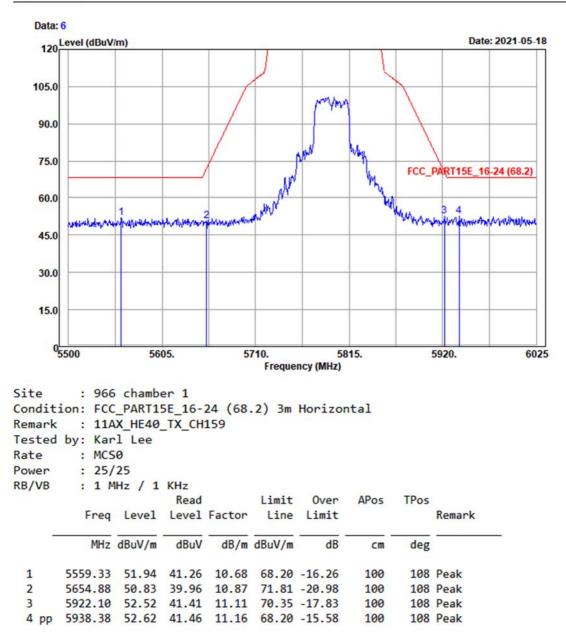


#### Remarks:

- 1. Level(dBuV/m) = Read Level(dBuV) + Factor(dB/m)
- 2. Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.
- 4. Over limit = Level Limit value
- 5. The emission levels of other frequencies were very low against the limit.







#### Remarks:

1. Level(dBuV/m) = Read Level(dBuV) + Factor(dB/m)

- 2. Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.
- 4. Over limit = Level Limit value
- 5. The emission levels of other frequencies were very low against the limit.





#### Remarks:

1. Level(dBuV/m) = Read Level(dBuV) + Factor(dB/m)

2. Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Over limit = Level - Limit value

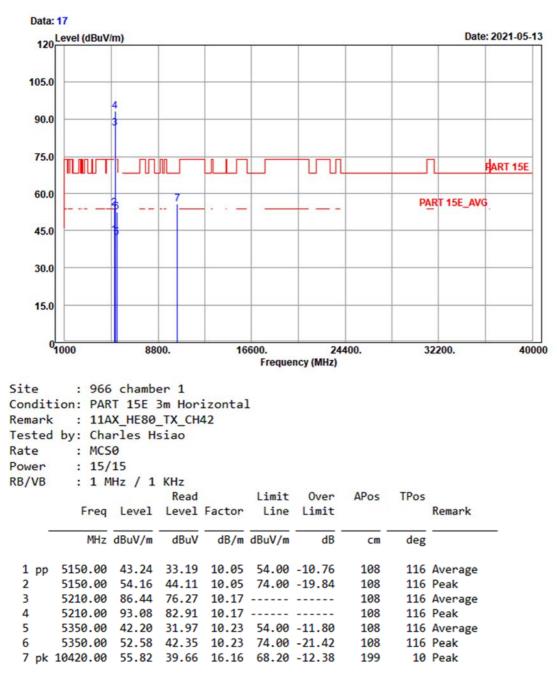
5. The emission levels of other frequencies were very low against the limit.



802.11ax (HE80)



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

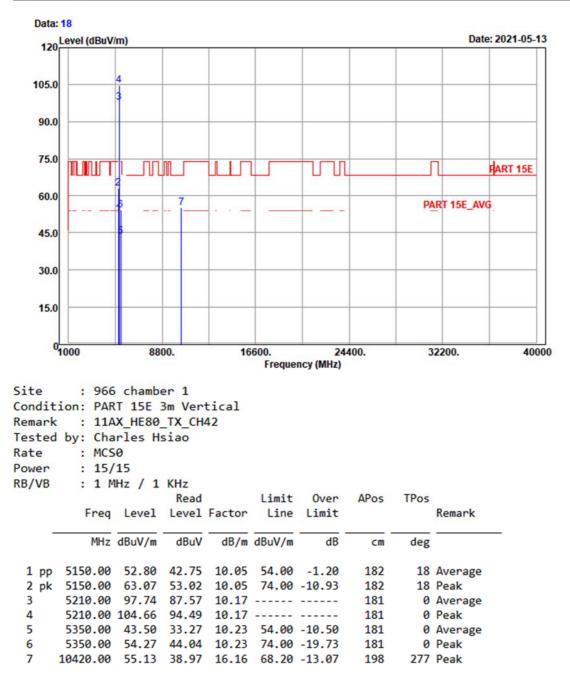


Remarks:

- 1. Level(dBuV/m) = Read Level(dBuV) + Factor(dB/m)
- 2. Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.
- 4. Over limit = Level Limit value
- 5. The emission levels of other frequencies were very low against the limit.





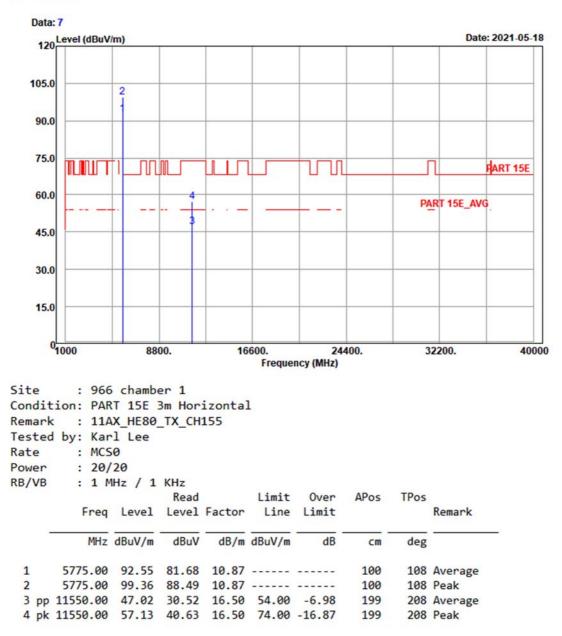


#### Remarks:

- 1. Level(dBuV/m) = Read Level(dBuV) + Factor(dB/m)
- 2. Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.
- 4. Over limit = Level Limit value
- 5. The emission levels of other frequencies were very low against the limit.







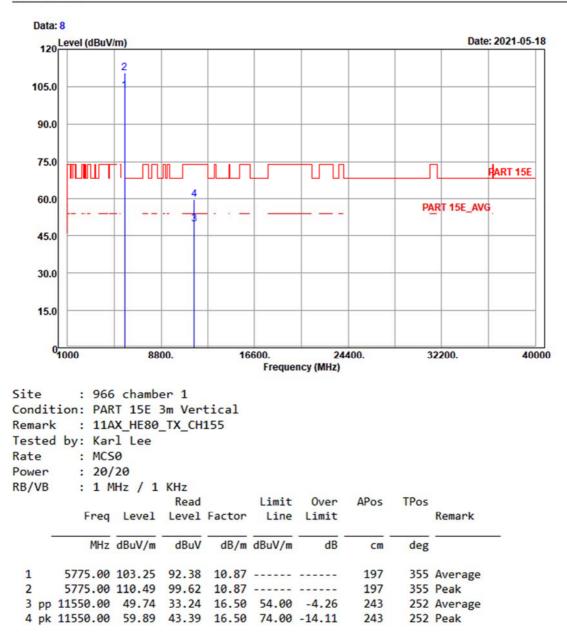
#### Remarks:

1. Level(dBuV/m) = Read Level(dBuV) + Factor(dB/m)

- 2. Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.
- 4. Over limit = Level Limit value
- 5. The emission levels of other frequencies were very low against the limit.





