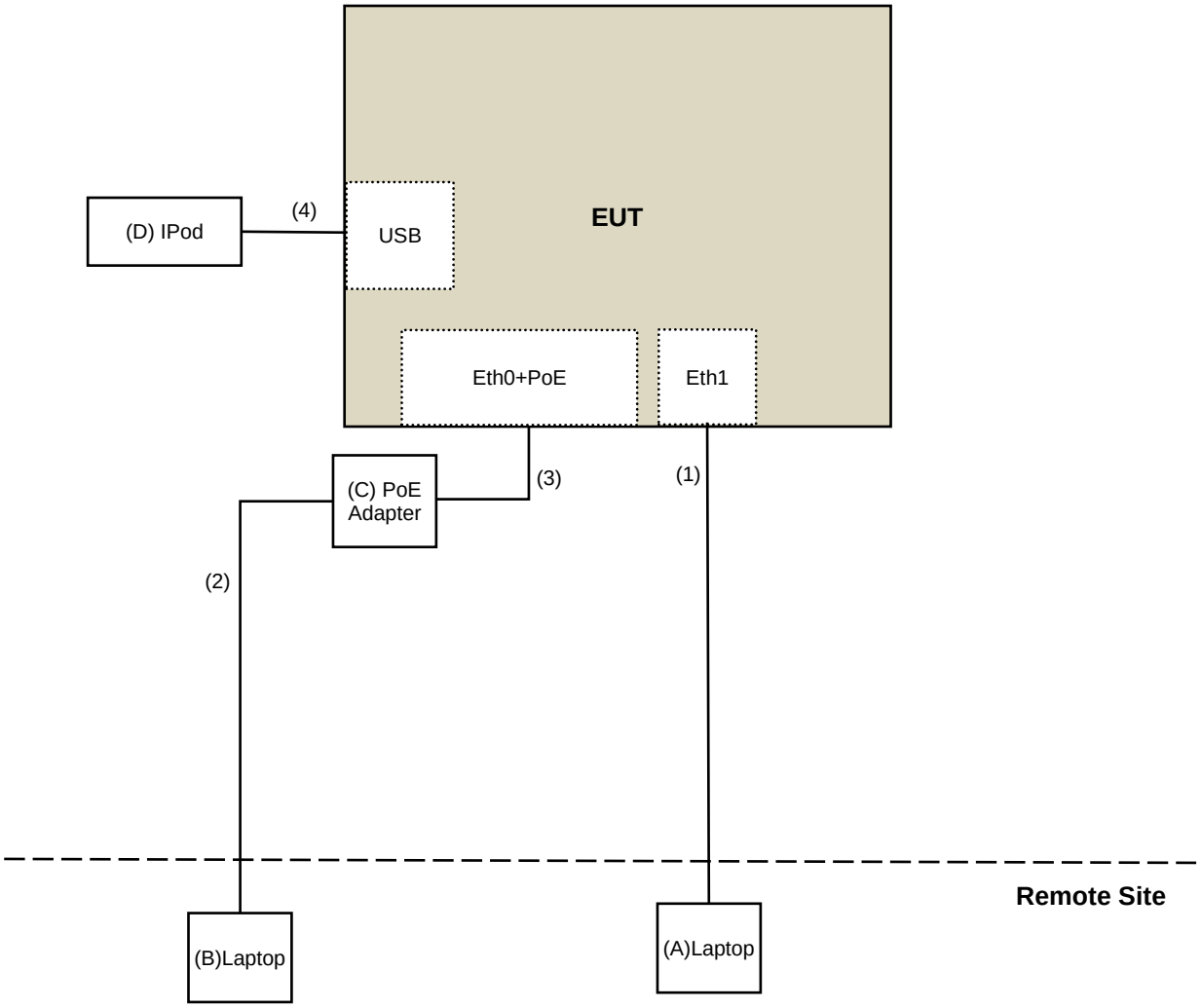
Note:

1. All power cords of the above support units are non-shielded (1.8m).

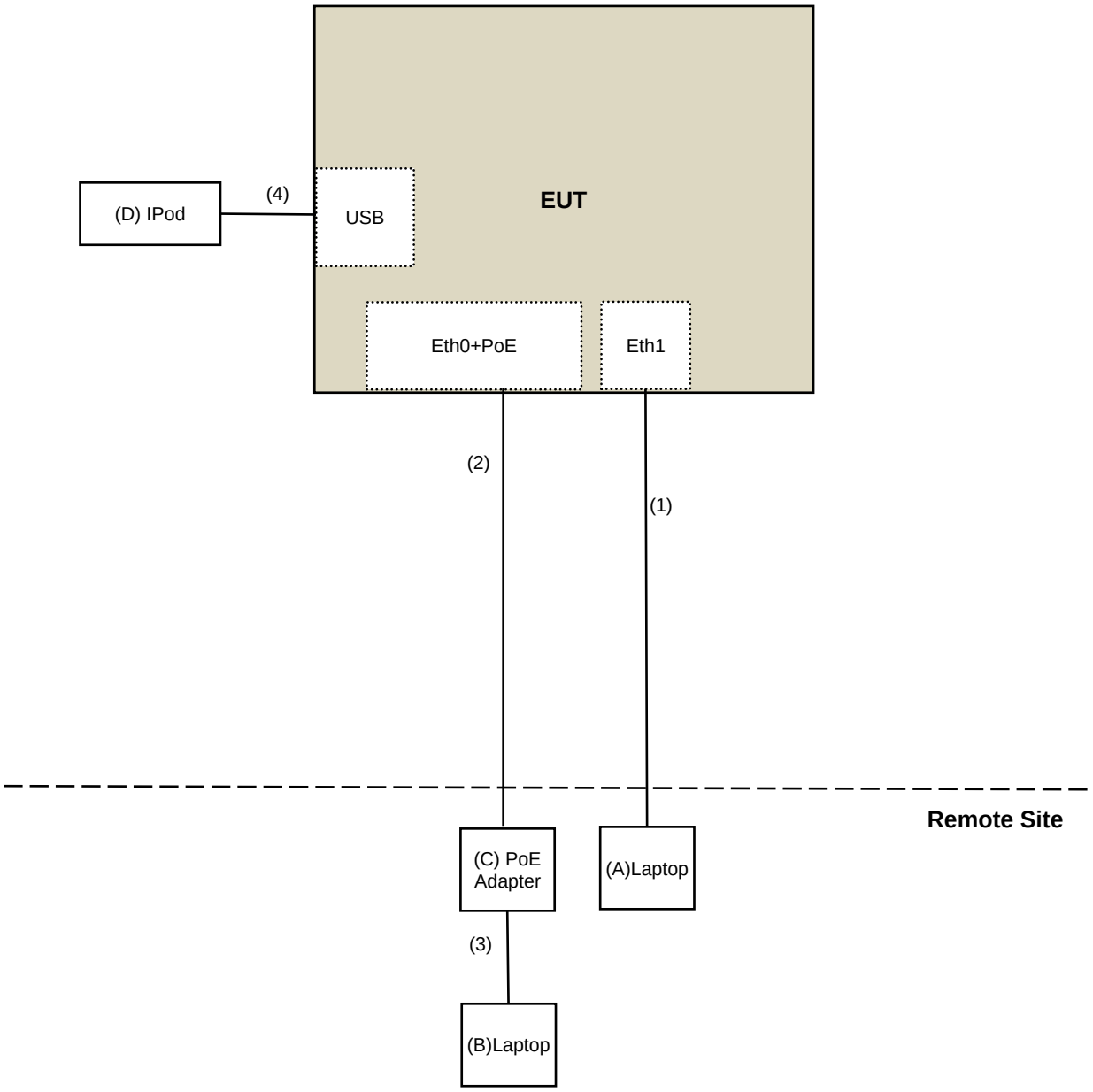
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ-45 Cable	1	10	No	0	Provided by Lab
2.	RJ-45 Cable	1	10	No	0	Provided by Lab
3.	RJ-45 Cable	1	1.5	No	0	Provided by Lab
4.	USB Cable	1	0.1	Yes	0	Provided by Lab

3.4.1 Configuration of System under Test

For conducted emission test:



For other test items:



3.5 General Description of Applied Standard and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test Standard:

FCC Part 15, Subpart E (15.407)
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

References Test Guidance:

KDB 789033 D02 General UNII Test Procedures New Rules v02r01
KDB 662911 D01 Multiple Transmitter Output v02r01

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

Frequencies (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).

4.1.2 Test Instruments

For radiated emission test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 03, 2019	July 02, 2020
Pre-Amplifier EMCI	EMC001340	980142	May 25, 2020	May 24, 2021
Loop Antenna Electro-Metrics	EM-6879	264	Feb. 18, 2020	Feb. 17, 2021
RF Cable	NA	LOOPCAB-001	Jan. 08, 2020	Jan. 07, 2021
RF Cable	NA	LOOPCAB-002	Jan. 08, 2020	Jan. 07, 2021
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-05	Apr. 28, 2020	Apr. 27, 2021
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Nov. 11, 2019	Nov. 10, 2020
RF Cable	8D	966-3-1	Mar. 17, 2020	Mar. 16, 2021
RF Cable	8D	966-3-2	Mar. 17, 2020	Mar. 16, 2021
RF Cable	8D	966-3-3	Mar. 17, 2020	Mar. 16, 2021
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Sep. 26, 2019	Sep. 25, 2020
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC12630SE	980384	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-1200	160922	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-2000	180601	June 10, 2019	June 09, 2020
RF Cable	EMC104-SM-SM-6000	180602	June 10, 2019	June 09, 2020
Spectrum Analyzer Keysight	N9030A	MY54490679	July 17, 2019	July 16, 2020
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 15, 2020	Jan. 14, 2021
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
RF Cable	EMC102-KM-KM-1200	160924	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 3.
3. Tested Date: May 30 to June 09, 2020

For OOBE and Band-edge test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 03, 2019	July 02, 2020
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC12630SE	980384	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-1200	160922	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-2000	180601	June 10, 2019	June 09, 2020
RF Cable	EMC104-SM-SM-6000	180602	June 10, 2019	June 09, 2020
Spectrum Analyzer Keysight	N9030A	MY54490679	July 17, 2019	July 16, 2020
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 15, 2020	Jan. 14, 2021
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
RF Cable	EMC102-KM-KM-1200	160924	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 3.
3. Tested Date: May 17 to 19, 2020

For other test items:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	May 29, 2020	May 28, 2021
Power meter Anritsu	ML2495A	1529002	July 26, 2019	July 25, 2020
Power sensor Anritsu	MA2411B	1339443	July 26, 2019	July 25, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
DC Power Supply Topward	6603D	795558	NA	NA
Temperature & Humidity Chamber Giant Force	GTH-150-40-SP-AR	MAA0812-008	Jan. 16, 2020	Jan. 15, 2021
Voltage Meter FLUKE	179	89610322	Sep. 25, 2019	Sep. 24, 2020
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

NOTE: 1. The test was performed in Oven room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: June 12, 2020

4.1.3 Test Procedure

For Radiated emission below 30MHz

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. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

For Radiated emission above 30MHz

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. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

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:

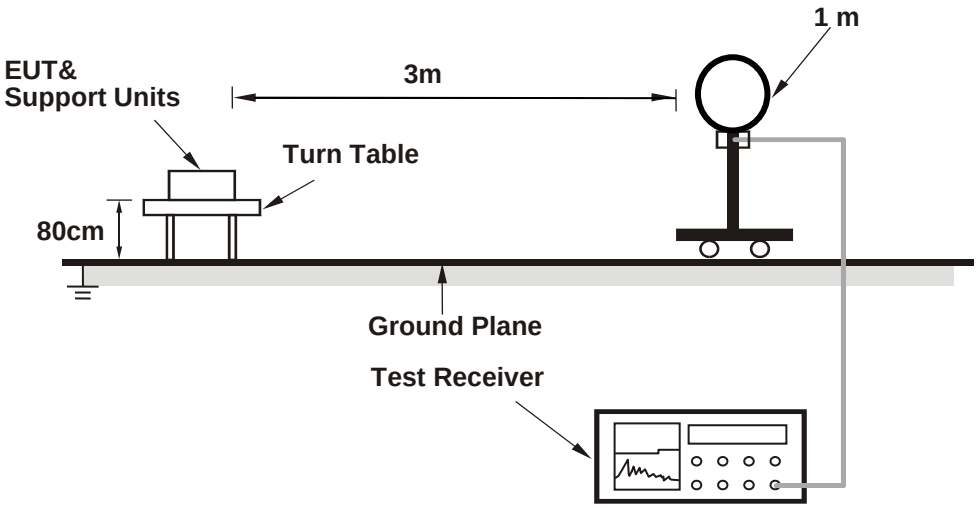
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. 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.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

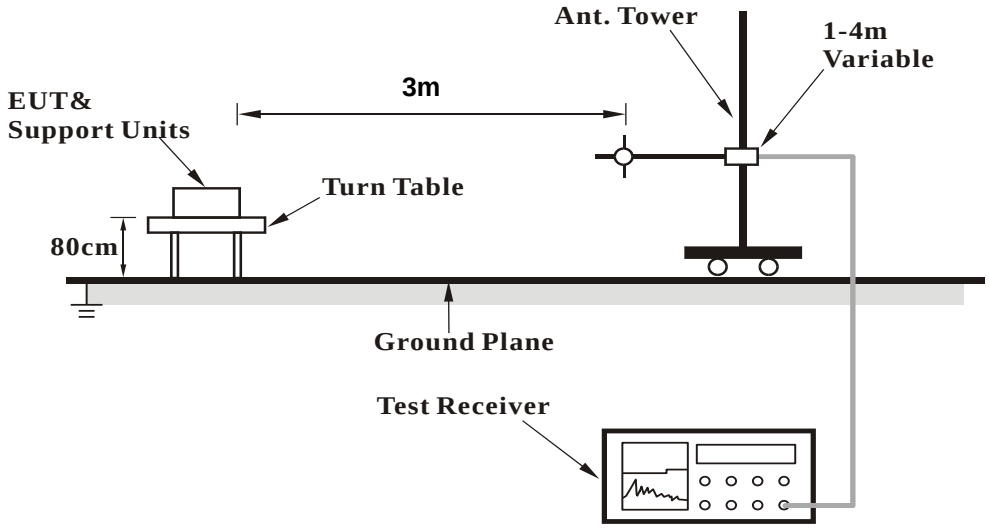
No deviation.

4.1.5 Test Setup

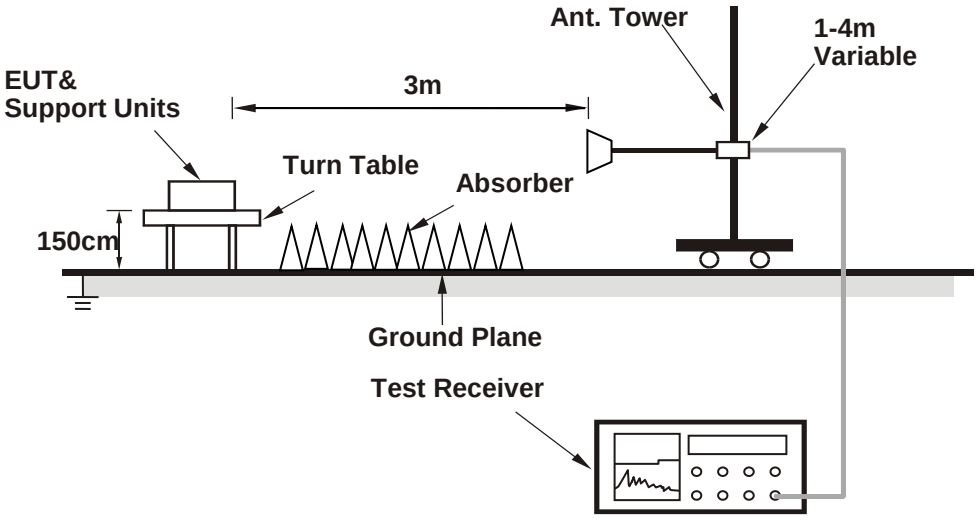
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Condition

a. Connected the EUT with the Laptop which is placed on remote site.
b. Controlling software (AccessMTool REL_3_1_0_3) has been activated to set the EUT under transmission condition continuously at specific channel frenquency.