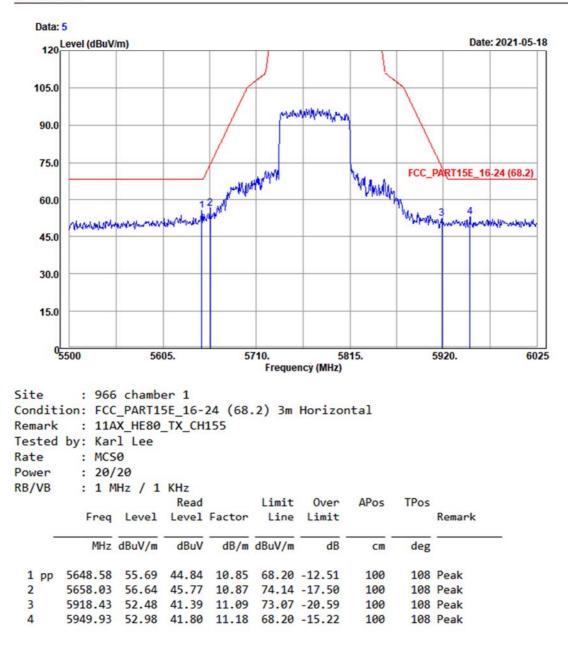


#### Remarks:

- 1. Level(dBuV/m) = Read Level(dBuV) + Factor(dB/m)
- 2. Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.
- 4. Over limit = Level Limit value
- 5. The emission levels of other frequencies were very low against the limit.







## Remarks:

- 1. Level(dBuV/m) = Read Level(dBuV) + Factor(dB/m)
- 2. Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.
- 4. Over limit = Level Limit value
- 5. The emission levels of other frequencies were very low against the limit.





#### Remarks:

1. Level(dBuV/m) = Read Level(dBuV) + Factor(dB/m)

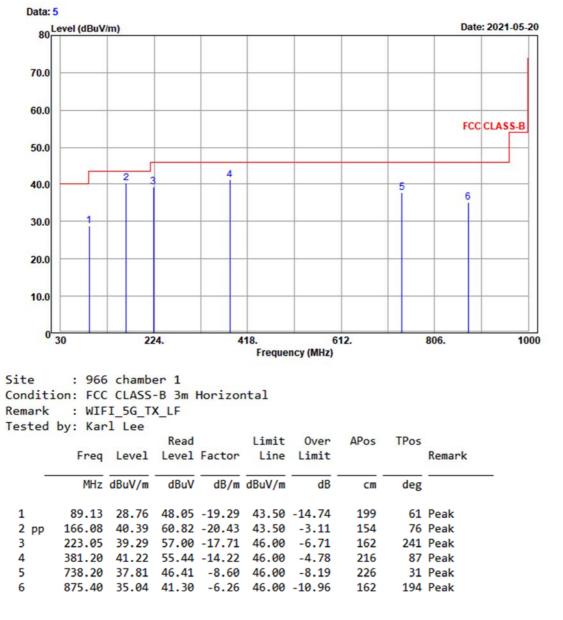
- 2. Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.
- 4. Over limit = Level Limit value
- 5. The emission levels of other frequencies were very low against the limit.



#### Below 1GHz Worst-Case:

802.11a

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Remarks:

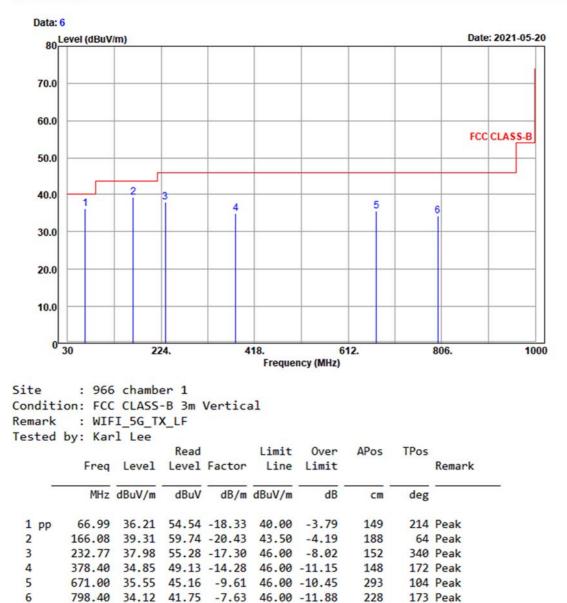
1. Level = Read Level + Factor

Margin value = level – Limit value.

2. The emission levels of other frequencies were very low against the limit.







Remarks:

1. Level = Read Level + Factor

Margin value = level – Limit value.

2. The emission levels of other frequencies were very low against the limit.



# 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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR3	R3 102783 De		Dec. 20, 2021
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 03, 2021	
V-LISN SCHWARZBECK (EUT)	NNBL 8226-2	8226-142	Jul. 31, 2020	Jul. 30, 2021
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Aug. 18, 2020	Aug. 17, 2021
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	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 HwaYa Shielded Room 2 (Conduction 2).

3. The VCCI Site Registration No. is C-12047.



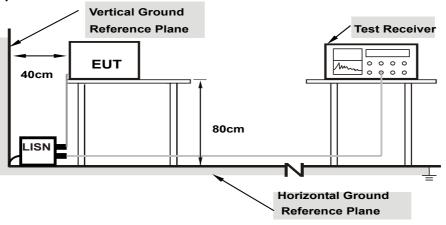
# 4.2.3 Test Procedures

- 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: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

#### 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 Conditions

Same as 4.1.6.