4.1.7 Test Results

ABOVE 1GHz DATA

802.11a

Channel	TX Channel 36	**Detector Function**	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	5150.00	68.9 PK	74.0	-5.1	1.50 H	311	65.2	3.7
2	5150.00	50.9 AV	54.0	-3.1	1.50 H	311	47.2	3.7
3	*5180.00	117.6 PK			1.50 H	311	114.0	3.6
4	*5180.00	107.6 AV			1.50 H	311	104.0	3.6
5	#10360.00	46.5 PK	68.2	-21.7	1.85 H	177	33.8	12.7
6	15540.00	50.8 PK	74.0	-23.2	1.11 H	329	37.6	13.2
7	15540.00	38.4 AV	54.0	-15.6	1.11 H	329	25.2	13.2
Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	5150.00	71.3 PK	74.0	-2.7	3.63 V	348	67.6	3.7
2	5150.00	53.5 AV	54.0	-0.5	3.63 V	348	49.8	3.7
3	*5180.00	116.5 PK			3.63 V	348	112.9	3.6
4	*5180.00	106.0 AV			3.63 V	348	102.4	3.6
5	#10360.00	46.2 PK	68.2	-22.0	1.13 V	109	33.5	12.7
6	15540.00	57.2 PK	74.0	-16.8	1.05 V	79	44.0	13.2
7	15540.00	43.7 AV	54.0	-10.3	1.05 V	79	30.5	13.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 40	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5200.00	118.9 PK			1.73 H	313	115.4	3.5
2	*5200.00	109.1 AV			1.73 H	313	105.6	3.5
3	#10400.00	46.5 PK	68.2	-21.7	1.85 H	163	33.7	12.8
4	15600.00	51.0 PK	74.0	-23.0	1.08 H	315	37.5	13.5
5	15600.00	40.4 AV	54.0	-13.6	1.08 H	315	26.9	13.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5200.00	117.0 PK			3.62 V	339	113.5	3.5
2	*5200.00	108.6 AV			3.62 V	339	105.1	3.5
3	#10400.00	46.6 PK	68.2	-21.6	1.13 V	111	33.8	12.8
4	15600.00	57.0 PK	74.0	-17.0	1.07 V	59	43.5	13.5
5	15600.00	44.5 AV	54.0	-9.5	1.07 V	59	31.0	13.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 48	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5240.00	118.7 PK			1.70 H	320	115.2	3.5
2	*5240.00	108.7 AV			1.70 H	320	105.2	3.5
3	5350.00	54.1 PK	74.0	-19.9	1.70 H	320	50.7	3.4
4	5350.00	41.8 AV	54.0	-12.2	1.70 H	320	38.4	3.4
5	#10480.00	46.3 PK	68.2	-21.9	1.84 H	160	33.2	13.1
6	15720.00	51.1 PK	74.0	-22.9	1.13 H	313	37.3	13.8
7	15720.00	38.6 AV	54.0	-15.4	1.13 H	313	24.8	13.8
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5240.00	117.6 PK			3.18 V	353	114.1	3.5
2	*5240.00	108.5 AV			3.18 V	353	105.0	3.5
3	5350.00	54.4 PK	74.0	-19.6	3.18 V	353	51.0	3.4
4	5350.00	42.5 AV	54.0	-11.5	3.18 V	353	39.1	3.4
5	#10480.00	46.4 PK	68.2	-21.8	1.08 V	112	33.3	13.1
6	15720.00	56.8 PK	74.0	-17.2	1.11 V	61	43.0	13.8
7	15720.00	43.4 AV	54.0	-10.6	1.11 V	61	29.6	13.8

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 149	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5745.00	117.8 PK			1.79 H	328	113.8	4.0
2	*5745.00	108.6 AV			1.79 H	328	104.6	4.0
3	11490.00	48.6 PK	74.0	-25.4	1.80 H	176	35.3	13.3
4	11490.00	38.5 AV	54.0	-15.5	1.80 H	176	25.2	13.3
5	#17235.00	62.7 PK	68.2	-5.5	1.10 H	327	45.1	17.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5745.00	117.5 PK			3.87 V	331	113.5	4.0
2	*5745.00	108.2 AV			3.87 V	331	104.2	4.0
3	11490.00	49.7 PK	74.0	-24.3	1.13 V	108	36.4	13.3
4	11490.00	39.4 AV	54.0	-14.6	1.13 V	108	26.1	13.3
5	#17235.00	67.5 PK	68.2	-0.7	1.13 V	67	49.9	17.6

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 157	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5785.00	117.6 PK			1.64 H	333	113.5	4.1
2	*5785.00	108.0 AV			1.64 H	333	103.9	4.1
3	11570.00	49.1 PK	74.0	-24.9	1.78 H	189	35.9	13.2
4	11570.00	38.7 AV	54.0	-15.3	1.78 H	189	25.5	13.2
5	#17355.00	63.4 PK	68.2	-4.8	1.12 H	324	45.8	17.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5785.00	116.5 PK			3.01 V	35	112.4	4.1
2	*5785.00	107.6 AV			3.01 V	35	103.5	4.1
3	11570.00	49.5 PK	74.0	-24.5	1.12 V	123	36.3	13.2
4	11570.00	39.0 AV	54.0	-15.0	1.12 V	123	25.8	13.2
5	#17355.00	67.6 PK	68.2	-0.6	1.07 V	67	50.0	17.6

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 165	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5825.00	118.1 PK			1.50 H	325	113.8	4.3
2	*5825.00	108.7 AV			1.50 H	325	104.4	4.3
3	11650.00	49.4 PK	74.0	-24.6	1.83 H	185	36.1	13.3
4	11650.00	38.9 AV	54.0	-15.1	1.83 H	185	25.6	13.3
5	#17475.00	63.1 PK	68.2	-5.1	1.20 H	325	45.2	17.9
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5825.00	117.2 PK			3.92 V	330	112.9	4.3
2	*5825.00	107.9 AV			3.92 V	330	103.6	4.3
3	11650.00	49.9 PK	74.0	-24.1	1.14 V	98	36.6	13.3
4	11650.00	39.9 AV	54.0	-14.1	1.14 V	98	26.6	13.3
5	#17475.00	68.0 PK	68.2	-0.2	1.00 V	30	50.1	17.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11ax (HE20)

Channel	TX Channel 36	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	69.7 PK	74.0	-4.3	1.49 H	320	66.0	3.7
2	5150.00	53.3 AV	54.0	-0.7	1.49 H	320	49.6	3.7
3	*5180.00	116.6 PK			1.49 H	320	113.0	3.6
4	*5180.00	105.2 AV			1.49 H	320	101.6	3.6
5	#10360.00	46.7 PK	68.2	-21.5	1.84 H	166	34.0	12.7
6	15540.00	50.9 PK	74.0	-23.1	1.18 H	314	37.7	13.2
7	15540.00	38.5 AV	54.0	-15.5	1.18 H	314	25.3	13.2
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	69.2 PK	74.0	-4.8	1.56 V	359	65.5	3.7
2	5150.00	53.5 AV	54.0	-0.5	1.56 V	359	49.8	3.7
3	*5180.00	116.5 PK			1.56 V	359	112.9	3.6
4	*5180.00	104.5 AV			1.56 V	359	100.9	3.6
5	#10360.00	45.8 PK	68.2	-22.4	1.13 V	94	33.1	12.7
6	15540.00	56.6 PK	74.0	-17.4	1.10 V	82	43.4	13.2
7	15540.00	43.3 AV	54.0	-10.7	1.10 V	82	30.1	13.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 40	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5200.00	119.9 PK			1.55 H	301	116.4	3.5
2	*5200.00	108.1 AV			1.55 H	301	104.6	3.5
3	#10400.00	46.9 PK	68.2	-21.3	1.89 H	177	34.1	12.8
4	15600.00	50.7 PK	74.0	-23.3	1.05 H	313	37.2	13.5
5	15600.00	40.1 AV	54.0	-13.9	1.05 H	313	26.6	13.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5200.00	118.6 PK			1.52 V	360	115.1	3.5
2	*5200.00	108.7 AV			1.52 V	360	105.2	3.5
3	#10400.00	46.3 PK	68.2	-21.9	1.08 V	101	33.5	12.8
4	15600.00	57.2 PK	74.0	-16.8	1.11 V	81	43.7	13.5
5	15600.00	43.8 AV	54.0	-10.2	1.11 V	81	30.3	13.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 48	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5240.00	120.5 PK			1.53 H	313	117.0	3.5
2	*5240.00	108.5 AV			1.53 H	313	105.0	3.5
3	5350.00	53.4 PK	74.0	-20.6	1.53 H	313	50.0	3.4
4	5350.00	41.7 AV	54.0	-12.3	1.53 H	313	38.3	3.4
5	#10480.00	46.5 PK	68.2	-21.7	1.89 H	145	33.4	13.1
6	15720.00	51.0 PK	74.0	-23.0	1.09 H	301	37.2	13.8
7	15720.00	38.3 AV	54.0	-15.7	1.09 H	301	24.5	13.8
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5240.00	118.6 PK			1.49 V	359	115.1	3.5
2	*5240.00	108.4 AV			1.49 V	359	104.9	3.5
3	5350.00	51.1 PK	74.0	-22.9	1.49 V	359	47.7	3.4
4	5350.00	41.1 AV	54.0	-12.9	1.49 V	359	37.7	3.4
5	#10480.00	46.3 PK	68.2	-21.9	1.13 V	102	33.2	13.1
6	15720.00	56.9 PK	74.0	-17.1	1.12 V	67	43.1	13.8
7	15720.00	43.7 AV	54.0	-10.3	1.12 V	67	29.9	13.8

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 149	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5745.00	119.8 PK			1.54 H	315	115.8	4.0
2	*5745.00	107.8 AV			1.54 H	315	103.8	4.0
3	11490.00	50.1 PK	74.0	-23.9	1.81 H	179	36.8	13.3
4	11490.00	39.3 AV	54.0	-14.7	1.81 H	179	26.0	13.3
5	#17235.00	63.3 PK	68.2	-4.9	1.20 H	337	45.7	17.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	*5745.00	119.2 PK			2.88 V	332	115.2	4.0
2	*5745.00	107.8 AV			2.88 V	332	103.8	4.0
3	11490.00	49.9 PK	74.0	-24.1	1.16 V	90	36.6	13.3
4	11490.00	40.1 AV	54.0	-13.9	1.16 V	90	26.8	13.3
5	#17235.00	67.7 PK	68.2	-0.5	1.20 V	70	50.1	17.6

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 157	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5785.00	119.6 PK			1.61 H	319	115.5	4.1
2	*5785.00	107.5 AV			1.61 H	319	103.4	4.1
3	11570.00	49.6 PK	74.0	-24.4	1.83 H	171	36.4	13.2
4	11570.00	39.4 AV	54.0	-14.6	1.83 H	171	26.2	13.2
5	#17355.00	63.0 PK	68.2	-5.2	1.19 H	333	45.4	17.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5785.00	118.6 PK			2.70 V	21	114.5	4.1
2	*5785.00	107.5 AV			2.70 V	21	103.4	4.1
3	11570.00	49.4 PK	74.0	-24.6	1.16 V	80	36.2	13.2
4	11570.00	39.9 AV	54.0	-14.1	1.16 V	80	26.7	13.2
5	#17355.00	68.0 PK	68.2	-0.2	1.22 V	85	50.4	17.6

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 165	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5825.00	119.6 PK			1.59 H	319	115.3	4.3
2	*5825.00	107.9 AV			1.59 H	319	103.6	4.3
3	11650.00	49.8 PK	74.0	-24.2	1.84 H	188	36.5	13.3
4	11650.00	39.3 AV	54.0	-14.7	1.84 H	188	26.0	13.3
5	#17475.00	62.8 PK	68.2	-5.4	1.20 H	334	44.9	17.9
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5825.00	118.6 PK			2.71 V	331	114.3	4.3
2	*5825.00	107.3 AV			2.71 V	331	103.0	4.3
3	11650.00	49.8 PK	74.0	-24.2	1.18 V	91	36.5	13.3
4	11650.00	39.9 AV	54.0	-14.1	1.18 V	91	26.6	13.3
5	#17475.00	67.7 PK	68.2	-0.5	1.15 V	83	49.8	17.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11ax (HE40)

Channel	TX Channel 38	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	65.4 PK	74.0	-8.6	1.58 H	312	61.7	3.7
2	5150.00	51.9 AV	54.0	-2.1	1.58 H	312	48.2	3.7
3	*5190.00	109.6 PK			1.58 H	312	106.0	3.6
4	*5190.00	99.9 AV			1.58 H	312	96.3	3.6
5	#10380.00	46.2 PK	68.2	-22.0	1.90 H	145	33.5	12.7
6	15570.00	51.3 PK	74.0	-22.7	1.15 H	286	37.9	13.4
7	15570.00	37.2 AV	54.0	-16.8	1.15 H	286	23.8	13.4
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	66.5 PK	74.0	-7.5	3.17 V	359	62.8	3.7
2	**5150.00**	**53.9 AV**	**54.0**	**-0.1**	**3.17 V**	**359**	**50.2**	**3.7**
3	*5190.00	110.1 PK			3.17 V	359	106.5	3.6
4	*5190.00	100.6 AV			3.17 V	359	97.0	3.6
5	#10380.00	45.6 PK	68.2	-22.6	1.03 V	98	32.9	12.7
6	15570.00	56.4 PK	74.0	-17.6	1.14 V	72	43.0	13.4
7	15570.00	42.2 AV	54.0	-11.8	1.14 V	72	28.8	13.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 46	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	65.6 PK	74.0	-8.4	1.55 H	312	61.9	3.7
2	5150.00	51.7 AV	54.0	-2.3	1.55 H	312	48.0	3.7
3	*5230.00	118.2 PK			1.55 H	312	114.7	3.5
4	*5230.00	105.8 AV			1.55 H	312	102.3	3.5
5	5350.00	55.6 PK	74.0	-18.4	1.55 H	312	52.2	3.4
6	5350.00	43.2 AV	54.0	-10.8	1.55 H	312	39.8	3.4
7	#10460.00	46.0 PK	68.2	-22.2	1.90 H	133	33.0	13.0
8	15690.00	51.1 PK	74.0	-22.9	1.13 H	276	37.2	13.9
9	15690.00	37.3 AV	54.0	-16.7	1.13 H	276	23.4	13.9
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	65.5 PK	74.0	-8.5	1.52 V	358	61.8	3.7
2	5150.00	53.8 AV	54.0	-0.2	1.52 V	358	50.1	3.7
3	*5230.00	115.1 PK			1.52 V	358	111.6	3.5
4	*5230.00	106.0 AV			1.52 V	358	102.5	3.5
5	5350.00	52.5 PK	74.0	-21.5	1.52 V	358	49.1	3.4
6	5350.00	41.7 AV	54.0	-12.3	1.52 V	358	38.3	3.4
7	#10460.00	45.3 PK	68.2	-22.9	1.07 V	108	32.3	13.0
8	15690.00	56.2 PK	74.0	-17.8	1.13 V	59	42.3	13.9
9	15690.00	42.0 AV	54.0	-12.0	1.13 V	59	28.1	13.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 151	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5755.00	115.2 PK			1.67 H	321	111.2	4.0
2	*5755.00	105.3 AV			1.67 H	321	101.3	4.0
3	11510.00	49.7 PK	74.0	-24.3	1.87 H	188	36.4	13.3
4	11510.00	37.7 AV	54.0	-16.3	1.87 H	188	24.4	13.3
5	#17265.00	60.7 PK	68.2	-7.5	1.24 H	325	43.2	17.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5755.00	115.4 PK			2.88 V	333	111.4	4.0
2	*5755.00	105.4 AV			2.88 V	333	101.4	4.0
3	11510.00	48.2 PK	74.0	-25.8	1.23 V	75	34.9	13.3
4	11510.00	37.6 AV	54.0	-16.4	1.23 V	75	24.3	13.3
5	#17265.00	65.6 PK	68.2	-2.6	1.14 V	90	48.1	17.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 159	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5795.00	117.2 PK			1.60 H	318	113.0	4.2
2	*5795.00	106.0 AV			1.60 H	318	101.8	4.2
3	11590.00	49.2 PK	74.0	-24.8	1.89 H	177	35.9	13.3
4	11590.00	37.5 AV	54.0	-16.5	1.89 H	177	24.2	13.3
5	#17385.00	60.6 PK	68.2	-7.6	1.18 H	326	42.9	17.7
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5795.00	114.9 PK			2.71 V	16	110.7	4.2
2	*5795.00	105.7 AV			2.71 V	16	101.5	4.2
3	11590.00	48.7 PK	74.0	-25.3	1.22 V	73	35.4	13.3
4	11590.00	38.1 AV	54.0	-15.9	1.22 V	73	24.8	13.3
5	#17385.00	65.8 PK	68.2	-2.4	1.15 V	104	48.1	17.7

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11ax (HE80)

Channel	TX Channel 42	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	66.1 PK	74.0	-7.9	1.55 H	319	62.4	3.7
2	**5150.00**	**53.9 AV**	**54.0**	**-0.1**	**1.55 H**	**319**	**50.2**	**3.7**
3	*5210.00	107.5 PK			1.55 H	319	103.9	3.6
4	*5210.00	96.5 AV			1.55 H	319	92.9	3.6
5	5350.00	53.4 PK	74.0	-20.6	1.55 H	319	50.0	3.4
6	5350.00	41.1 AV	54.0	-12.9	1.55 H	319	37.7	3.4
7	#10420.00	46.0 PK	68.2	-22.2	1.90 H	142	33.2	12.8
8	15630.00	50.7 PK	74.0	-23.3	1.11 H	270	37.0	13.7
9	15630.00	37.2 AV	54.0	-16.8	1.11 H	270	23.5	13.7
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5150.00	67.6 PK	74.0	-6.4	3.25 V	1	63.9	3.7
2	5150.00	53.5 AV	54.0	-0.5	3.25 V	1	49.8	3.7
3	*5210.00	108.3 PK			3.25 V	1	104.7	3.6
4	*5210.00	96.8 AV			3.25 V	1	93.2	3.6
5	5350.00	54.5 PK	74.0	-19.5	3.25 V	1	51.1	3.4
6	5350.00	42.3 AV	54.0	-11.7	3.25 V	1	38.9	3.4
7	#10420.00	45.7 PK	68.2	-22.5	1.05 V	121	32.9	12.8
8	15630.00	56.4 PK	74.0	-17.6	1.13 V	53	42.7	13.7
9	15630.00	41.9 AV	54.0	-12.1	1.13 V	53	28.2	13.7

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Channel	TX Channel 155	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5775.00	112.3 PK			1.54 H	321	108.2	4.1
2	*5775.00	99.6 AV			1.54 H	321	95.5	4.1
3	11550.00	49.8 PK	74.0	-24.2	1.88 H	177	36.6	13.2
4	11550.00	37.7 AV	54.0	-16.3	1.88 H	177	24.5	13.2
5	#17325.00	60.6 PK	68.2	-7.6	1.18 H	331	43.0	17.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5775.00	113.4 PK			2.91 V	18	109.3	4.1
2	*5775.00	99.2 AV			2.91 V	18	95.1	4.1
3	11550.00	47.8 PK	74.0	-26.2	1.29 V	76	34.6	13.2
4	11550.00	37.1 AV	54.0	-16.9	1.29 V	76	23.9	13.2
5	#17325.00	65.4 PK	68.2	-2.8	1.19 V	80	47.8	17.6

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

BELOW 1GHz DATA

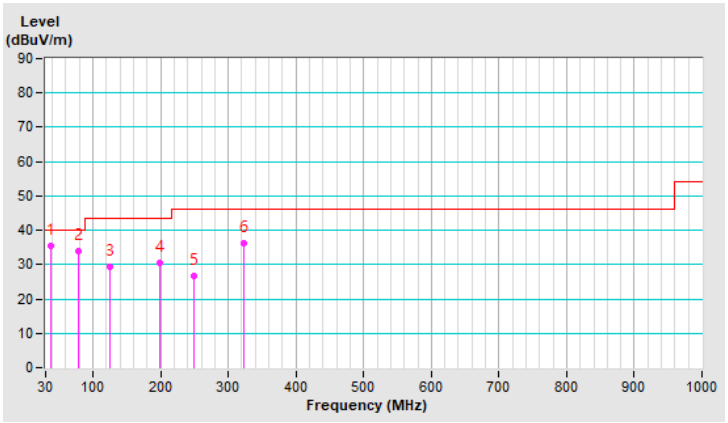
802.11ax (HE20)

Channel	TX Channel 149	Detector Function	Quasi-Peak (QP)
Frequency Range	9kHz ~ 1GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	36.96	35.4 QP	40.0	-4.6	2.00 H	229	43.8	-8.4
2	78.44	33.8 QP	40.0	-6.2	2.00 H	128	46.1	-12.3
3	125.00	29.2 QP	43.5	-14.3	2.00 H	86	38.1	-8.9
4	198.50	30.4 QP	43.5	-13.1	2.00 H	176	40.8	-10.4
5	250.01	26.8 QP	46.0	-19.2	1.50 H	206	35.2	-8.4
6	323.56	36.2 QP	46.0	-9.8	1.00 H	246	41.7	-5.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

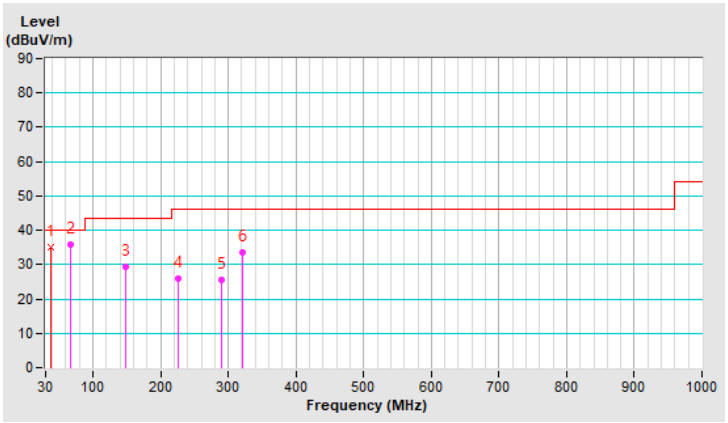


Channel	TX Channel 149	**Detector Function**	Quasi-Peak (QP)
Frequency Range	9kHz ~ 1GHz		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	38.71	35.2 QP	40.0	-4.8	1.57 V	241	43.5	-8.3
2	67.49	35.8 QP	40.0	-4.2	1.00 V	134	45.4	-9.6
3	148.11	29.3 QP	43.5	-14.2	1.00 V	274	36.4	-7.1
4	226.05	25.8 QP	46.0	-20.2	1.00 V	163	35.6	-9.8
5	289.39	25.6 QP	46.0	-20.4	1.50 V	186	32.3	-6.7
6	321.35	33.5 QP	46.0	-12.5	2.00 V	168	39.0	-5.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 19, 2020	Mar. 18, 2021
50 ohms Terminator	50	3	Oct. 23, 2019	Oct. 22, 2020
RF Cable	5D-FB	COCCAB-001	Sep. 27, 2019	Sep. 26, 2020
Fixed attenuator EMCI	STI02-2200-10	005	Aug. 30, 2019	Aug. 29, 2020
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3. Tested Date: June 09, 2020

4.2.3 Test Procedure

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

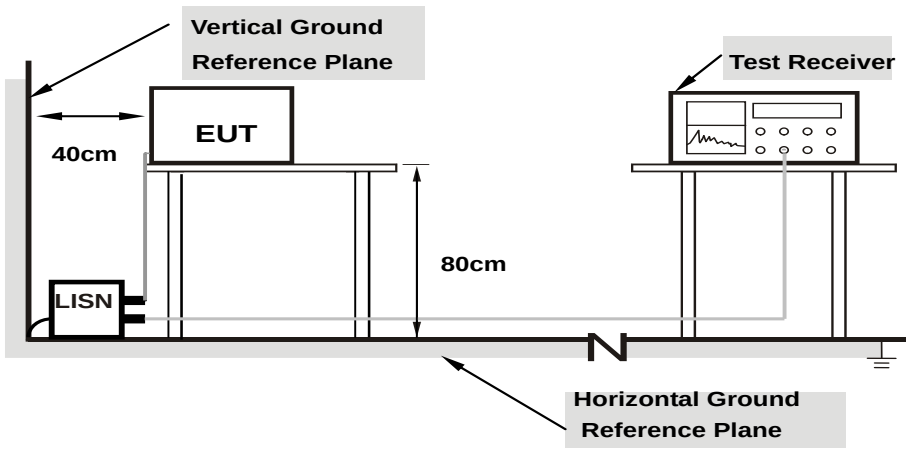
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Condition

Same as 4.1.6.

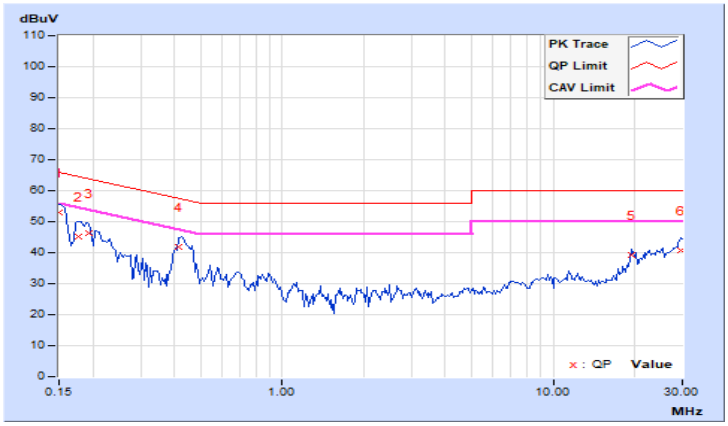
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.01	42.78	32.31	52.79	42.32	66.00	56.00	-13.21	-13.68
2	0.17734	10.02	35.06	15.41	45.08	25.43	64.61	54.61	-19.53	-29.18
3	0.19297	10.02	36.38	25.16	46.40	35.18	63.91	53.91	-17.51	-18.73
4	0.41563	10.03	31.70	24.80	41.73	34.83	57.54	47.54	-15.81	-12.71
5	19.39844	11.11	28.19	26.73	39.30	37.84	60.00	50.00	-20.70	-12.16
6	29.58984	11.50	29.12	24.18	40.62	35.68	60.00	50.00	-19.38	-14.32

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

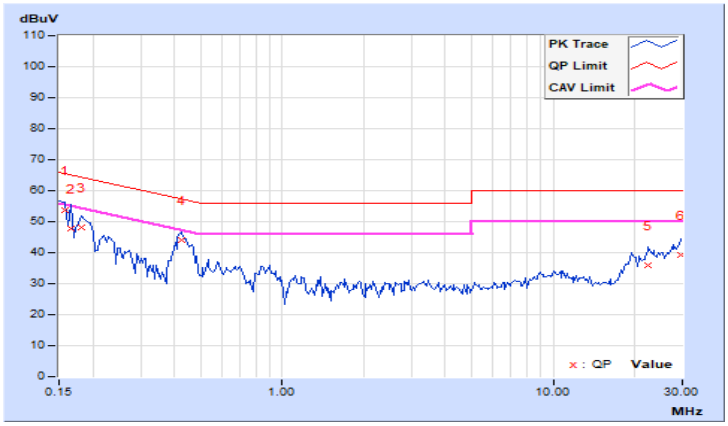


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	10.00	43.52	32.82	53.52	42.82	65.58	55.58	-12.06	-12.76
2	0.16562	10.00	37.86	15.60	47.86	25.60	65.18	55.18	-17.32	-29.58
3	0.18125	10.01	37.98	19.18	47.99	29.19	64.43	54.43	-16.44	-25.24
4	**0.42344**	**10.01**	**33.98**	**29.64**	**43.99**	**39.65**	**57.38**	**47.38**	**-13.39**	**-7.73**
5	22.41797	10.94	25.12	20.04	36.06	30.98	60.00	50.00	-23.94	-19.02
6	29.73047	11.11	28.09	23.13	39.20	34.24	60.00	50.00	-20.80	-15.76

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



4.3 Transmit Power Measurement

4.3.1 Limits of Transmit Power Measurement

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)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
	√	Indoor Access Point	1 Watt (30 dBm)
		Client device	250mW (24 dBm)
U-NII-2A			250mW (24 dBm) or 11 dBm+10 log B*
U-NII-2C			250mW (24 dBm) or 11 dBm+10 log B*
U-NII-3	√		1 Watt (30 dBm)

*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.

4.3.2 Test Setup

4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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. Duty factor is not added to measured value.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Result

Non-Beamforming Mode

802.11a

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
36	5180	14.33	14.48	13.22	13.46	98.328	19.93	26.00	Pass
40	5200	14.24	14.52	13.42	13.43	98.868	19.95	26.00	Pass
48	5240	14.29	14.50	13.39	13.39	98.692	19.94	26.00	Pass
149	5745	20.08	19.97	19.85	19.73	391.748	25.93	26.00	Pass
157	5785	20.16	19.98	19.67	19.65	388.234	25.89	26.00	Pass
165	5825	20.09	20.04	19.31	19.77	383.171	25.83	26.00	Pass

Note: 1. The Max gain is 10dBi > 6dBi, therefore the limit needs to reduce, so the power limit shall be reduced to 30-(10-6) = 26dBm.

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
36	5180	14.09	14.21	13.05	13.19	93.037	19.69	26.00	Pass
40	5200	14.09	14.17	13.13	12.91	91.869	19.63	26.00	Pass
48	5240	14.14	14.37	13.06	12.91	93.068	19.69	26.00	Pass
149	5745	19.98	19.71	19.54	19.67	375.714	25.75	26.00	Pass
157	5785	19.95	19.68	19.36	19.35	364.149	25.61	26.00	Pass
165	5825	19.98	19.68	19.28	19.51	366.49	25.64	26.00	Pass

Note: 1. The Max gain is 10dBi > 6dBi, therefore the limit needs to reduce, so the power limit shall be reduced to 30-(10-6) = 26dBm.

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
38	5190	15.34	15.52	14.35	14.31	124.047	20.94	26.00	Pass
46	5230	16.95	17.28	16.14	16.01	184.019	22.65	26.00	Pass
151	5755	19.71	19.70	19.54	19.27	361.344	25.58	26.00	Pass
159	5795	19.68	19.80	19.62	19.32	365.525	25.63	26.00	Pass

Note: 1. The Max gain is 10dBi > 6dBi, therefore the limit needs to reduce, so the power limit shall be reduced to 30-(10-6) = 26dBm.

802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
42	5210	15.04	15.11	13.92	14.01	114.187	20.58	26.00	Pass
155	5775	18.47	18.47	17.88	17.65	260.201	24.15	26.00	Pass

Note: 1. The Max gain is 10dBi > 6dBi, therefore the limit needs to reduce, so the power limit shall be reduced to 30-(10-6) = 26dBm.

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
36	5180	14.31	14.46	13.28	13.39	98.012	19.91	26.00	Pass
40	5200	14.35	14.40	13.38	13.19	97.391	19.89	26.00	Pass
48	5240	14.40	14.58	13.34	13.14	98.434	19.93	26.00	Pass
149	5745	19.98	19.95	19.82	19.96	393.419	25.95	26.00	Pass
157	5785	19.95	19.94	19.61	19.63	380.728	25.81	26.00	Pass
165	5825	19.98	19.91	19.51	19.76	381.444	25.81	26.00	Pass

Note: 1. The Max gain is 10dBi > 6dBi, therefore the limit needs to reduce, so the power limit shall be reduced to 30-(10-6) = 26dBm.

802.11ax (HE40)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
38	5190	15.61	15.74	14.62	14.56	131.438	21.19	26.00	Pass
46	5230	17.23	17.49	16.34	16.25	194.172	22.88	26.00	Pass
151	5755	19.93	19.94	19.76	19.53	381.396	25.81	26.00	Pass
159	5795	19.93	20.02	19.86	19.58	386.473	25.87	26.00	Pass

Note: 1. The Max gain is 10dBi > 6dBi, therefore the limit needs to reduce, so the power limit shall be reduced to 30-(10-6) = 26dBm.

802.11ax (HE80)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
42	5210	15.27	15.39	14.14	14.22	120.611	20.81	26.00	Pass
155	5775	18.71	18.69	18.17	17.89	275.395	24.40	26.00	Pass

Note: 1. The Max gain is 10dBi > 6dBi, therefore the limit needs to reduce, so the power limit shall be reduced to 30-(10-6) = 26dBm.

Beamforming Mode

802.11ac (VHT20)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
36	5180	14.09	14.21	13.05	13.19	93.037	19.69	19.98	Pass
40	5200	14.09	14.17	13.13	12.91	91.869	19.63	19.98	Pass
48	5240	14.14	14.37	13.06	12.91	93.068	19.69	19.98	Pass
149	5745	13.84	13.70	13.45	13.37	91.511	19.61	19.98	Pass
157	5785	13.91	13.73	13.51	13.36	92.324	19.65	19.98	Pass
165	5825	13.81	13.68	13.41	13.39	91.134	19.60	19.98	Pass

Note: 1. Directional gain = 10dBi + 10log(4) = 16.02dBi > 6dBi , so the power limit shall be reduced to 30-(16.02-6) = 19.98dBm.

802.11ac (VHT40)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
38	5190	14.17	14.08	12.86	13.28	92.309	19.65	19.98	Pass
46	5230	13.95	14.10	13.00	13.28	91.769	19.63	19.98	Pass
151	5755	13.86	13.88	13.35	13.41	92.312	19.65	19.98	Pass
159	5795	13.82	13.85	13.35	13.37	91.719	19.62	19.98	Pass

Note: 1. Directional gain = 10dBi + 10log(4) = 16.02dBi > 6dBi , so the power limit shall be reduced to 30-(16.02-6) = 19.98dBm.

802.11ac (VHT80)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
42	5210	14.15	14.26	12.82	13.12	92.324	19.65	19.98	Pass
155	5775	13.96	13.79	13.34	13.35	92.026	19.64	19.98	Pass

Note: 1. Directional gain = 10dBi + 10log(4) = 16.02dBi > 6dBi , so the power limit shall be reduced to 30-(16.02-6) = 19.98dBm.

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
36	5180	14.31	14.46	13.28	13.39	98.012	19.91	19.98	Pass
40	5200	14.35	14.40	13.38	13.19	97.391	19.89	19.98	Pass
48	5240	14.40	14.58	13.34	13.14	98.434	19.93	19.98	Pass
149	5745	14.10	13.94	13.69	13.63	96.934	19.86	19.98	Pass
157	5785	14.12	13.98	13.74	13.65	97.659	19.90	19.98	Pass
165	5825	14.09	13.97	13.69	13.64	97.1	19.87	19.98	Pass

Note: 1. Directional gain = 10dBi + 10log(4) = 16.02dBi > 6dBi , so the power limit shall be reduced to 30-(16.02-6) = 19.98dBm.

802.11ax (HE40)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
38	5190	14.41	14.36	13.11	13.52	97.851	19.91	19.98	Pass
46	5230	14.23	14.38	13.20	13.56	97.492	19.89	19.98	Pass
151	5755	14.03	14.11	13.62	13.62	97.085	19.87	19.98	Pass
159	5795	14.06	14.12	13.59	13.57	96.898	19.86	19.98	Pass

Note: 1. Directional gain = 10dBi + 10log(4) = 16.02dBi > 6dBi , so the power limit shall be reduced to 30-(16.02-6) = 19.98dBm.

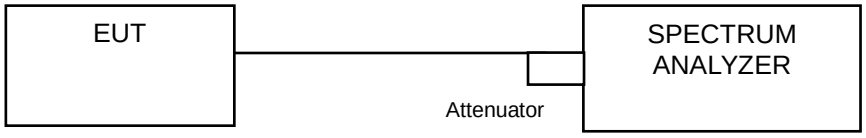
802.11ax (HE80)

Chan.	Chan. Freq. (MHz)	Maximum Conducted Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
42	5210	14.35	14.48	13.06	13.41	97.44	19.89	19.98	Pass
155	5775	14.21	14.05	13.62	13.59	97.643	19.90	19.98	Pass

Note: 1. Directional gain = 10dBi + 10log(4) = 16.02dBi > 6dBi , so the power limit shall be reduced to 30-(16.02-6) = 19.98dBm.