# 4.2.7 Test Results

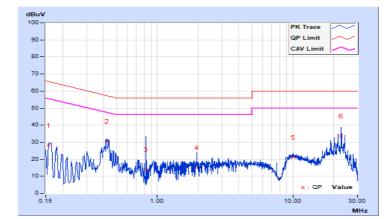
## Worst-case data: 802.11a

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	TX Channel 40		

Freq		Corr.	Reading Value		Emission Level		Limit		Margin	
No	Fleg.	Freq. Factor		(uV)]	[dB (	(uV)]	[dB (	(uV)]	(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15782	0.11	28.21	14.47	28.32	14.58	65.58	55.58	-37.26	-41.00
2	0.42334	0.14	30.47	21.52	30.61	21.66	57.38	47.38	-26.77	-25.72
3	0.82643	0.17	14.01	2.33	14.18	2.50	56.00	46.00	-41.82	-43.50
4	1.94860	0.22	14.85	6.04	15.07	6.26	56.00	46.00	-40.93	-39.74
5	10.10095	0.36	20.74	8.41	21.10	8.77	60.00	50.00	-38.90	-41.23
6	22.81236	0.43	33.33	19.78	33.76	20.21	60.00	50.00	-26.24	-29.79

#### **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.



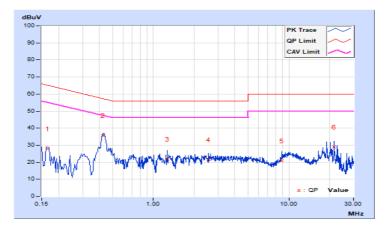


Phase	Neutral (N)	LIETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)
Channel	TX Channel 40		

Freq.		Corr.	Reading Value		Emissic	Emission Level		nit	Ма	rgin
No	Fieq.	Factor	[dB (	(uV)]	[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16564	0.12	27.70	18.16	27.82	18.28	65.18	55.18	-37.36	-36.90
2	0.42761	0.15	35.41	30.33	35.56	30.48	57.30	47.30	-21.74	-16.82
3	1.27217	0.20	21.75	15.03	21.95	15.23	56.00	46.00	-34.05	-30.77
4	2.54292	0.25	21.33	14.40	21.58	14.65	56.00	46.00	-34.42	-31.35
5	8.89276	0.42	20.52	12.81	20.94	13.23	60.00	50.00	-39.06	-36.77
6	21.55725	0.66	28.15	17.18	28.81	17.84	60.00	50.00	-31.19	-32.16

**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		
	-	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)		
U-NII-1	-	Fixed point-to-point Access Point	point-to-point Access Point 1 Watt (30 dBm)		
	$\checkmark$	Indoor Access Point	1 Watt (30 dBm)		
	-	Mobile and Portable 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		$\checkmark$	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,

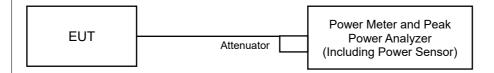
Array Gain = 0 dB (i.e., no array gain) for  $N_{ANT} \le 4$ ;

Array Gain = 0 dB (i.e., no array gain) for channel widths  $\geq$  40 MHz for any N<sub>ANT</sub>;

Array Gain = 5 log(N<sub>ANT</sub>/N<sub>SS</sub>) dB or 3 dB, whichever is less for 20-MHz channel widths with N<sub>ANT</sub>  $\geq$  5.

For power measurements on all other devices: Array Gain = 10 log(N<sub>ANT</sub>/N<sub>SS</sub>) 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 and set the detector to average. Duty factor is not added to measured value.

#### 4.3.5 Deviation from Test Standard

No deviation.

#### 4.3.6 EUT Operating Conditions

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

Power Output:

# CDD Mode

# 802.11a

Chan. Freq. (MHz)	Freq.	Maximum Conducted Power (dBm)		Total Power	Total Power	Power Limit	Pass /
	Chain 0	Chain 1	(mW)	(dBm)	(dBm)	Fail	
36	5180	18.92	18.82	154.191	21.88	30.00	Pass
40	5200	21.42	21.51	280.255	24.48	30.00	Pass
48	5240	21.43	21.46	278.954	24.46	30.00	Pass
149	5745	20.29	20.73	225.210	23.53	30.00	Pass
157	5785	18.79	18.39	144.707	21.60	30.00	Pass
165	5825	19.96	19.53	188.826	22.76	30.00	Pass

Note:

For 5180~5240MHz: Max. gain = 2.51dBi < 6dBi, so the power limit is not reduced. For 5745~5825MHz: Max. gain = 2.77dBi < 6dBi, so the power limit is not reduced.

# 802.11ax (HE20)

Chan. Freq. (MHz)	Freq.	Maximum Conducted Power (dBm)		Total	Total	Power Limit	Pass /
	Chain 0	Chain 1	Power (mW)	Power (dBm)	(dBm)	Fail	
36	5180	17.14	17.26	104.972	20.21	30.00	Pass
40	5200	21.12	21.34	265.564	24.24	30.00	Pass
48	5240	21.13	21.26	263.377	24.21	30.00	Pass
149	5745	20.56	20.16	217.516	23.37	30.00	Pass
157	5785	20.19	19.63	196.305	22.93	30.00	Pass
165	5825	20.17	19.82	199.932	23.01	30.00	Pass

Note:

For 5180~5240MHz: Max. gain = 2.51dBi < 6dBi, so the power limit is not reduced.

For 5745~5825MHz: Max. gain = 2.77dBi < 6dBi, so the power limit is not reduced.



# 802.11ax (HE40)

Chan. Freq.	Freq.	Maximum Conduc	Total Power	Total Power	Power Limit	Pass /	
Chan.	(MHz)	Chain 0	Chain 1	(mW)	(dBm)	(dBm)	Fail
38	5190	13.73	13.64	46.725	16.70	30.00	Pass
46	5230	20.83	20.53	234.039	23.69	30.00	Pass
151	5755	20.32	20.51	220.107	23.43	30.00	Pass
159	5795	20.86	20.93	245.779	23.91	30.00	Pass

Note:

For 5180~5240MHz: Max. gain = 2.51dBi < 6dBi, so the power limit is not reduced.

For 5745~5825MHz: Max. gain = 2.77dBi < 6dBi, so the power limit is not reduced.

# 802.11ax (HE80)

Chop Freq.	Maximum Conducted Power (dBm)		Total Dowor	Total Power	Power Limit	Pass /	
Chan.	Chan. (MHz)	Chain 0	Chain 1	Power (mW)	(dBm)	(dBm)	Fail
42	5210	13.72	13.76	47.319	16.75	30.00	Pass
155	5775	18.83	18.08	140.652	21.48	30.00	Pass

#### Note:

For 5180~5240MHz: Max. gain = 2.51dBi < 6dBi, so the power limit is not reduced.

For 5745~5825MHz: Max. gain = 2.77dBi < 6dBi, so the power limit is not reduced.



# **Beamforming Mode**

## 802.11ax (HE20)

Chan. Freq. (MHz)	Freq.	Maximum Conduc	Total Power	Total Power	Power Limit	Pass /	
	Chain 0	Chain 1	(mW)	(dBm)	(dBm)	Fail	
36	5180	14.13	14.25	52.489	17.20	30.00	Pass
40	5200	18.11	18.33	132.791	21.23	30.00	Pass
48	5240	18.12	18.25	131.698	21.20	30.00	Pass
149	5745	17.55	17.15	108.765	20.36	30.00	Pass
157	5785	17.18	16.62	98.159	19.92	30.00	Pass
165	5825	17.16	16.81	99.973	20.00	30.00	Pass

Note:

For 5180~5240MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2]=5.45$ dBi < 6dBi, so the limit no need to reduced.

For 5745~5825MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2]=5.58$ dBi < 6dBi, so the limit no need to reduced.