4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to SAMPLE. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean power of a given emission.

4.4.4 Test Results

802.11a

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
36	5180	16.92	17.04	16.92	16.8
40	5200	17.04	17.04	17.04	16.8
48	5240	17.04	17.16	17.16	17.04
149	5745	17.28	17.31	17.52	17.88
157	5785	17.28	17.28	17.28	18.12
165	5825	17.28	17.28	17.28	17.88

802.11ax (HE20)

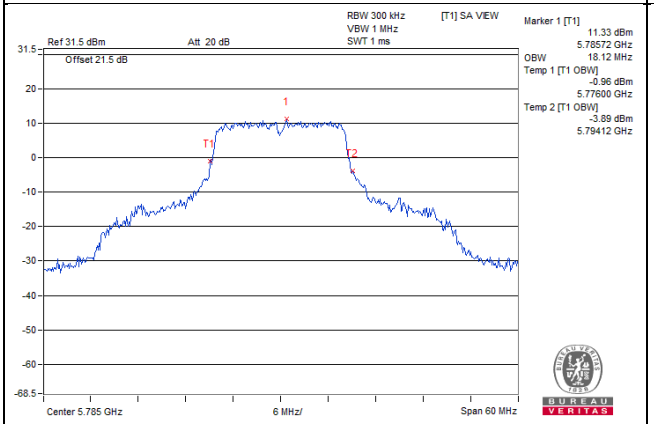
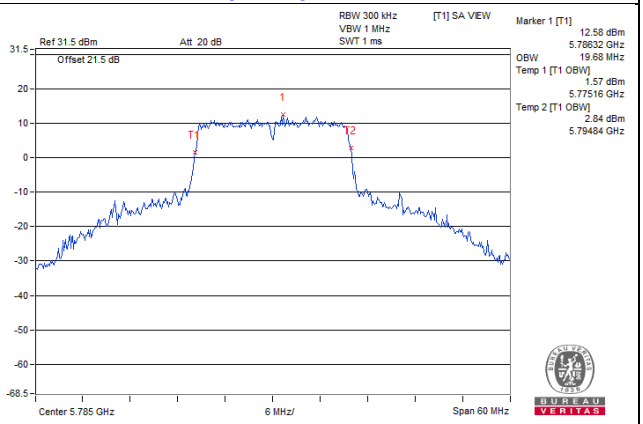
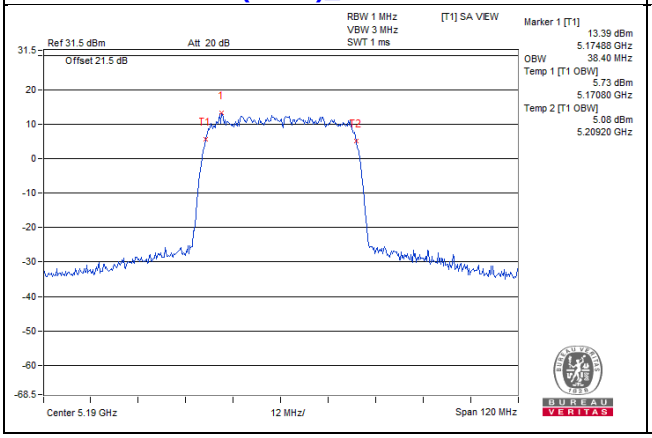
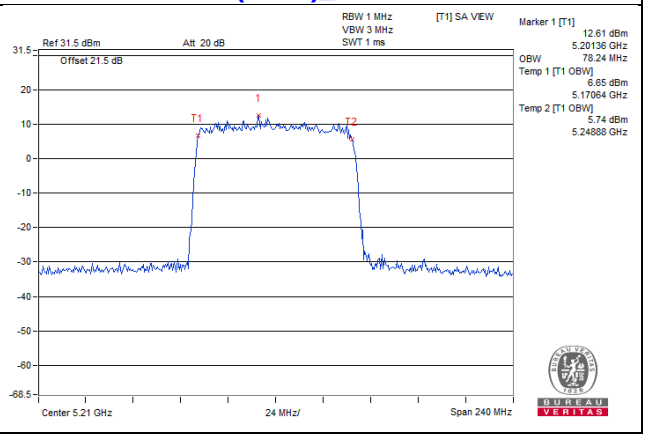
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
36	5180	19.08	19.2	19.2	19.2
40	5200	19.08	19.2	19.2	19.2
48	5240	19.08	19.2	19.2	19.2
149	5745	19.2	19.2	19.44	19.68
157	5785	19.2	19.2	19.44	19.68
165	5825	19.2	19.2	19.32	19.44

802.11ax (HE40)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
38	5190	37.68	37.68	38.4	37.68
46	5230	37.68	37.68	38.4	37.68
151	5755	37.92	37.92	38.16	38.16
159	5795	37.92	37.92	38.16	38.16

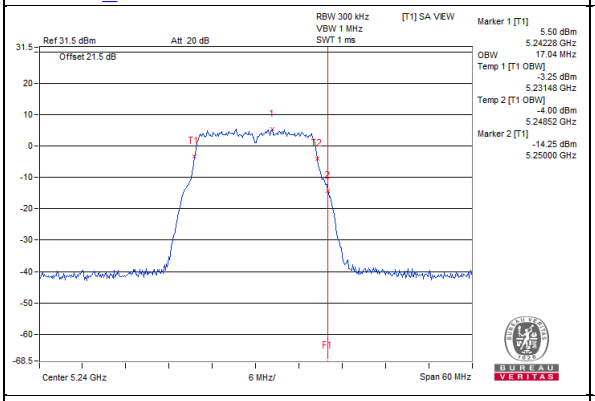
802.11ax (HE80)

Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)			
		Chain 0	Chain 1	Chain 2	Chain 3
42	5210	78.24	78.24	78.24	77.28
155	5775	77.28	77.28	77.28	77.76

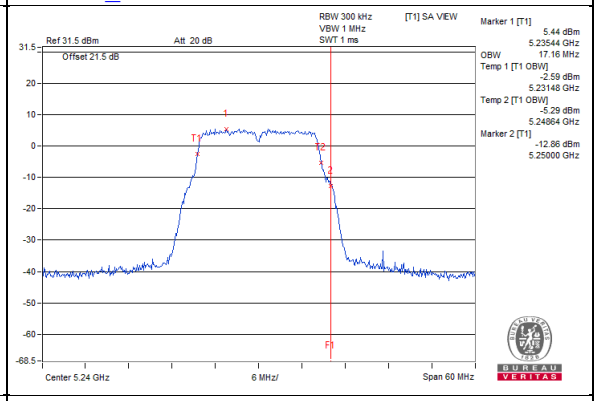
Spectrum Plot of Max. Value	
802.11a_Chain 3 / CH157	**802.11ax (HE20)_Chain 3 / CH157**
	
802.11ax (HE40)_Chain 2 / CH38	**802.11ax (HE80)_Chain 0 / CH42**
	

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

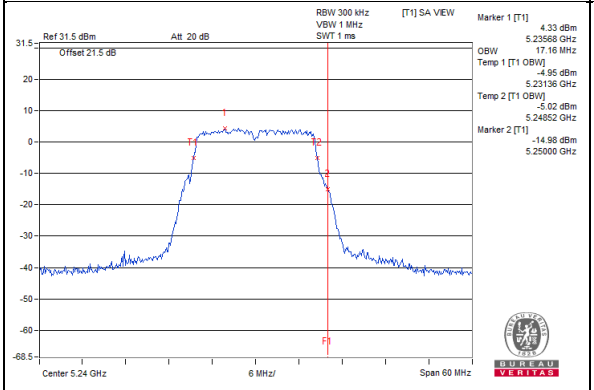
802.11a_Chain 0 / CH48



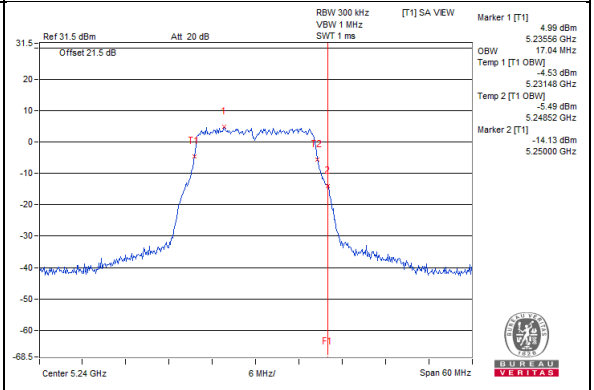
802.11a_Chain 1 / CH48



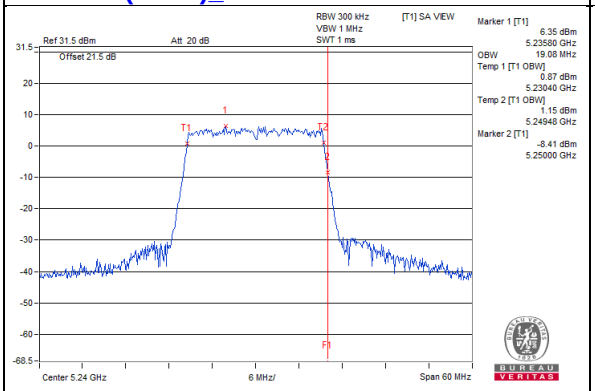
802.11a_Chain 2 / CH48



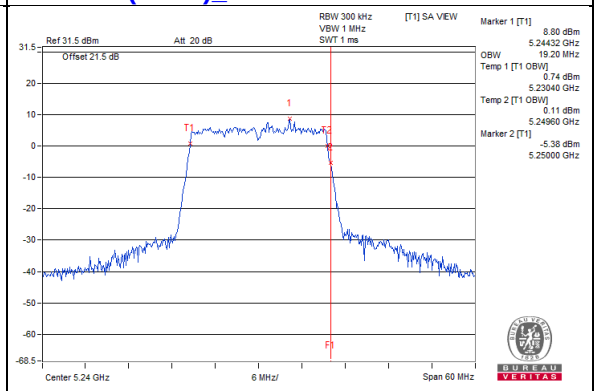
802.11a_Chain 3 / CH48



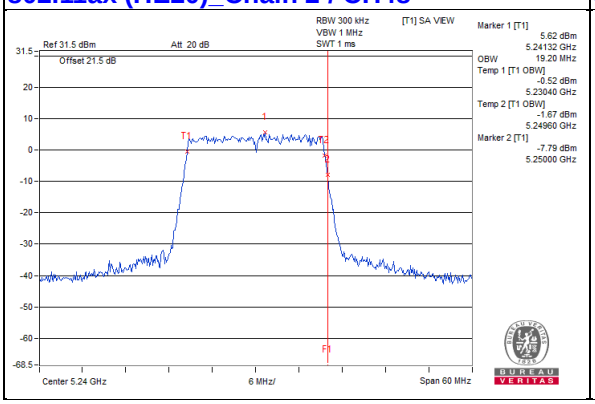
802.11ax (HE20)_Chain 0 / CH48



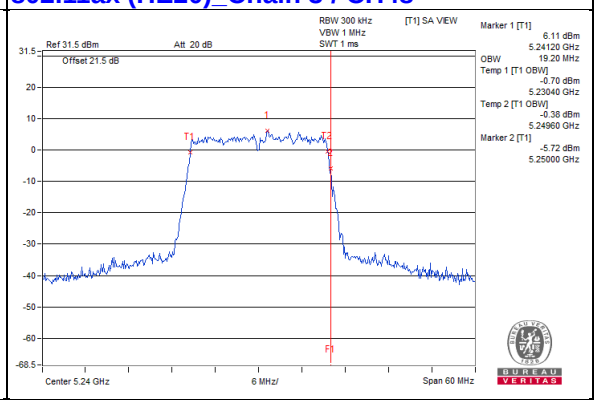
802.11ax (HE20)_Chain 1 / CH48



802.11ax (HE20)_Chain 2 / CH48

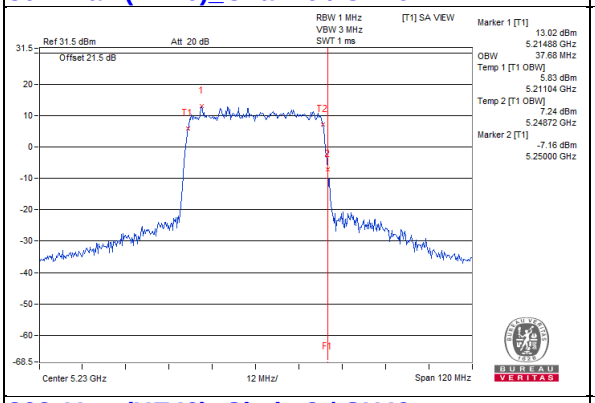


802.11ax (HE20)_Chain 3 / CH48

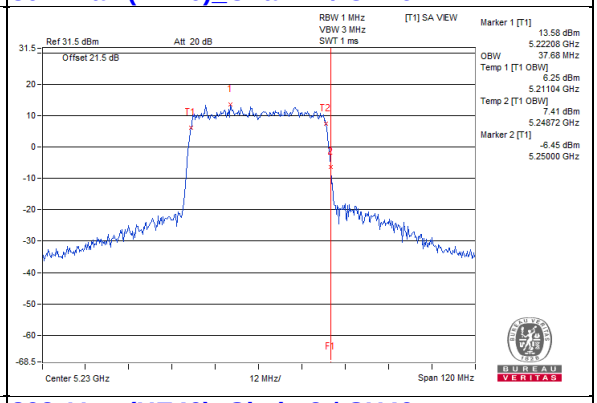


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2A band)

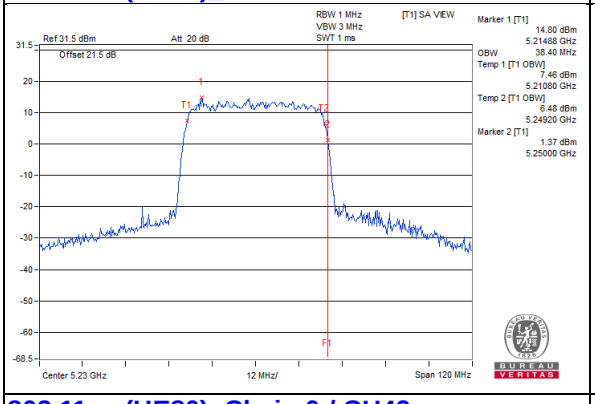
802.11ax (HE40)_Chain 0 / CH46



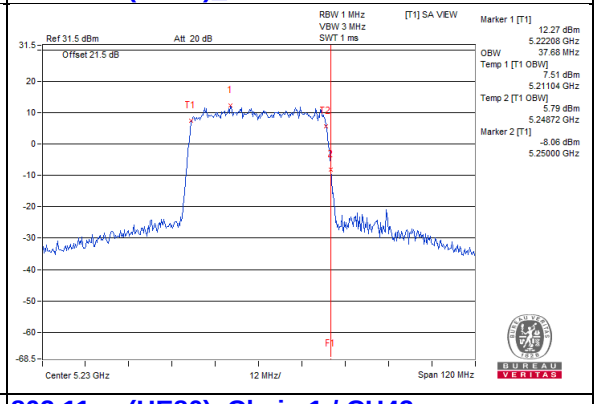
802.11ax (HE40)_Chain 1 / CH46



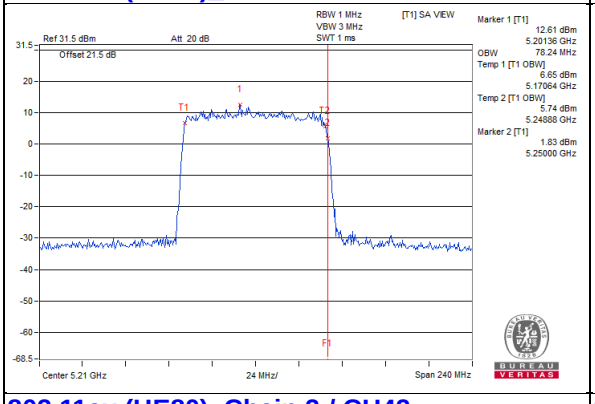
802.11ax (HE40)_Chain 2 / CH46



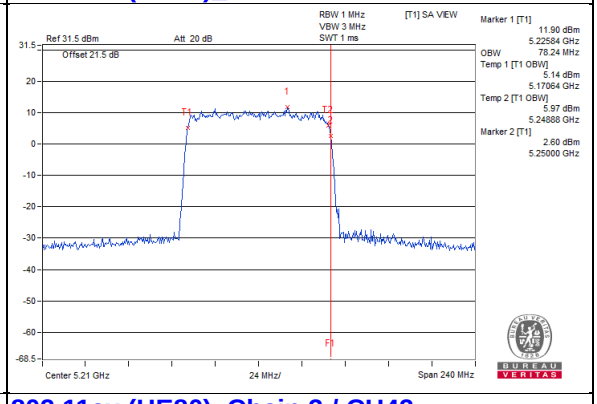
802.11ax (HE40)_Chain 3 / CH46



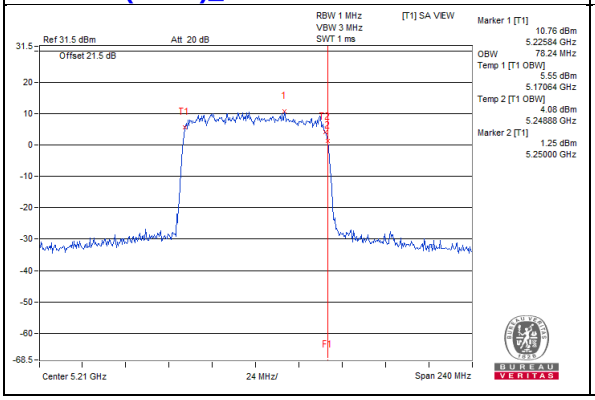
802.11ax (HE80)_Chain 0 / CH42



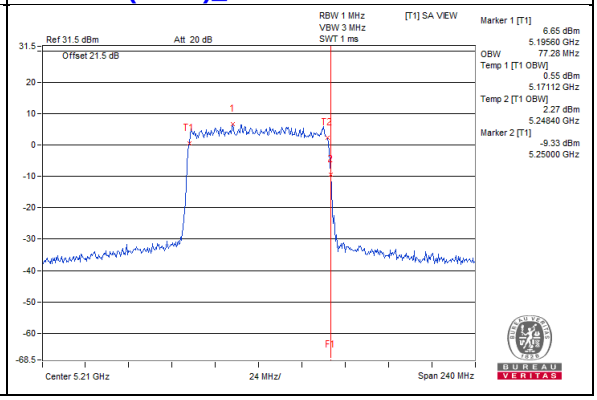
802.11ax (HE80)_Chain 1 / CH42



802.11ax (HE80)_Chain 2 / CH42

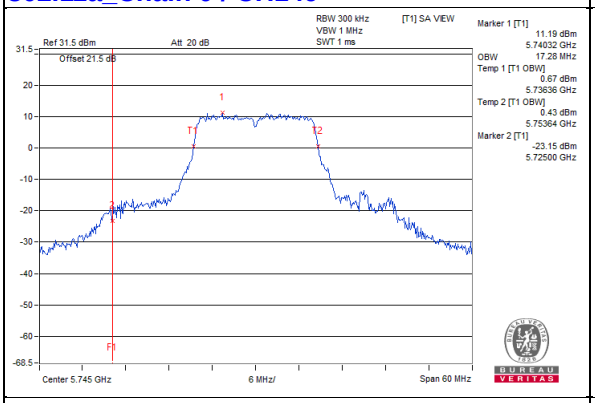


802.11ax (HE80)_Chain 3 / CH42

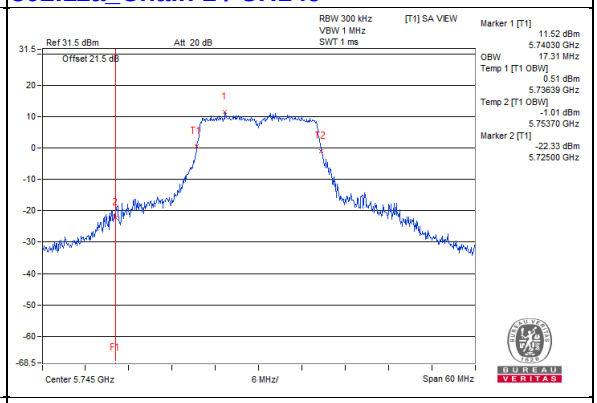


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2C band)

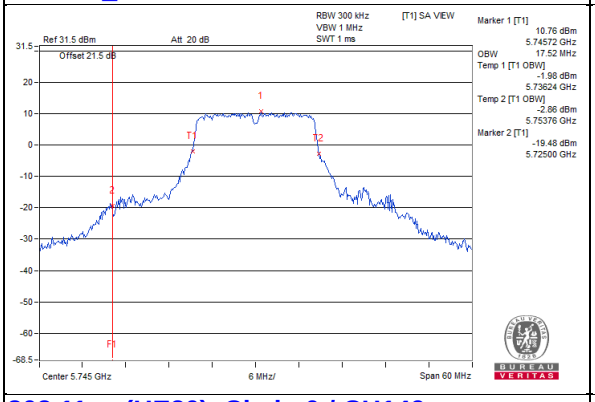
802.11a_Chain 0 / CH149



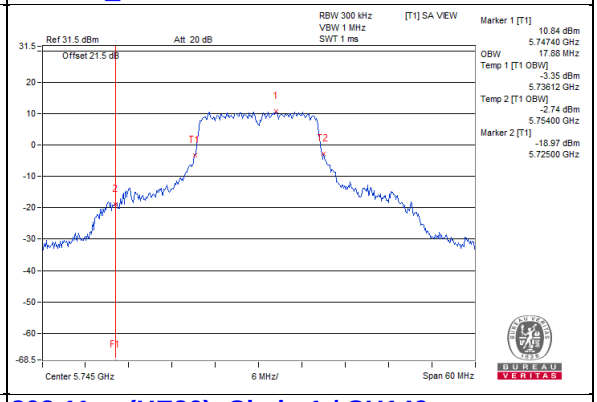
802.11a_Chain 1 / CH149



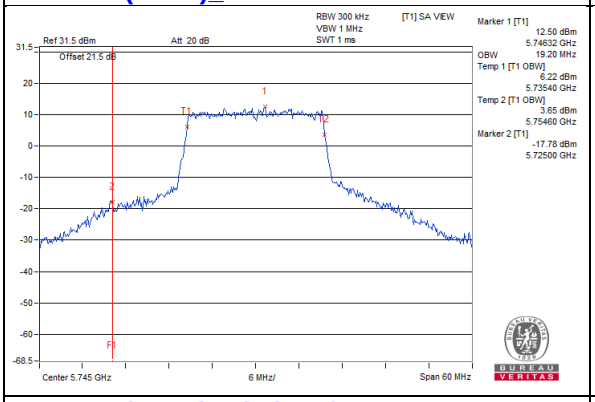
802.11a_Chain 2 / CH149



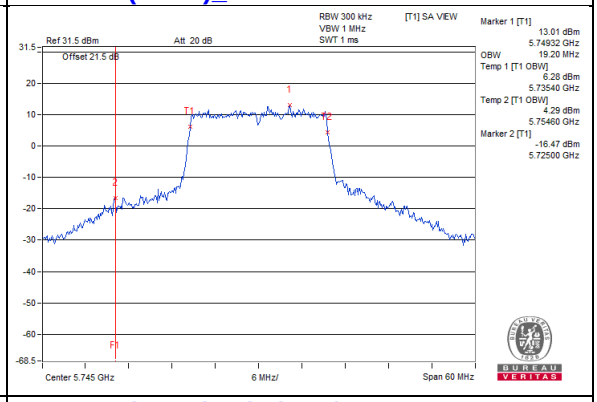
802.11a_Chain 3 / CH149



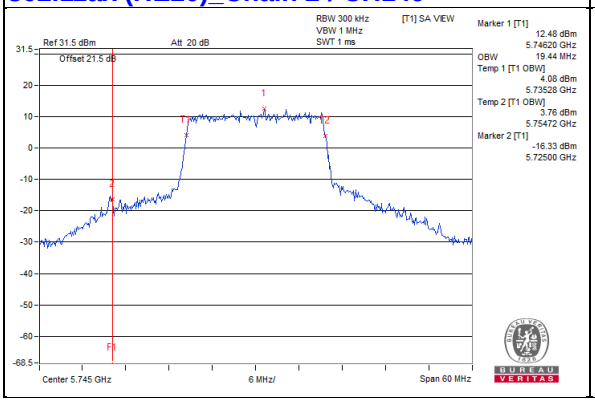
802.11ax (HE20)_Chain 0 / CH149



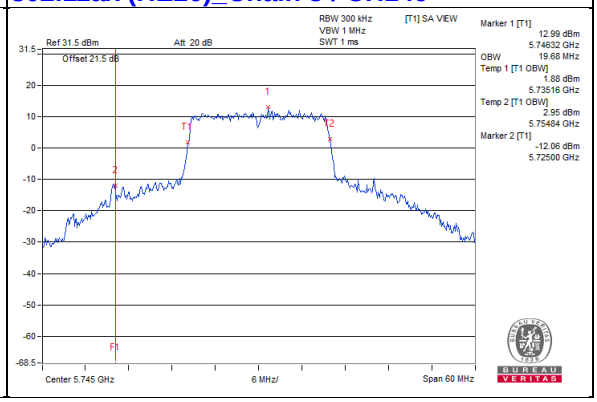
802.11ax (HE20)_Chain 1 / CH149



802.11ax (HE20)_Chain 2 / CH149

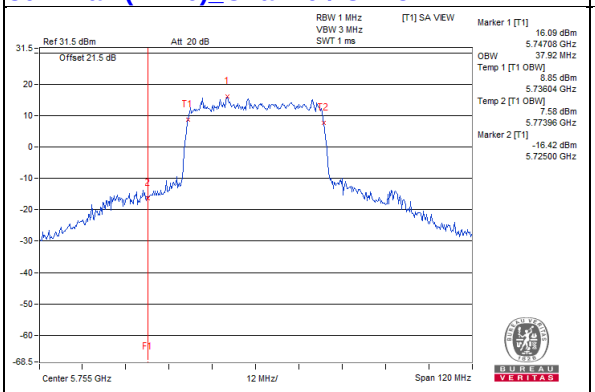


802.11ax (HE20)_Chain 3 / CH149

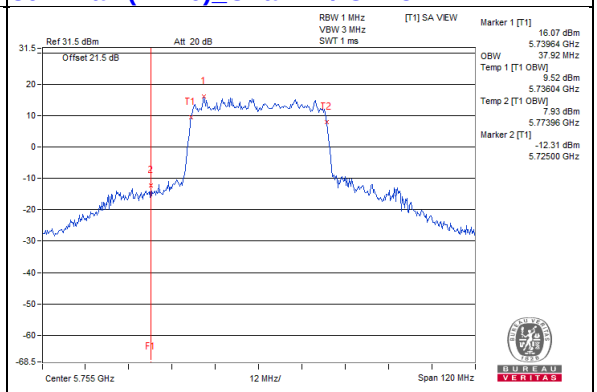


Spectrum Plot for near by DFS band
(DFS is required, if 99% OCP straddle into U-NII-2C band)

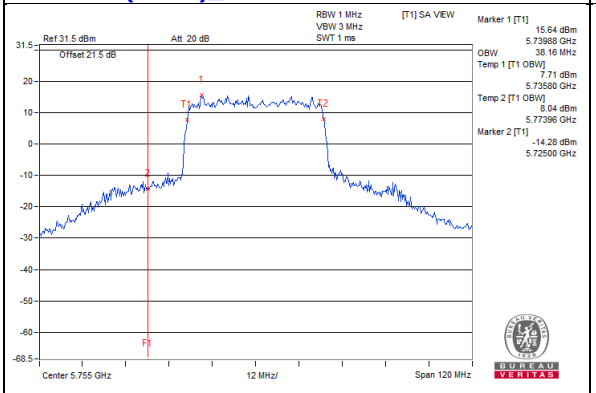
802.11ax (HE40)_Chain 0 / CH151



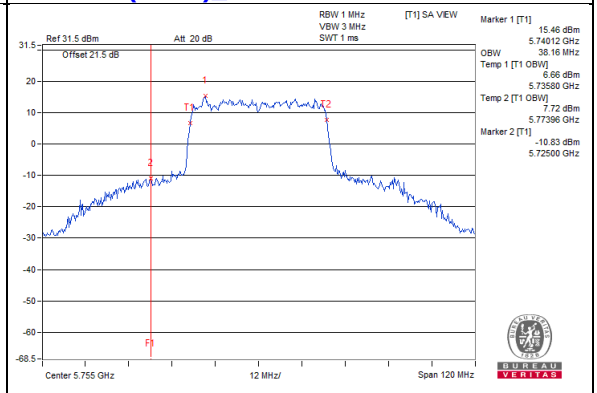
802.11ax (HE40)_Chain 1 / CH151



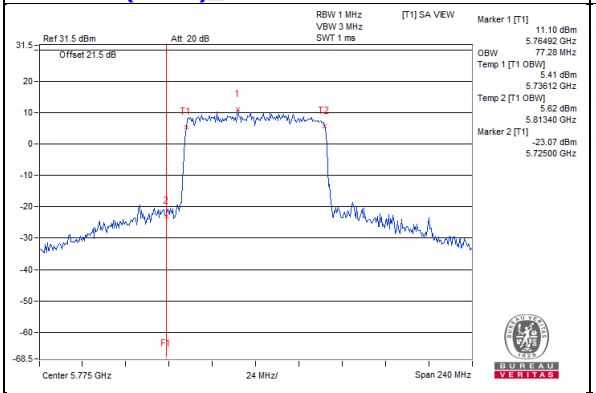
802.11ax (HE40)_Chain 2 / CH151



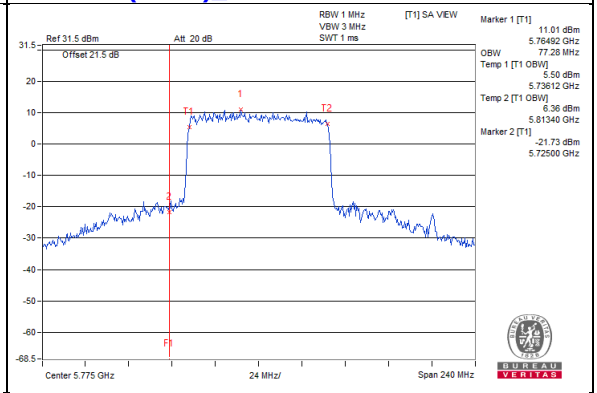
802.11ax (HE40)_Chain 3 / CH151



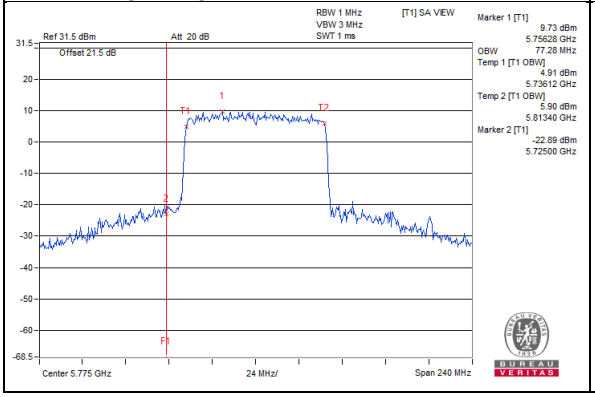
802.11ax (HE80)_Chain 0 / CH155



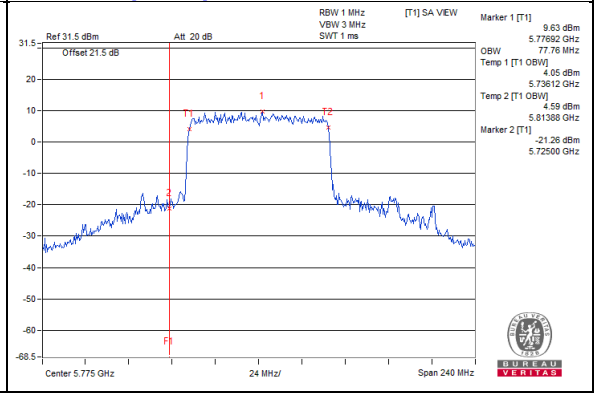
802.11ax (HE80)_Chain 1 / CH155



802.11ax (HE80)_Chain 2 / CH155



802.11ax (HE80)_Chain 3 / CH155

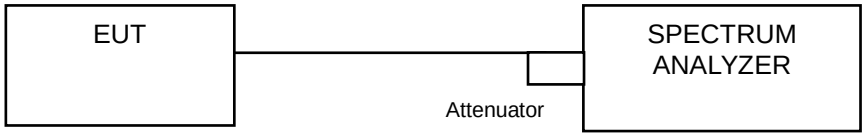


4.5 Peak Power Spectral Density Measurement

4.5.1 Limits of Peak Power Spectral Density Measurement

Operation Band	EUT Category		Limit
U-NII-1		Outdoor Access Point	17dBm/ MHz
		Fixed point-to-point Access Point	
	√	Indoor Access Point	
		Client device	11dBm/ MHz
U-NII-2A			11dBm/ MHz
U-NII-2C			11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

For 802.11a:
For U-NII-1:
Using method SA-1

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW ≥ 3 MHz, Detector = RMS
3. Sweep time = auto, trigger set to “free run”.
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value

For U-NII-3:

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS
3. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
4. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(500 kHz/300kHz)
5. Sweep time = auto, trigger set to “free run”.
6. Trace average at least 100 traces in power averaging mode.
7. Record the max value

For other modulation:

For U-NII-1:

Using method SA-2

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

For U-NII-3:

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS
3. Use the peak marker function to determine the maximum power level in any 300 kHz band segment within the fundamental EBW.
4. Scale the observed power level to an equivalent value in 500 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(500 kHz/300kHz)
5. Sweep time = auto, trigger set to “free run”.
6. Trace average at least 100 traces in power averaging mode.
7. Record the max value and add 10 log (1/duty cycle)

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6.