#### 802.11ax (HE40)

Chan	Chan. Freq.	Maximum Conduc	Maximum Conducted Power (dBm)		Total Power	Power Limit	Pass /	
Chan.	(MHz)	Chain 0	Chain 1	Power (mW)	(dBm)	(dBm)	Fail	
38	5190	10.72	10.63	23.364	13.69	30.00	Pass	
46	5230	17.82	17.52	117.028	20.68	30.00	Pass	
151	5755	17.31	17.50	110.061	20.42	30.00	Pass	
159	5795	17.85	17.92	122.898	20.90	30.00	Pass	

Note:

For 5180~5240MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2]=5.45$ dBi < 6dBi, so the limit no need to reduced.

For 5745~5825MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2]=5.58$ dBi < 6dBi, so the limit no need to reduced.

#### 802.11ax (HE80)

Chan. Freq.	Freq.	Maximum Conduc	Total Dowor	Total Power	Power	Pass /		
Chan.	(MHz)	Chain 0	Chain 1	Power (mW)	(dBm)	Limit (dBm)	Fail	
42	5210	10.71	10.75	23.661	13.74	30.00	Pass	
155	5775	15.82	15.07	70.331	18.47	30.00	Pass	

#### Note:

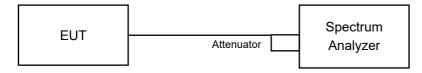
For 5180~5240MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2]=5.45$ dBi < 6dBi, so the limit no need to reduced.

For 5745~5825MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2]=5.58$ dBi < 6dBi, so the limit no need to reduced.



## 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 sampling. 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 Result

### 802.11a

Channel		Occupied Bandwidth (MHz)				
Channel	Frequency (MHz)	Chain 0	Chain 1			
36	5180	16.68	16.56			
40	5200	16.80	16.92			
48	5240	16.86	16.80			
149	5745	16.92	16.80			
157	5785	16.68	16.44			
165	5825	16.80	16.56			

# 802.11ax (HE20)

Channel		Occupied Bandwidth (MHz)				
Channel	Frequency (MHz)	Chain 0	Chain 1			
36	5180	19.08	18.84			
40	5200	19.50	19.08			
48	5240	19.38	19.20			
149	5745	19.56	19.08			
157	5785	19.56	19.08			
165	5825	19.32	18.96			

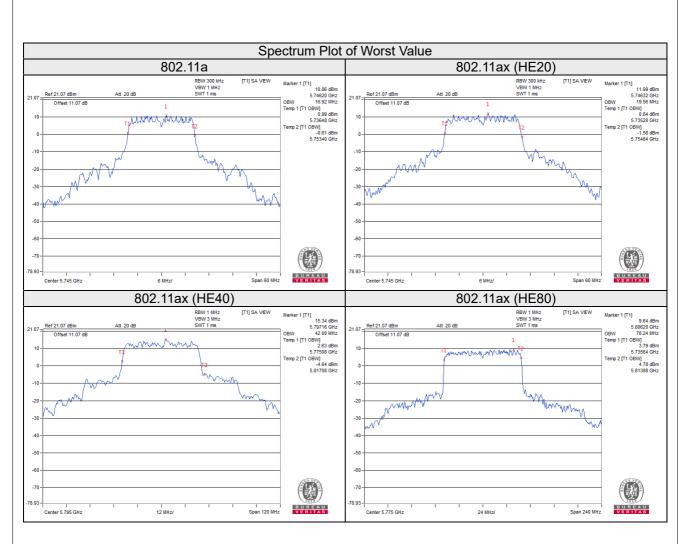
# 802.11ax (HE40)

Channel		Occupied Bandwidth (MHz)			
Channel	Frequency (MHz)	Chain 0	Chain 1		
38	5190	38.16	38.16		
46	5230	39.36	39.60		
151	5755	40.32	39.60		
159	5795	42.00	39.84		

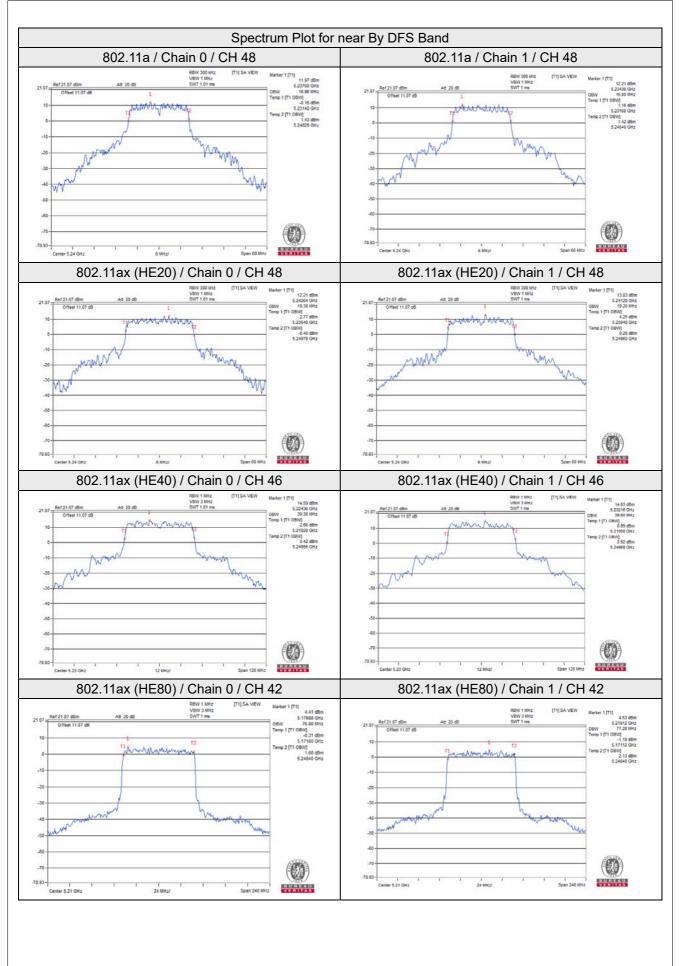
# 802.11ax (HE80)

Channel		Occupied Bandwidth (MHz)				
Channel	Frequency (MHz)	Chain 0	Chain 1			
42	5210	76.80	77.28			
155	5775	78.24	77.76			