4.5.7 Test Results

For U-NII-1:

802.11a

Chan.	Chan. Freq. (MHz)	PSD (dBm/MHz)				Total Power Density (dBm/MHz)	MAX. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3			
36	5180	0.97	1.43	-0.11	0.42	6.74	6.98	Pass
40	5200	1.10	1.26	0.26	0.46	6.81	6.98	Pass
48	5240	1.22	1.37	0.23	0.34	6.84	6.98	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 = 10dBi + 10log(4) = 16.02dBi > 6dBi, so the Power Density limit shall be reduced to 17-(16.02-6) = 6.98dBm

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm/MHz)				Duty Factor (dB)	Total PSD With Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
36	5180	0.47	0.78	-0.29	-0.57	0.1	6.25	6.98	Pass
40	5200	0.46	0.77	-0.41	-0.67	0.1	6.20	6.98	Pass
48	5240	0.59	1.00	-0.45	-0.39	0.1	6.35	6.98	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 = 10dBi + 10log(4) = 16.02dBi > 6dBi, so the Power Density limit shall be reduced to 17-(16.02-6) = 6.98dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE40)

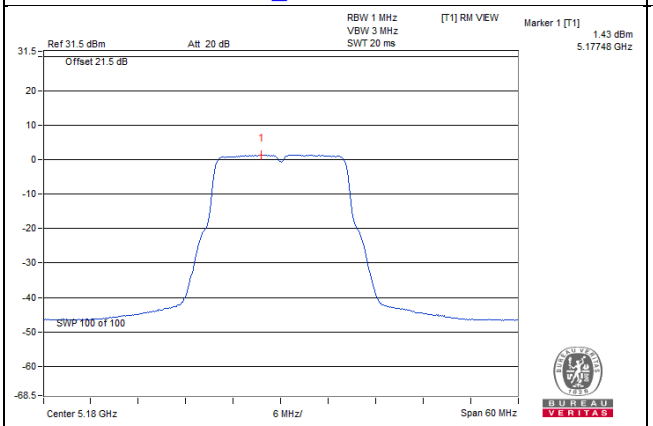
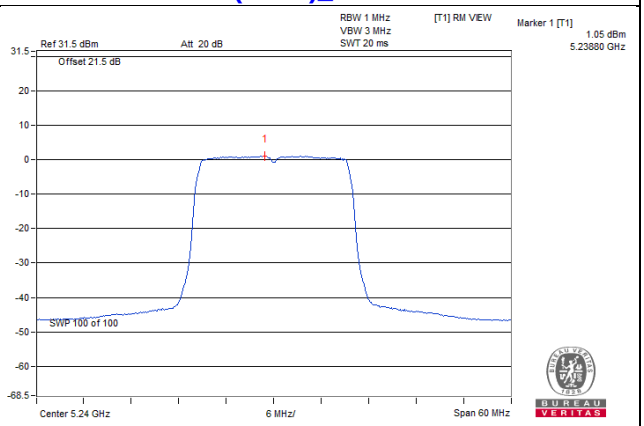
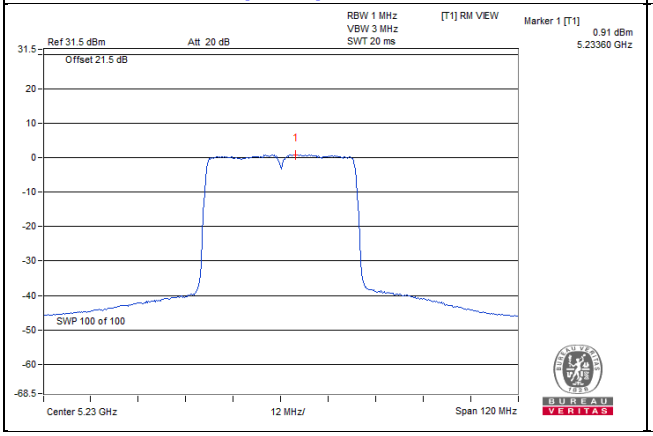
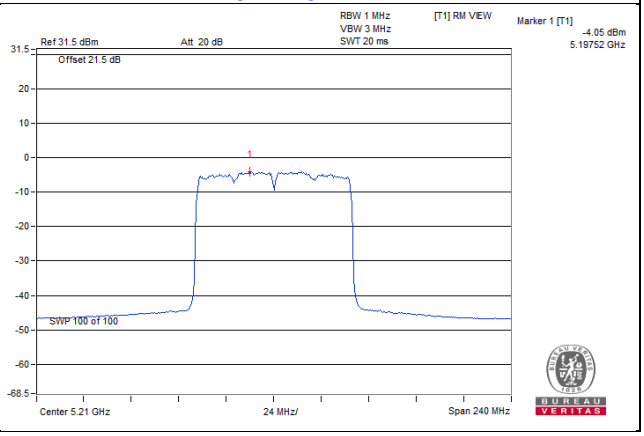
Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm/MHz)				Duty Factor (dB)	Total PSD With Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
38	5190	-0.85	-0.69	-2.04	-1.87	0.22	4.92	6.98	Pass
46	5230	0.45	0.83	-0.42	-0.27	0.22	6.42	6.98	Pass

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 = 10dBi + 10log(4) = 16.02dBi > 6dBi, so the Power Density limit shall be reduced to 17-(16.02-6) = 6.98dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE80)

Chan.	Chan. Freq. (MHz)	PSD W/O Duty Factor (dBm/MHz)				Duty Factor (dB)	Total PSD With Duty Factor (dBm/MHz)	Max. Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
42	5210	-4.35	-4.07	-5.38	-5.14	0.36	1.68	6.98	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 = 10dBi + 10log(4) = 16.02dBi > 6dBi, so the Power Density limit shall be reduced to 17-(16.02-6) = 6.98dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value	
802.11a_Chain 1 / CH36	**802.11ax (HE20)_Chain 1 / CH48**
	
802.11ax (HE40)_Chain 1 / CH46	**802.11ax (HE80)_Chain 1 / CH42**
	

For U-NII-3:

802.11a

Chan.	Freq. (MHz)	PSD (dBm/300kHz)				Total PSD		Total PSD (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
		Chain 0	Chain 1	Chain 2	Chain 3	mW/ 300kHz	dBm/ 300kHz			
149	5745	-1.55	-1.72	-1.88	-1.57	2.7164	4.34	6.56	19.98	Pass
157	5785	-1.70	-1.56	-2.26	-1.86	2.6182	4.18	6.40	19.98	Pass
165	5825	-1.55	-1.82	-2.07	-1.60	2.673	4.27	6.49	19.98	Pass

Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = 10dBi + 10log(4) = 16.02dBi > 6dBi, so the Power Density limit shall be reduced to 30-(16.02-6) = 19.98dBm

802.11ax (HE20)

Chan.	Freq. (MHz)	PSD W/O Duty Factor (dBm/300kHz)				Duty Factor (dB)	Total PSD With Duty Factor		Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
		Chain 0	Chain 1	Chain 2	Chain 3		mW/300 kHz	dBm/300kHz			
149	5745	-2.75	-2.73	-3.31	-2.97	0.1	2.0845	3.19	5.41	19.98	Pass
157	5785	-2.90	-3.08	-3.16	-3.27	0.1	2.0045	3.02	5.24	19.98	Pass
165	5825	-2.30	-2.73	-3.20	-3.34	0.1	2.1135	3.25	5.47	19.98	Pass

Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = 10dBi + 10log(4) = 16.02dBi > 6dBi, so the Power Density limit shall be reduced to 30-(16.02-6) = 19.98dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE40)

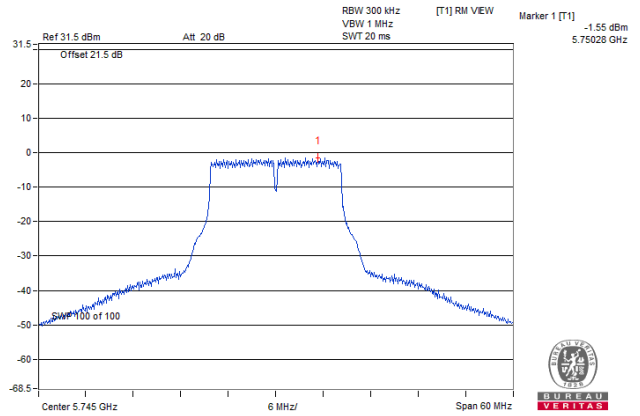
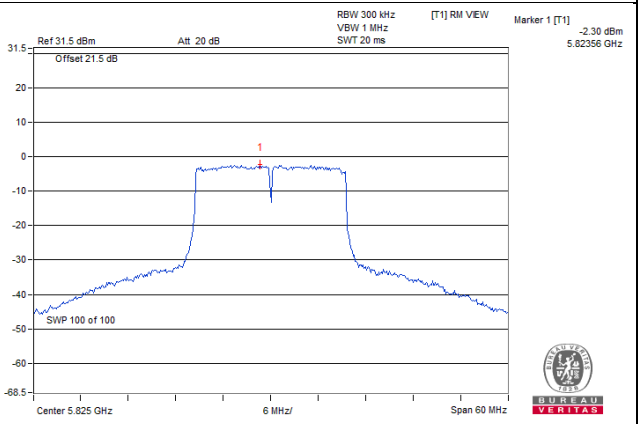
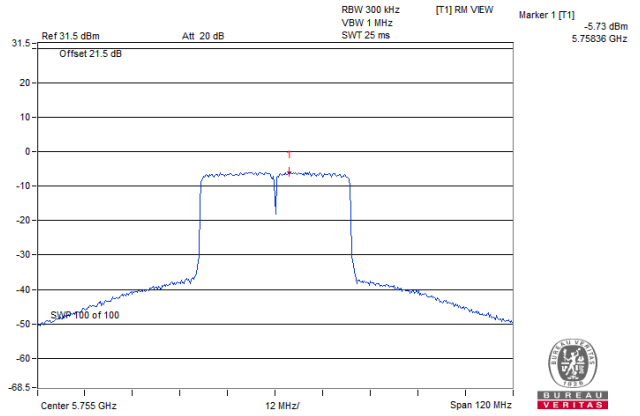
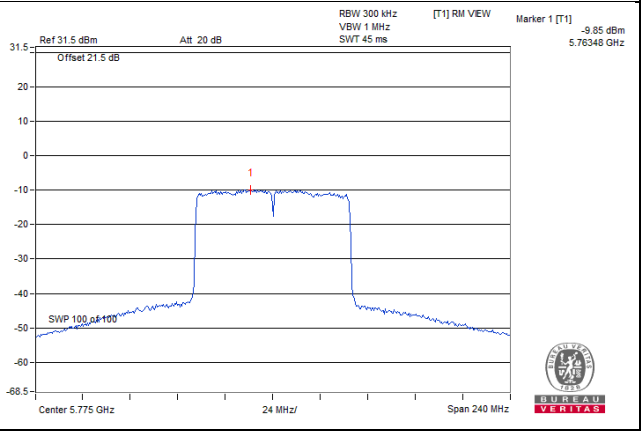
Chan.	Freq. (MHz)	PSD W/O Duty Factor (dBm/300kHz)				Duty Factor (dB)	Total PSD With Duty Factor		Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
		Chain 0	Chain 1	Chain 2	Chain 3		mW/300 kHz	dBm/300kHz			
151	5755	-5.73	-5.91	-5.91	-6.21	0.22	1.0715	0.30	2.52	19.98	Pass
159	5795	-5.96	-5.74	-5.84	-6.26	0.22	1.0691	0.29	2.51	19.98	Pass

Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = 10dBi + 10log(4) = 16.02dBi > 6dBi, so the Power Density limit shall be reduced to 30-(16.02-6) = 19.98dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE80)

Chan.	Freq. (MHz)	PSD W/O Duty Factor (dBm/300kHz)				Duty Factor (dB)	Total PSD With Duty Factor		Total PSD With Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	Pass /Fail
		Chain 0	Chain 1	Chain 2	Chain 3		mW/300 kHz	dBm/300kHz			
155	5775	-9.87	-9.85	-10.24	-10.57	0.36	0.42267	-3.74	-1.52	19.98	Pass

Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. Directional gain = 10dBi + 10log(4) = 16.02dBi > 6dBi, so the Power Density limit shall be reduced to 30-(16.02-6) = 19.98dBm
3. Refer to section 3.3 for duty cycle spectrum plot.

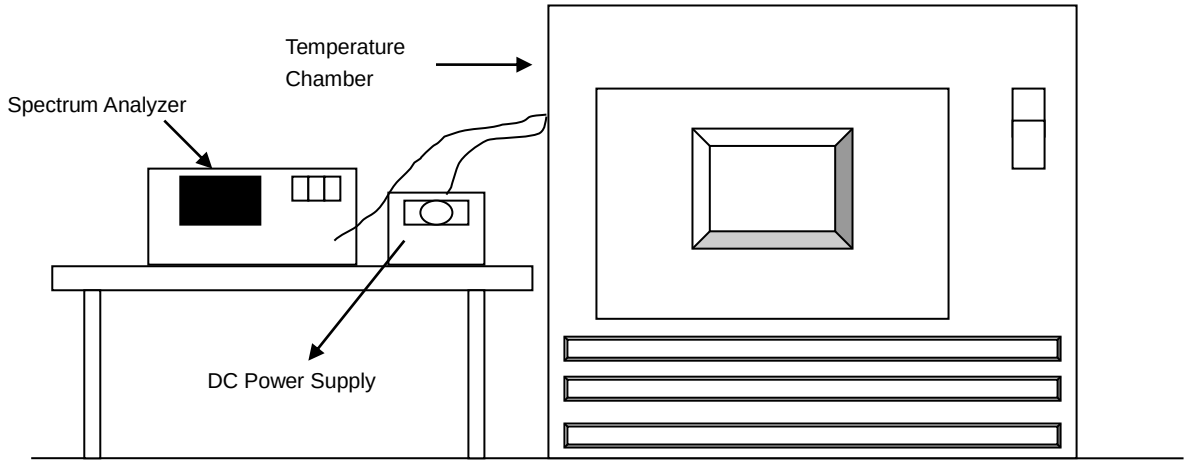
Spectrum Plot of Worst Value	
802.11a_Chain 0 / CH149	**802.11ax (HE20)_Chain 0 / CH165**
	
802.11ax (HE40)_Chain 0 / CH151	**802.11ax (HE80)_Chain 1 / CH155**
	

4.6 Frequency Stability Measurement

4.6.1 Limits of Frequency Stability Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal DC 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 (d) with the temperature chamber set to the next desired temperature until measurements down to the lowest specified temperature have been completed.
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.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Set the EUT transmit at un-modulation mode to test frequency stability.

4.6.7 Test Results

Frequency Stability Versus Temp.									
Operating Frequency: 5180 MHz									
TEMP. (℃)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
40	55	5180.0217	PASS	5180.0185	PASS	5180.0202	PASS	5180.0218	PASS
30	55	5180.0173	PASS	5180.0205	PASS	5180.0183	PASS	5180.0181	PASS
20	55	5179.9977	PASS	5179.9969	PASS	5179.9988	PASS	5179.9956	PASS
10	55	5179.9806	PASS	5179.9834	PASS	5179.9833	PASS	5179.982	PASS
0	55	5179.9748	PASS	5179.9727	PASS	5179.9741	PASS	5179.9732	PASS
-5	55	5180.0121	PASS	5180.0168	PASS	5180.0121	PASS	5180.0133	PASS

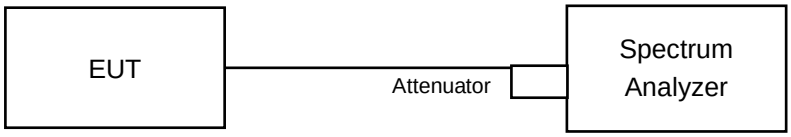
Frequency Stability Versus Voltage									
Operating Frequency: 5180 MHz									
TEMP. (℃)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
20	63.25	5179.9972	PASS	5179.9968	PASS	5179.9986	PASS	5179.9949	PASS
	55	5179.9977	PASS	5179.9969	PASS	5179.9988	PASS	5179.9956	PASS
	46.75	5179.9978	PASS	5179.9961	PASS	5179.9983	PASS	5179.9962	PASS

4.7 6dB Bandwidth Measurement

4.7.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.7.7 Test Results

802.11a

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
149	5745	16.41	16.39	16.4	16.4	0.5	Pass
157	5785	16.41	16.41	16.42	16.4	0.5	Pass
165	5825	16.41	16.41	16.4	16.4	0.5	Pass

802.11ax (HE20)

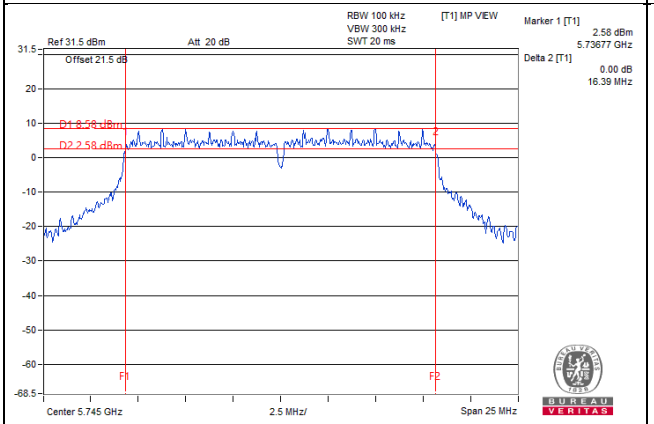
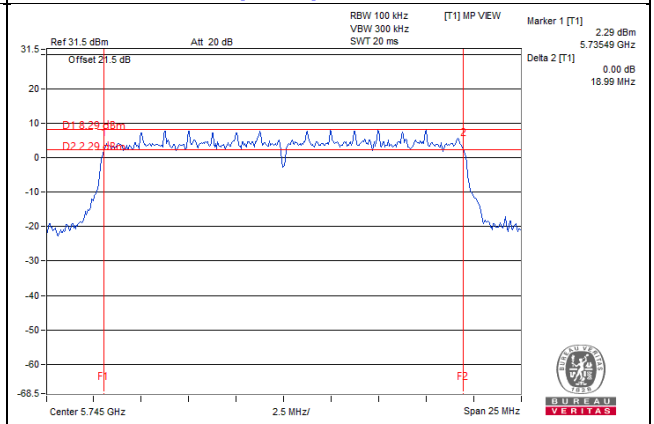
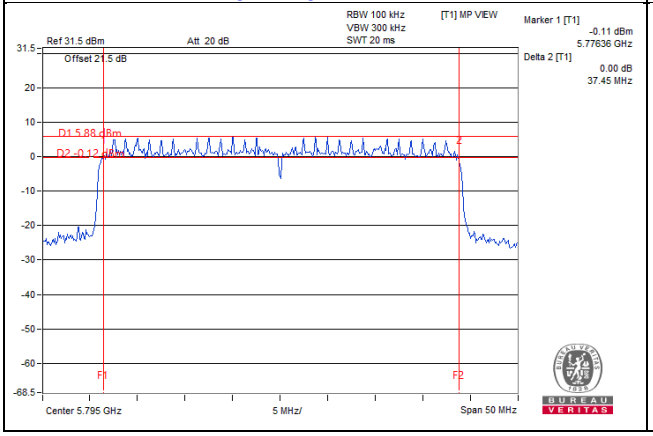
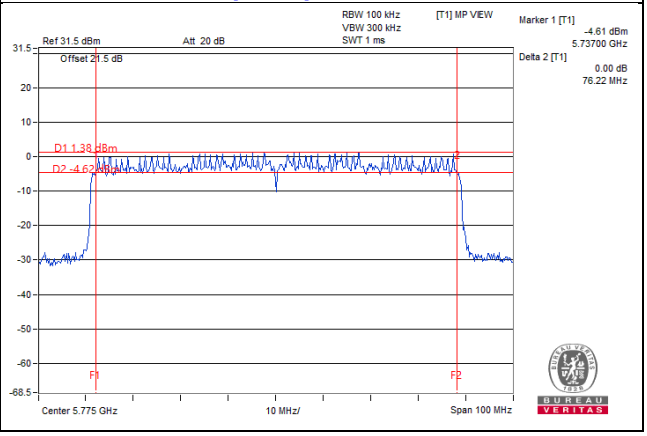
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
149	5745	19.06	19.04	18.99	19	0.5	Pass
157	5785	19.07	19.05	19.04	19	0.5	Pass
165	5825	19.05	19.02	19.01	19.02	0.5	Pass

802.11ax (HE40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
151	5755	37.64	37.66	37.56	37.77	0.5	Pass
159	5795	37.67	37.45	37.48	37.74	0.5	Pass

802.11ax (HE80)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
155	5775	77.43	77.45	77.14	76.22	0.5	Pass

Spectrum Plot of Worst Value	
802.11a_Chain 1 / CH149	**802.11ax (HE20)_Chain 2 / CH149**
	
802.11ax (HE40)_Chain 1 / CH159	**802.11ax (HE80)_Chain 3 / CH155**
	

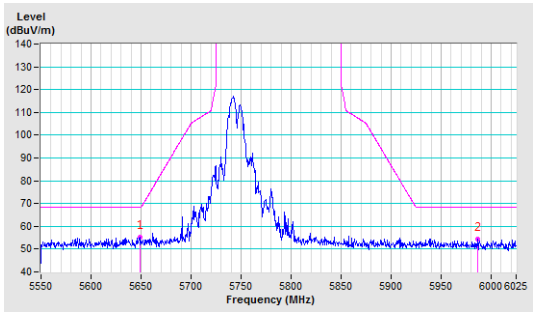
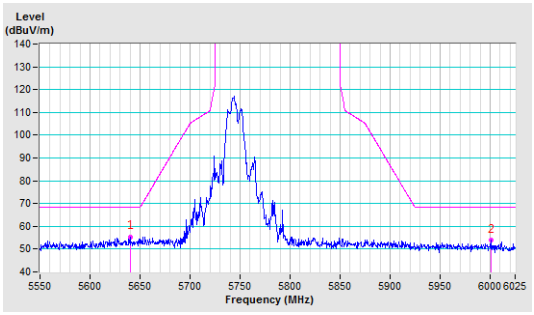
5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

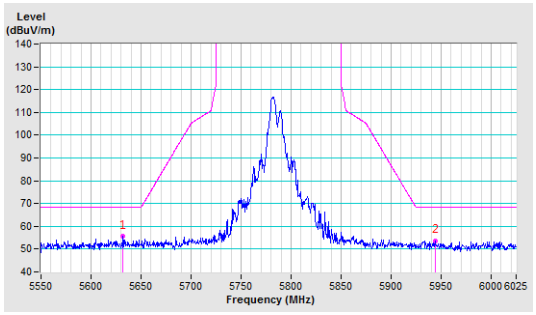
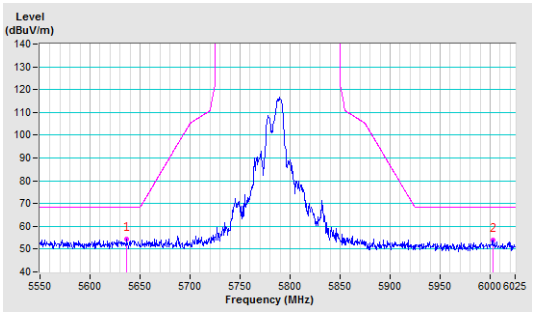
Annex A- Radiated Out of Band Emission (OOBE) Measurement (For U-NII-3 band)

802.11a

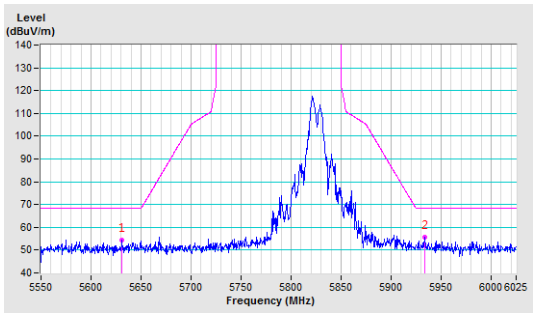
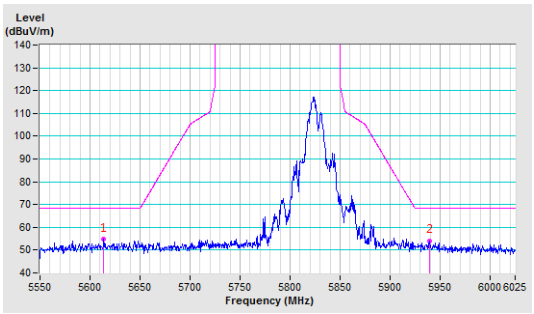
CH 149 5745 MHz

Horizontal	Vertical
	

CH 157 5785 MHz

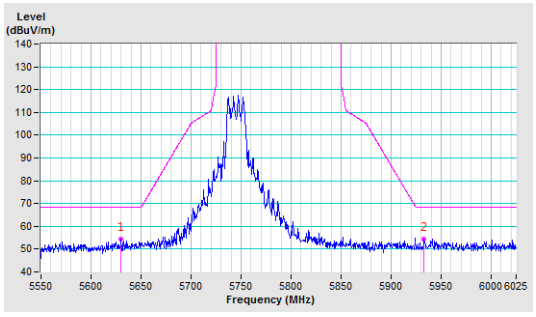
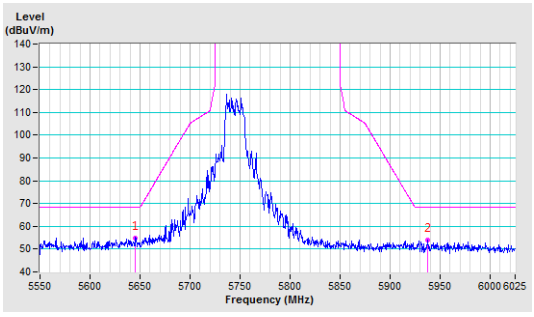
Horizontal	Vertical
	

CH 165 5825 MHz

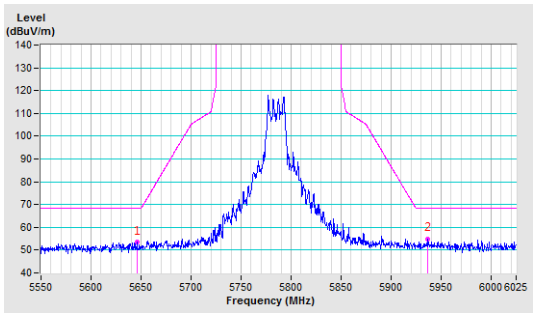
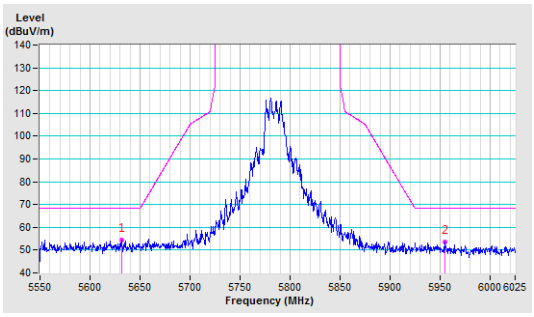
Horizontal	Vertical
	

802.11ax (HE20)

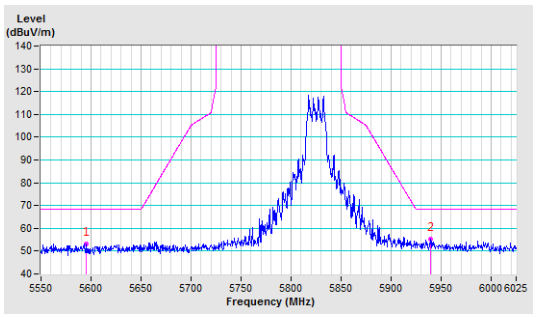
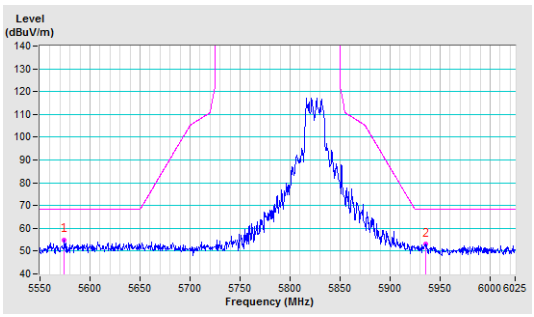
CH 149 5745 MHz

Horizontal	Vertical
	

CH 157 5785 MHz

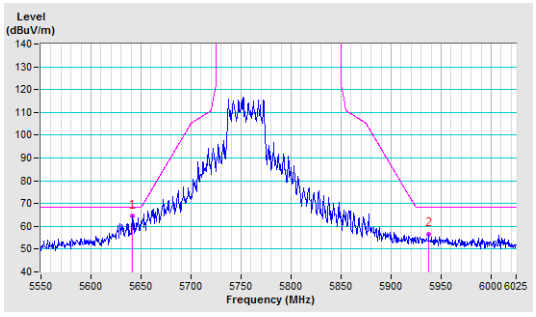
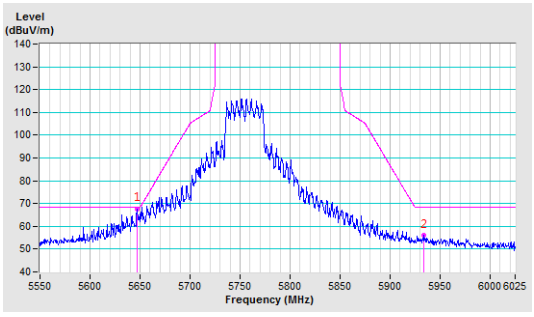
Horizontal	Vertical
	

CH 165 5825 MHz

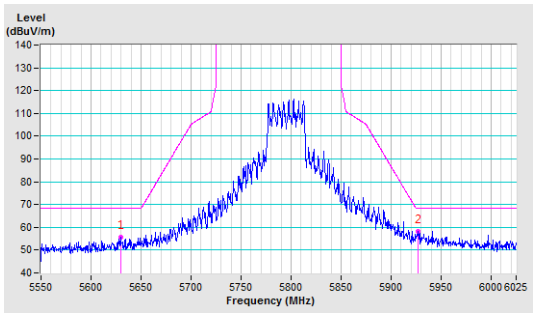
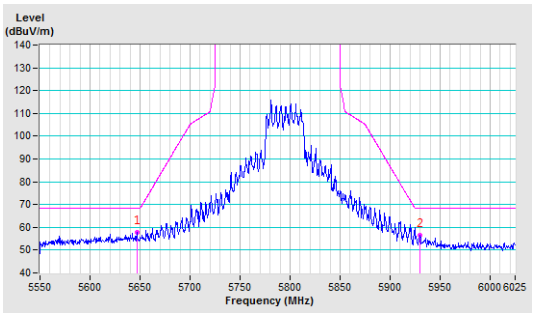
Horizontal	Vertical
	

802.11ax (HE40)

CH 151 5755 MHz

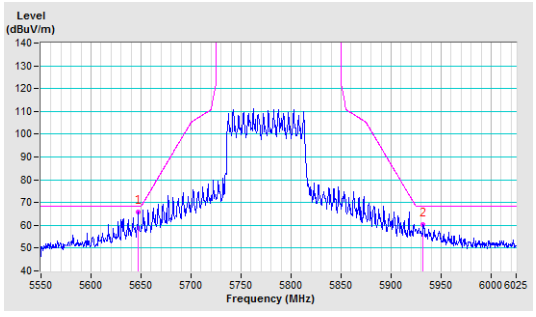
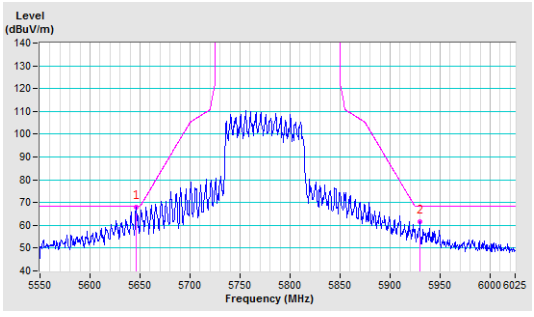
Horizontal	Vertical
	

CH 159 5795 MHz

Horizontal	Vertical
	

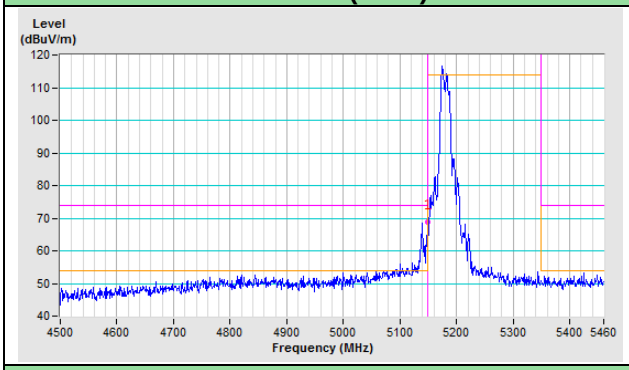
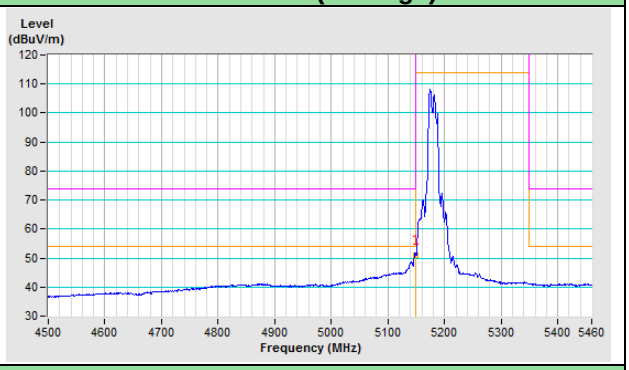
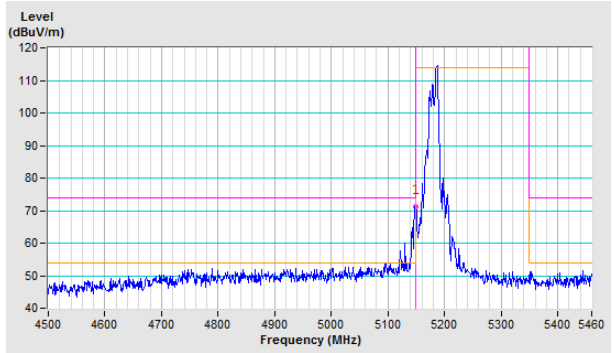
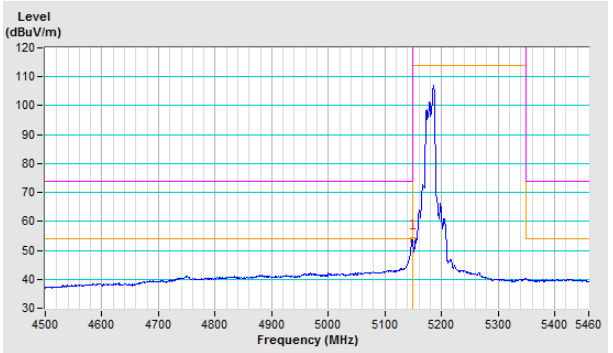
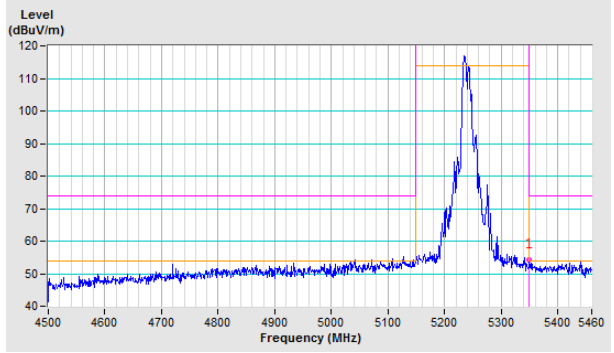
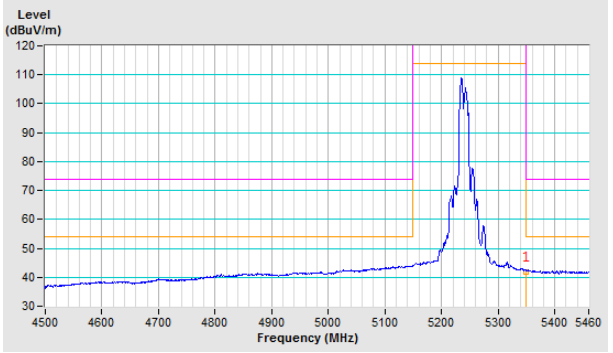
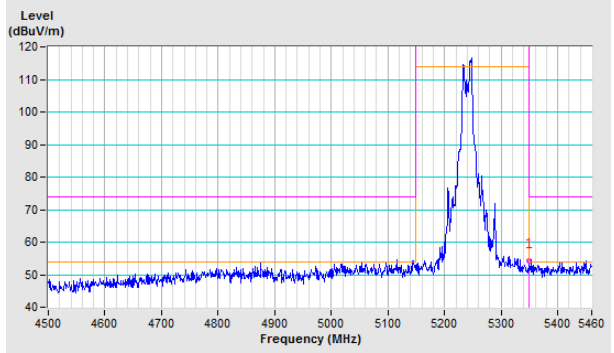
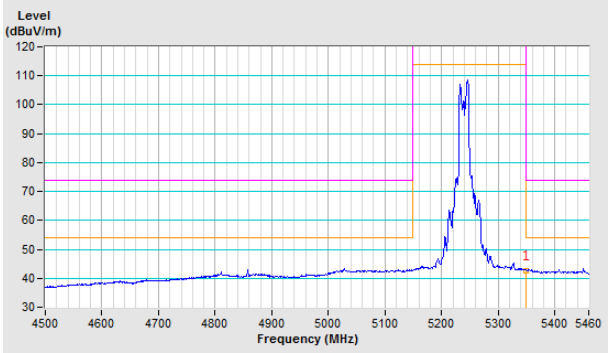
802.11ax (HE80)