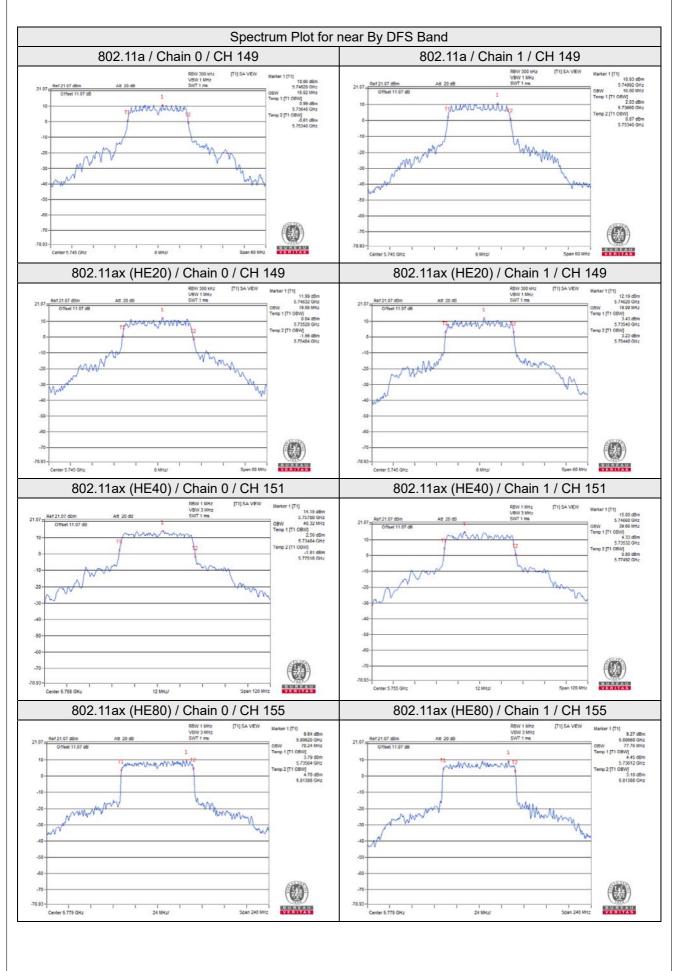












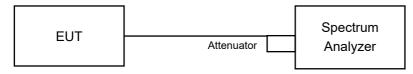


#### 4.5 Peak Power Spectral Density Measurement

#### 4.5.1 Limits of Peak Power Spectral Density Measurement

Operation Band		EUT Category	LIMIT
		Outdoor Access Point	
U-NII-1		Fixed point-to-point Access Point	17dBm/ MHz
	$\checkmark$	Indoor Access Point	
		Mobile and Portable client device	11dBm/ MHz
U-NII-2A		-	11dBm/ MHz
U-NII-2C		-	11dBm/ MHz
U-NII-3		$\checkmark$	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 Procedures

#### For U-NII-1 band:

Duty cycle of test signal is < 98%

Using method SA-2

1) Set span to encompass the entire emission bandwidth (EBW) of the signal.

2) Set RBW = 1MHz, Set VBW  $\geq$  3 MHz, Detector = RMS.

3) Set Channel power measure = 1MHz.

- 4) Sweep time = auto, trigger set to "free run".
- 5) Trace average at least 100 traces in power averaging mode.
- 6) Record the max value and add 10 log (1/duty cycle).

#### For U-NII-3 band:

Duty cycle of test signal is < 98%

- 1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- 2) Set RBW = 300 kHz, Set VBW  $\geq$  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 (Increasing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(500 kHz / 300 kHz).
- 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 Conditions

Same as 4.3.6.



# 4.5.7 Test Results

#### For U-NII-1 band:

#### 802.11a

Chan. Freq.	PSD W/O Duty Factor (dBm/MHz)		Duty Factor	Total PSD With Duty	Max. Limit	Pass /	
Chan.	(MHz)			(dB)	Factor (dBm/MHz)	(dBm/MHz)	Fail
36	5180	7.88	8.29	0.14	11.24	17.00	Pass
40	5200	10.25	10.41	0.14	13.48	17.00	Pass
48	5240	10.20	10.06	0.14	13.28	17.00	Pass

Note:

1. Method E) 2) 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 =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2] = 5.45$ dBi < 6dBi, so the limit no need to reduced.

3. Refer to section 3.3 for duty cycle spectrum plot.

#### 802.11ax (HE20)

Chan. Freq.		Duty Factor /MHz)	Duty Factor	Total PSD With Duty	Max. Limit	Pass /			
Chan.	(MHz)	MHz)		Hz) Chain 0 Chain 1 <sup>(dB)</sup>		Factor (dBm/MHz) (dBm/MHz)		Fail	
36	5180	6.22	6.68	0.10	9.57	17.00	Pass		
40	5200	10.21	10.73	0.10	13.59	17.00	Pass		
48	5240	9.81	10.67	0.10	13.37	17.00	Pass		

Note:

1. Method E) 2) 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 =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2] = 5.45$ dBi < 6dBi, so the limit no need to reduced.

3. Refer to section 3.3 for duty cycle spectrum plot.

#### 802.11ax (HE40)

Chan. Freq.	PSD W/O Duty Factor (dBm/MHz)		Duty Factor	Total PSD With Duty	Max. Limit	Pass /		
Chan.	(MHz)			(dB)	Factor (dBm/MHz)	(dBm/MHz)	Fail	
38	5190	-0.72	-0.79	0.10	2.36	17.00	Pass	
46	5230	6.68	6.30	0.10	9.60	17.00	Pass	

#### Note:

1. Method E) 2) 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 =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2] = 5.45$ dBi < 6dBi, so the limit no need to reduced.

3. Refer to section 3.3 for duty cycle spectrum plot.



#### 802.11ax (HE80)

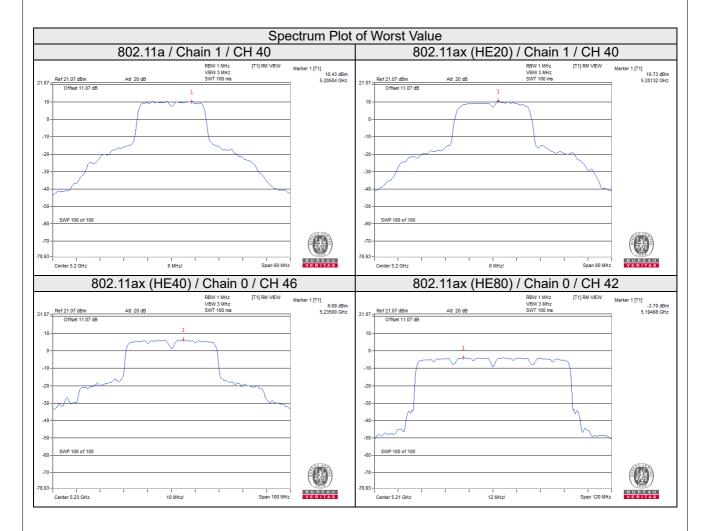
Chan	Chan. Freq.		Duty Factor /MHz)	Duty Factor	Total PSD With Duty	Max. Limit	Pass /
Chan.	(MHz)	Chain 0	Chain 1	(dB)	Factor (dBm/MHz)	(dBm/MHz)	Fail
42	5210	-3.72	-3.72	0.17	-0.54	17.00	Pass

Note:

1. Method E) 2) 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 =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2] = 5.45$ dBi < 6dBi, so the limit no need to reduced.