CH 155 5775 MHz

Horizontal	Vertical
	

Annex B- Band-edge measurement (For U-NII-1 band)

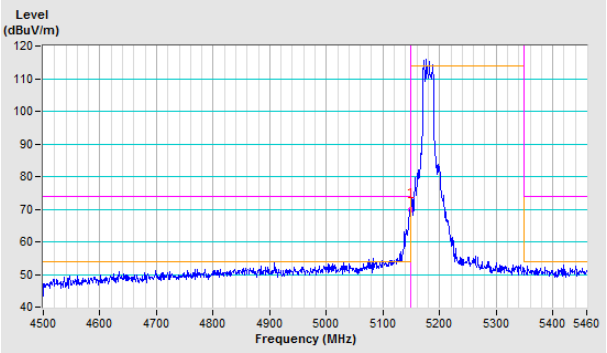
802.11a

Channel 36	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	
Channel 48	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	

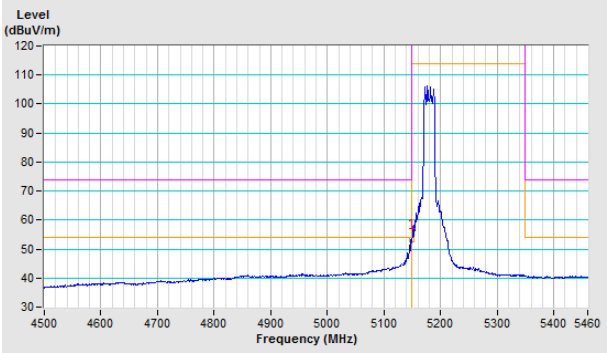
802.11ax (HE20)

Channel 36

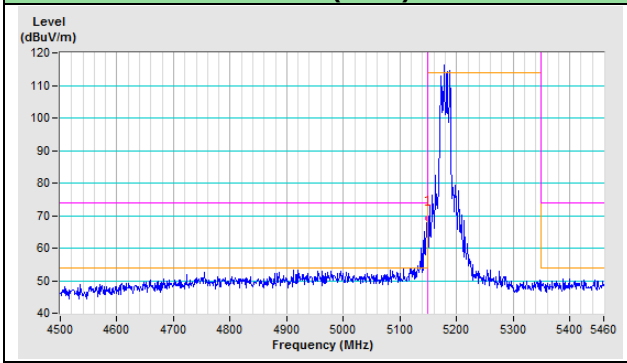
Horizontal (Peak)



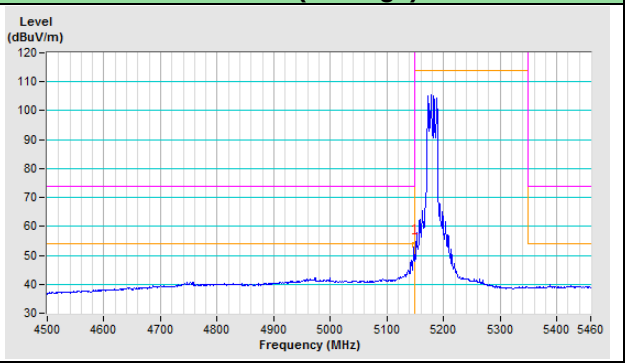
Horizontal (Average)



Vertical (Peak)

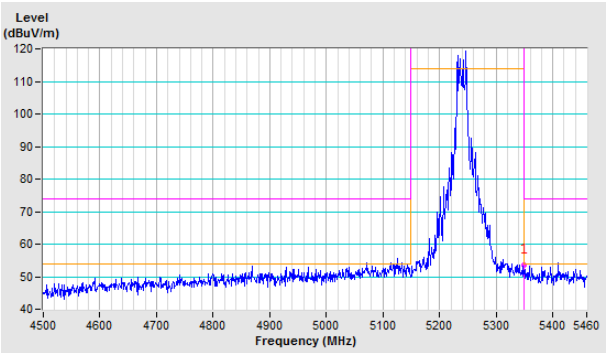


Vertical (Average)

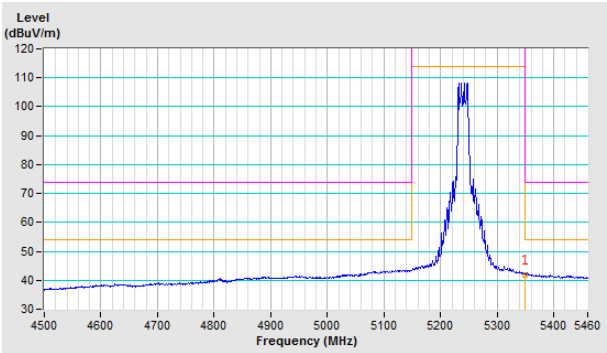


Channel 48

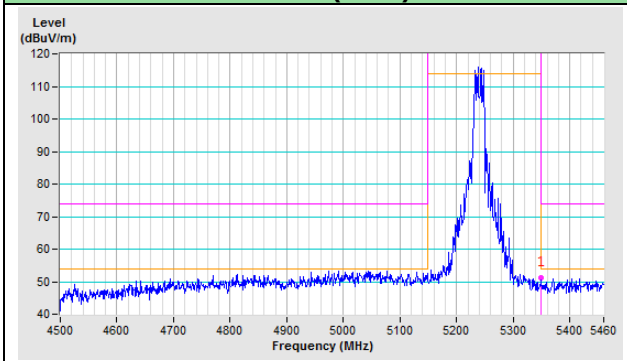
Horizontal (Peak)



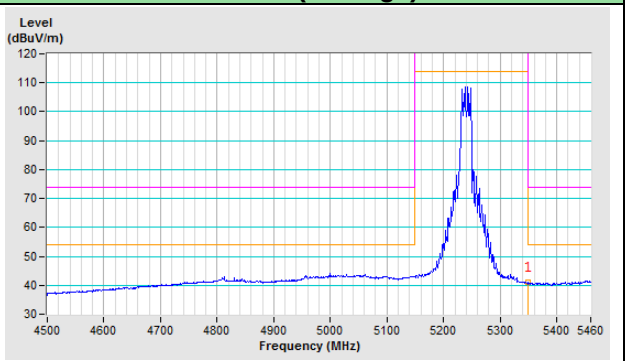
Horizontal (Average)



Vertical (Peak)



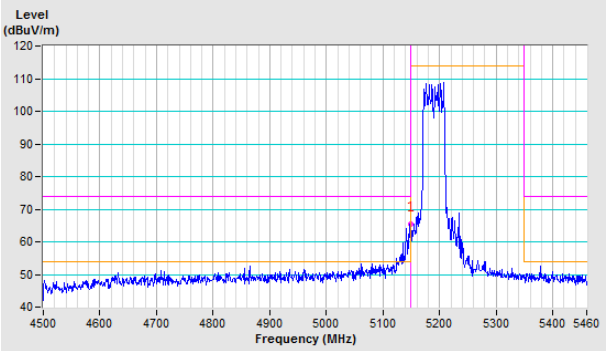
Vertical (Average)



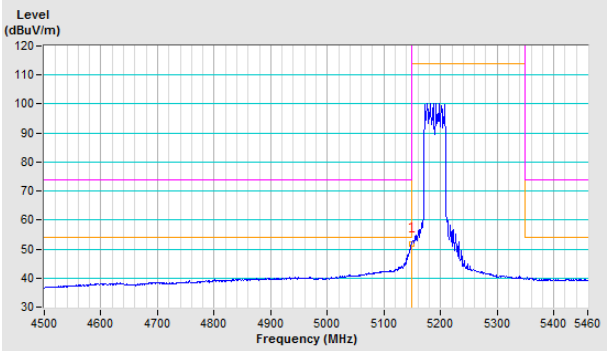
802.11ax (HE40)

Channel 38

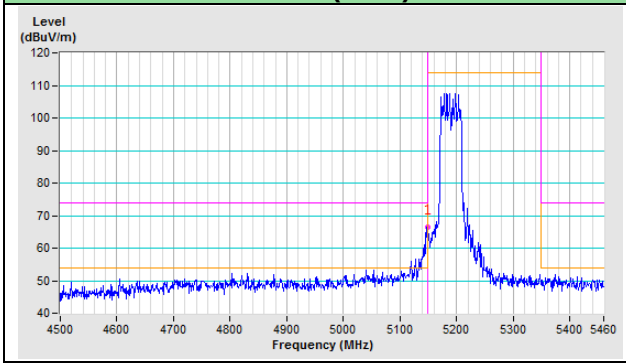
Horizontal (Peak)



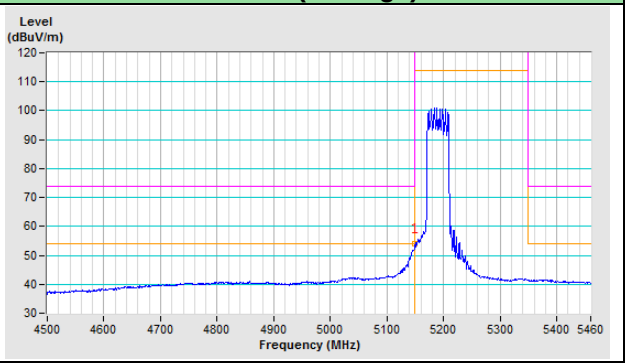
Horizontal (Average)



Vertical (Peak)

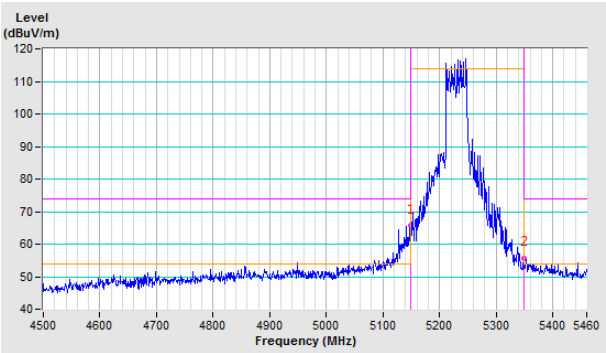


Vertical (Average)

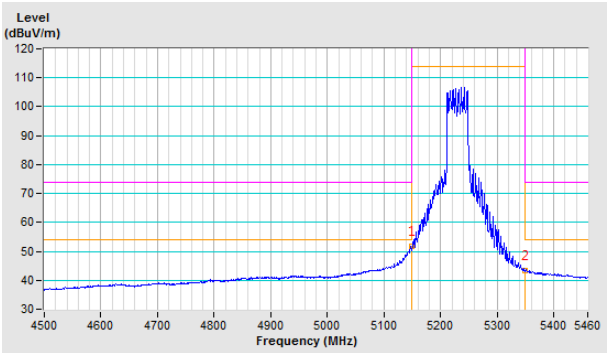


Channel 46

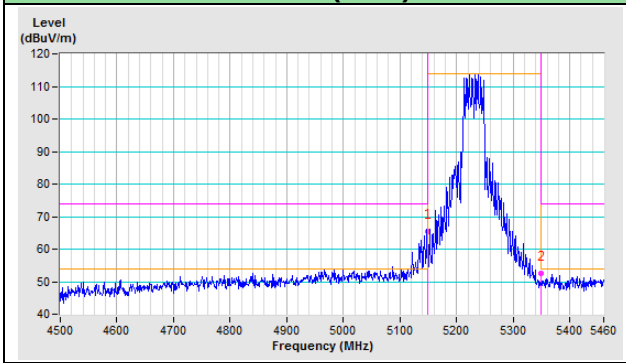
Horizontal (Peak)



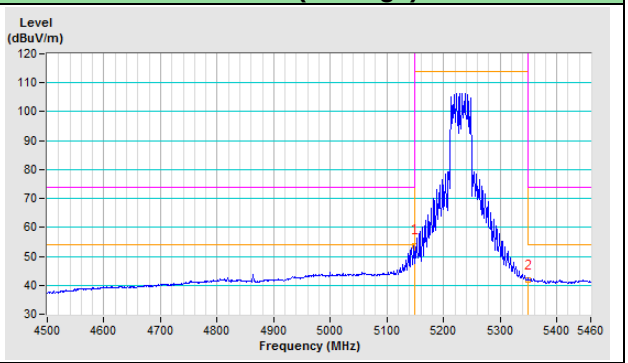
Horizontal (Average)



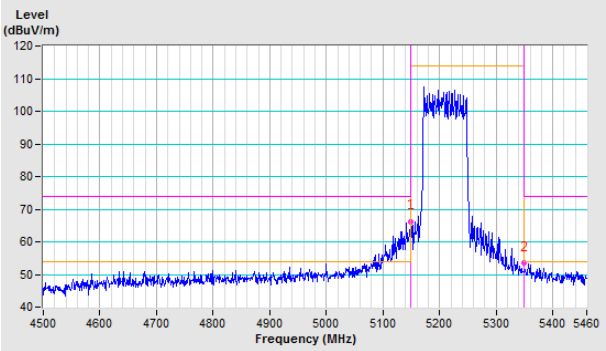
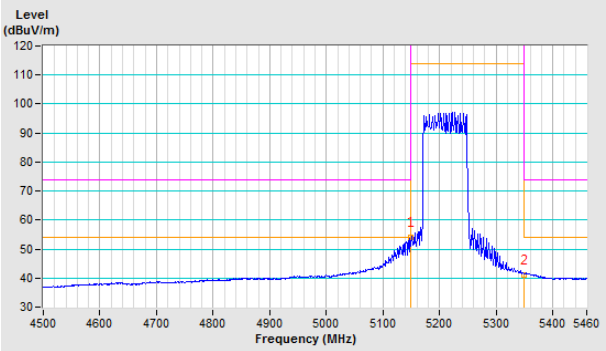
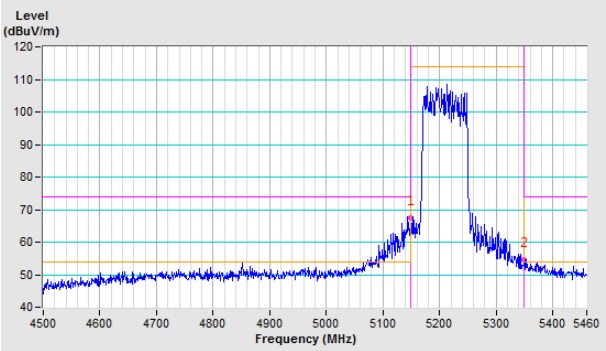
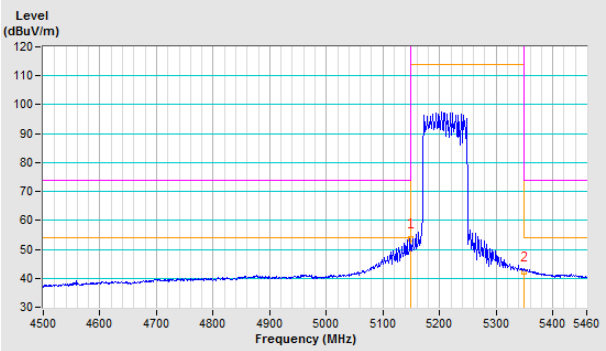
Vertical (Peak)



Vertical (Average)



802.11ax (HE80)

Channel 42	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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