3. Refer to section 3.3 for duty cycle spectrum plot.





# For U-NII-3 band:

802.11a

тх	('hon	Freq. (N		10 log (N=2)	Duty	Total PSD With	Limit	Pass	
chain	Chan.	(MHz)	(dBm/300kHz)	(dBm/500kHz)	dB	Factor (dB)	Duty Factor (dBm/500kHz)	(dBm/ 500kHz) / Fail	/ Fail
	149	5745	6.26	8.48	3.01	0.14	11.63	30.00	Pass
0	157	5785	4.85	7.07	3.01	0.14	10.22	30.00	Pass
	165	5825	5.15	7.37	3.01	0.14	10.52	30.00	Pass
	149	5745	5.92	8.14	3.01	0.14	11.29	30.00	Pass
1	157	5785	4.64	6.86	3.01	0.14	10.01	30.00	Pass
	165	5825	6.60	8.82	3.01	0.14	11.97	30.00	Pass

Note:

1. Method E(2) c) of power density measurement of KDB 662911 is using for calculating total power density.

2. Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2] = 5.58$ dBi < 6dBi, so the limit no need to reduced.

3. Refer to section 3.3 for duty cycle spectrum plot.

# 802.11ax (HE20)

ТХ	l Chon	Freq.	PSD W/O I	Outy Factor	10 log	Duty	Total PSD With	Limit	Pass
chain Chan. (MF	(MHz)	(dBm/300kHz)	(dBm/500kHz)	(N=2) dB	Factor (dB)	Duty Factor (dBm/500kHz)	(dBm/ 500kHz)	/ Fail	
	149	5745	6.59	8.81	3.01	0.10	11.92	30.00	Pass
0	157	5785	6.15	8.37	3.01	0.10	11.48	30.00	Pass
	165	5825	5.86	8.08	3.01	0.10	11.19	30.00	Pass
	149	5745	6.46	8.68	3.01	0.10	11.79	30.00	Pass
1	157	5785	6.01	8.23	3.01	0.10	11.34	30.00	Pass
	165	5825	6.53	8.75	3.01	0.10	11.86	30.00	Pass

Note:

1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.

2. Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2] = 5.58$ dBi < 6dBi, so the limit no need to reduced. 3. Refer to section 3.3 for duty cycle spectrum plot.



#### 802.11ax (HE40)

TX chain Chan.	Chan	Freq.	PSD W/O Duty Factor		10 log (N=2)	Duty Factor	Total PSD With Duty Factor	Limit (dBm/ 500kHz)	Pass
	(MHz)	(dBm/300kHz)	(dBm/500kHz)	dB	(dB)	(dBm/500kHz)	/ Fail		
0	151	5755	3.19	5.41	3.01	0.10	8.52	30.00	Pass
0	159	5795	3.55	5.77	3.01	0.10	8.88	30.00	Pass
1	151	5755	2.98	5.20	3.01	0.10	8.31	30.00	Pass
	159	5795	3.13	5.35	3.01	0.10	8.46	30.00	Pass

Note:

1. Method E(2) c) of power density measurement of KDB 662911 is using for calculating total power density.

2. Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2] = 5.58$ dBi < 6dBi, so the limit no need to reduced.

3. Refer to section 3.3 for duty cycle spectrum plot.

# 802.11ax (HE80)

ТХ	Chan.				10 log (N=2)	Duty Factor	Total PSD With Duty Factor	Limit (dBm/	Pass
chain			(dBm/300kHz)	(dBm/500kHz)		(dB)	(dBm/500kHz)	(dBm/ 500kHz)	/ Fail
0	155	5775	-2.06	0.16	3.01	0.17	3.34	30.00	Pass
1	155	5775	-2.96	-0.74	3.01	0.17	2.44	30.00	Pass

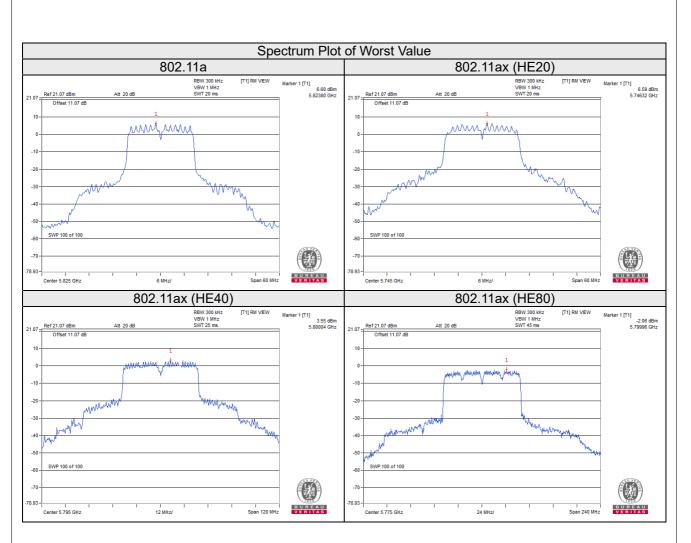
Note:

1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.

2. Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})^2/2] = 5.58$ dBi < 6dBi, so the limit no need to reduced.

3. Refer to section 3.3 for duty cycle spectrum plot.





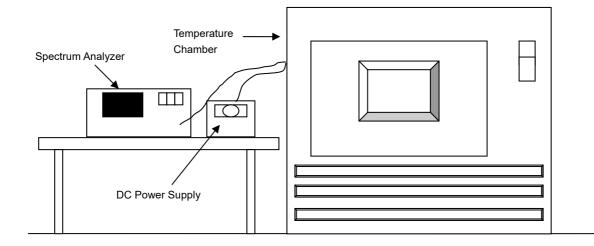


# 4.6 Frequency Stability

# 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



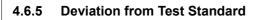
## 4.6.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 16, 2020	Sep. 15, 2021
Standard Temperature And Humidity Chamber	MHU-225AU	920842	May 28, 2020	May 27, 2021
Digital Multimeter Fluke	87-111	70360742	Jun. 23, 2020	Jun. 22, 2021
DC Power Supply Topward	6306A	727263	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.

#### 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.



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: 5180MHz										
Ŧ	Power	0 Mi	nute	2 Mi	nute	5 Minute		10 Minute			
Temp. (℃)	emp. Supply Mea		Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail		
40	12	5179.9946	Pass	5179.9961	Pass	5179.9933	Pass	5179.9946	Pass		
30	12	5180.0201	Pass	5180.0206	Pass	5180.0233	Pass	5180.0232	Pass		
20	12	5179.9939	Pass	5179.9914	Pass	5179.9923	Pass	5179.9942	Pass		
10	12	5179.9913	Pass	5179.9936	Pass	5179.9915	Pass	5179.9903	Pass		
0	12 5180.0121 Pass 5180.0137 Pass 5180.0135 Pass 5180.0139 P						Pass				

	Frequency Stability Versus Voltage										
Operating Frequency: 5180MHz											
Term Power 0 Minute 2 Minute 5 Minute 10 Minute									inute		
Temp. (℃)	Supply (Vdc)	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail		
	13.8	5179.9934	Pass	5179.9919	Pass	5179.9918	Pass	5179.9948	Pass		
20	12	5179.9939	Pass	5179.9914	Pass	5179.9923	Pass	5179.9942	Pass		
	10.2	5179.9935	Pass	5179.9917	Pass	5179.9924	Pass	5179.9939	Pass		

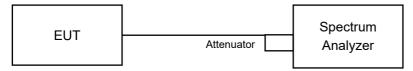


## 4.7 6dB Bandwidth Measurement

## 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)  $\ge$  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

Chan.	Freq. (MHz)	6dB Bandw	/idth (MHz)	Minimum Limit	Pass / Fail	
		Chain 0	Chain 1	(MHz)		
149	5745	15.34	15.24	0.5	Pass	
157	5785	15.78	15.25	0.5	Pass	
165	5825	15.24	15.23	0.5	Pass	

802.11ax (HE20)

Chan.	Freq. (MHz)	6dB Bandw	vidth (MHz)	Minimum Limit	Pass / Fail	
		Chain 0	Chain 1	(MHz)		
149	5745	17.78	17.91	0.5	Pass	
157	5785	17.78	17.91	0.5	Pass	
165	5825	18.17	17.91	0.5	Pass	

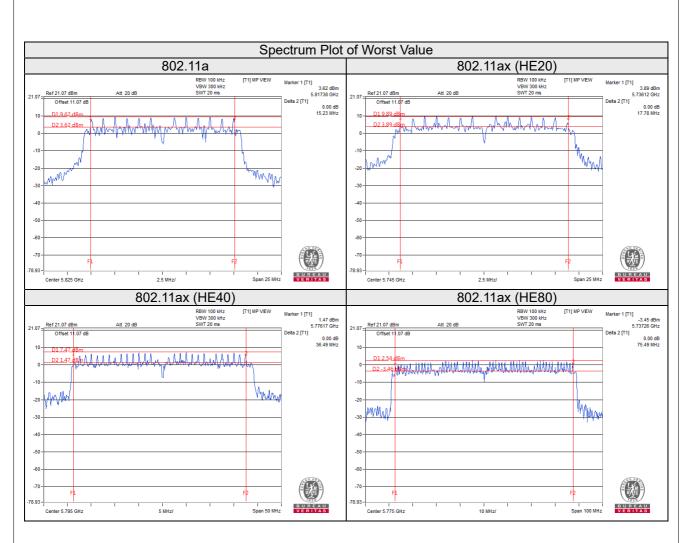
802.11ax (HE40)

Chan.		6dB Bandv	vidth (MHz)	Minimum Limit	Pass / Fail	
	Freq. (MHz)	Chain 0	Chain 1	(MHz)		
151	5755	37.52	37.27	0.5	Pass	
159	5795	36.61	36.49	0.5	Pass	

802.11ax (HE80)

Chan		6dB Bandw	vidth (MHz)	Minimum Limit	Pass / Fail	
Chan.	Freq. (MHz)	Chain 0	Chain 1	(MHz)	Pass / Fail	
155	5775	75.49	75.68	0.5	Pass	







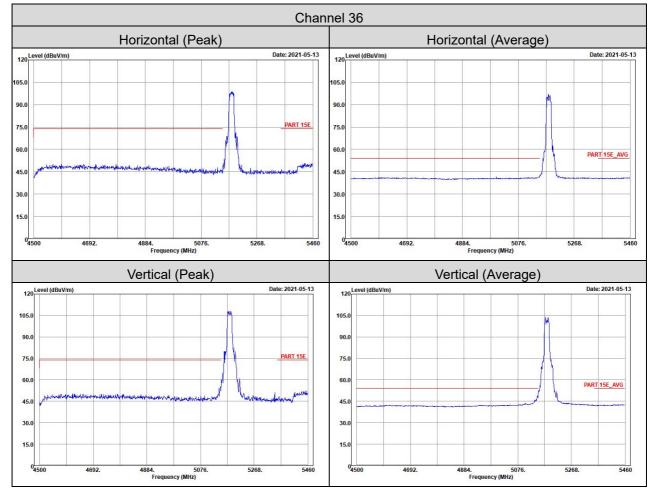
# 5 Pictures of Test Arrangements

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

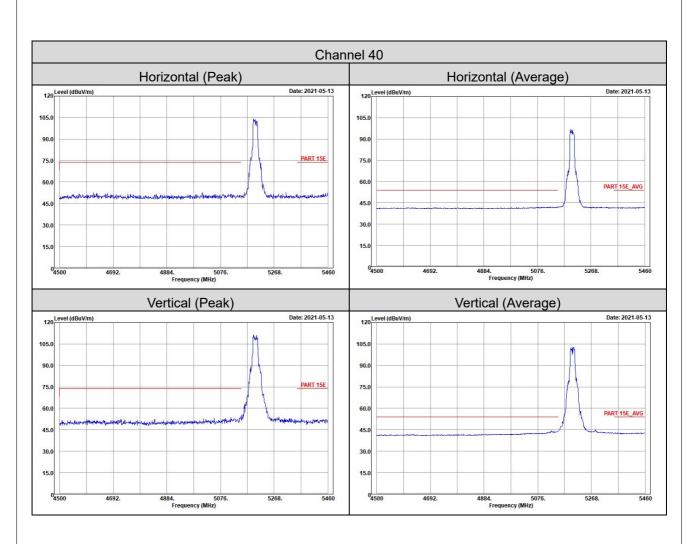


# Annex A- Band Edge Measurement

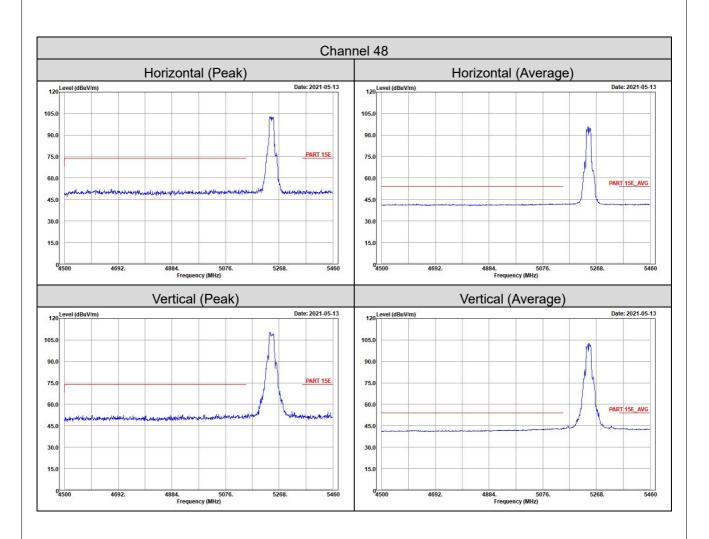
## 802.11a





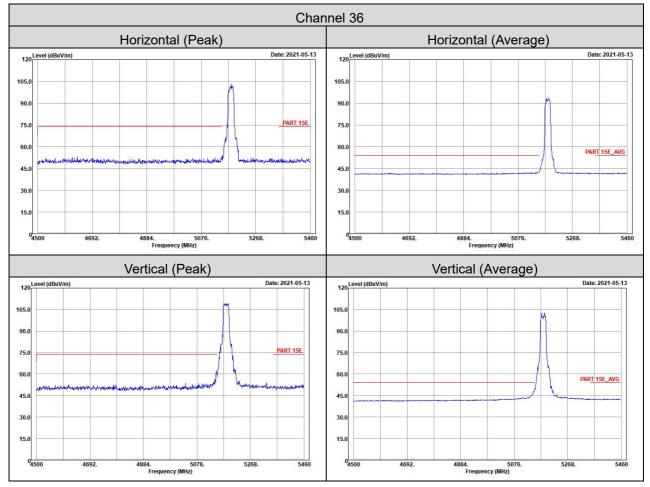




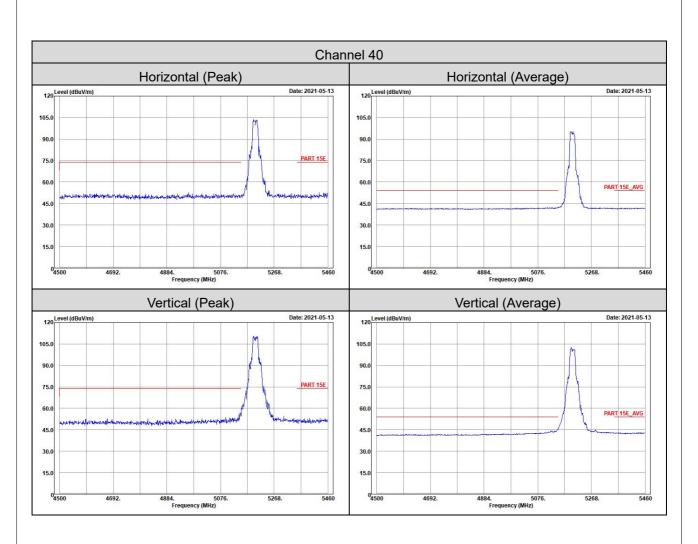




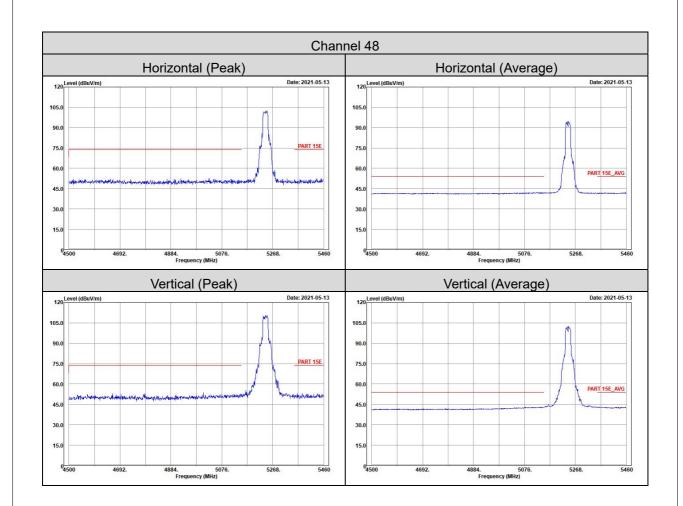
#### 802.11ax (HE20)





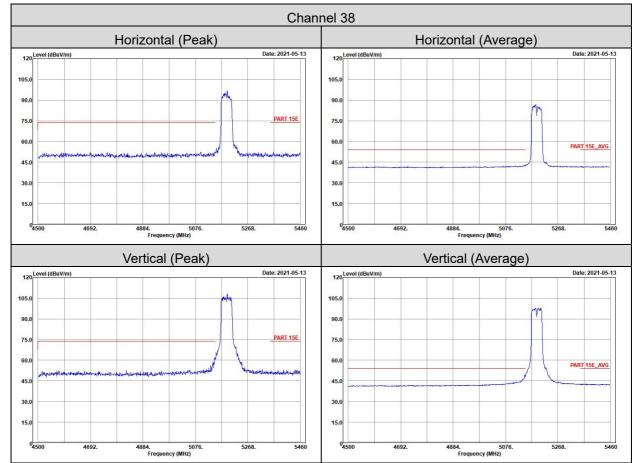




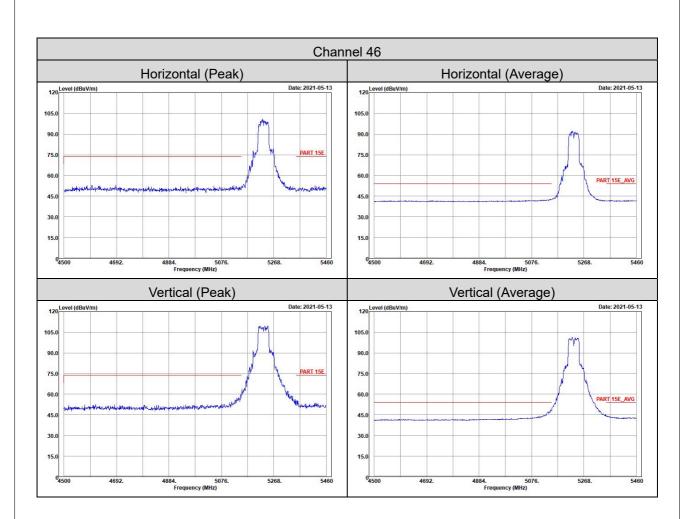




# 802.11ax (HE40)









#### Channel 42 Horizontal (Peak) Horizontal (Average) Date: 2021-05-13 120 Level (dBuV/m) Date: 2021-05-13 120 Level (dBuV/m) 105.0 105.0 90.0 90.0 ingh lates mm PART 15E 75.0 75.0 60.0 60.0 PART 15E\_AVG 45.0 45.0 30.0 30.0 15.0 15.0 0450 0450 4692. 5268. 4692. 4884. 5076. Frequency (MHz) 5268 5460 4884. 5076. Frequency (MHz) 546 Vertical (Peak) Vertical (Average) 120 Level (dBuV/m) Date: 2021-05-13 120 Level (dBuV/m) Date: 2021-05-13 105.0 105.0 -mathema manyman 90.0 90.0 75.0 PART 15E 75.0 60.0 60.0 PART 15E\_AVG another more 45.0 45.0 30.0 30.0 15.0 15.0 04500 4692. 4884. 5076. Frequency (MHz) 5268. 5460 <sup>0</sup>4500 4692. 4884. 5076. Frequency (MHz) 5268. 5460

# 802.11ax (HE80)



## 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 and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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**Hwa Ya EMC/RF/Safety Lab** Tel: 886-3-3183232 Fax: 886-3-3270892

Email: <u>service.adt@tw.bureauveritas.com</u> Web Site: <u>www.bureauveritas-adt.com</u>

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

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