TEST REPORT

Report Number	:	TZ0278250701FRF08
Product Name	:	Wifi Pineapple Pager
Model/Type reference	:	Mk1
FCC ID	:	2A52Y-MK1
Prepared for	:	Hak5 LLC
		750 N Saint Paul St STE 250 #39371, Dallas, Texas 75201, United States

Prepared By	:	Shenzhen Tongzhou Testing Co.,Ltd. 1st Floor, Building 1, Haomai High-tech Park, Huating Road 387, Dalang Street, Longhua, Shenzhen, China
Standards	:	FCC CFR Title 47 Part 15E, ANSI C63.10-2020
Date of Test	:	2025-07-16 ~ 2025-09-03
Date of Issue	:	2025-09-04

Prepared by	:	Nancy Li	
Reviewed by	:	Allen Lai	
Approved by	:	Max Zhang (Authorized Officer)	

** Report Revise Record **

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	2025-09-04	Valid	Initial release

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1. GENERAL INFORMATION

1.1. Client Information

Applicant	:	Hak5 LLC
Address	:	750 N Saint Paul St STE 250 #39371, Dallas, Texas 75201, United States
Manufacturer	:	Shenzhen Gainstrong Technology Co., Ltd.
Address	:	4/F, Building B, Hengmingzhu Industrial Park, Qian Jin Road 2, Baoan District, Shenzhen, China

1.2. Description of Device (EUT)

Product Name	:	Wifi Pineapple Pager
Trade Mark	:	/
Model Number	:	Mk1
Model Declaration	:	N/A
Test Model	:	Mk1
Power Supply	:	DC 3.7V by battery, Input: DC 5V
Hardware version	:	V1.0
Software version	:	V1.0

1.3. Wireless Function Tested in this Report

WiFi		
WLAN	:	Supported IEEE 802.11ax
WLAN FCC Operation Frequency	:	U-NII Band 5: 5945~6425MHz U-NII Band 6: 6425~6525MHz U-NII Band 7: 6525~6875MHz U-NII Band 8: 6875~7125MHz
WLAN Modulation Technology	:	IEEE 802.11ax: OFDM (1024-QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK)
Antenna Type And Gain	:	Internal Antenna, Ant. 1: 4.43dBi, Ant. 2: 2.93dBi 802.11a/n/ac/ax support 2T2R.[Antenna 1 and Antenna 2]

Note 1: Antenna position refer to EUT Photos.
Note 2: the above information was supplied by the applicant.

U-NII Band 5: 5945~6425MHz

13 channels are provided for 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
1	**5955 MHz**	49	6195 MHz
5	5975 MHz	53	6215 MHz
9	5995 MHz	57	6235 MHz
13	6015 MHz	61	6255 MHz
17	6035 MHz	65	6275 MHz
21	6055 MHz	69	6295 MHz
25	6075 MHz	73	6315 MHz
29	6095 MHz	77	6335 MHz
33	6115 MHz	81	6355 MHz
37	6135 MHz	85	6375 MHz
41	6155 MHz	89	6395 MHz
45	**6175 MHz**	93	**6415 MHz**

6 channels are provided for 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
3	**5965 MHz**	51	6205 MHz
11	6005 MHz	59	6245 MHz
19	6045 MHz	67	6285 MHz
27	6085 MHz	75	6325 MHz
35	6125 MHz	83	6365 MHz
43	**6165 MHz**	91	**6405 MHz**

3 channel is provided for 802.11ax (HE80):

Channel	Frequency	Channel	Frequency
7	**5985 MHz**	55	6225 MHz
23	6065 MHz	71	6305 MHz
39	**6145 MHz**	87	**6385 MHz**

U-NII Band 6: 6425~6525MHz

5 channels are provided for 802.11a, 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
97	**6435 MHz**	109	6495 MHz
101	6455 MHz	113	**6515 MHz**
105	**6475 MHz**		

2 channels are provided for 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
99	**6445 MHz**	107	**6485 MHz**

2 channels are provided for 802.11ax (HE80):

Channel	Frequency	Channel	Frequency
103	**6465 MHz**	119	**6545 MHz**

U-NII Band 7: 6525~6875MHz

17 channels are provided for 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
117	**6535 MHz**	153	6715 MHz
121	6555 MHz	157	6735 MHz
125	6575 MHz	161	6755 MHz
129	6595 MHz	165	6775 MHz
133	6615 MHz	169	6795 MHz
137	6635 MHz	173	6815 MHz
141	6655 MHz	177	6835 MHz
145	6675 MHz	181	**6855 MHz**
149	**6695 MHz**		

9 channels are provided for 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
115	**6525 MHz**	155	6725 MHz
123	6565 MHz	163	6765 MHz
131	6605 MHz	171	6805 MHz
139	6645 MHz	179	**6845 MHz**
147	**6685 MHz**		

3 channel is provided for 802.11ax (HE80):

Channel	Frequency	Channel	Frequency
135	**6625 MHz**	167	**6785 MHz**
151	6705 MHz		

U-NII Band 8: 6875~7125MHz

13 channels are provided for 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
185	**6875 MHz**	213	7015 MHz
189	6895 MHz	217	7035 MHz
193	6915 MHz	221	7055 MHz
197	6935 MHz	225	7075 MHz
201	6955 MHz	229	7095 MHz
205	6975 MHz	233	**7115 MHz**
209	**6995 MHz**		

6 channels are provided for 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
187	**6885 MHz**	211	**7005 MHz**
195	6925 MHz	219	7045 MHz
203	6965 MHz	227	**7085 MHz**

3 channel is provided for 802.11ax (HE80):

Channel	Frequency	Channel	Frequency
183	**6865 MHz**	215	**7025 MHz**
199	6945 MHz		

1.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:
●supplied by the manufacturer

○supplied by the lab

○	Adapter	Model:	MDY-10-EH
		Input:	100-240V~ 50/60Hz 0.7A
		Output:	DC 5V, 3A

1.5. Description of Test Facility

FCC

Designation Number: CN1275
Test Firm Registration Number: 167722
Shenzhen Tongzhou Testing Co.,Ltd has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA

Certificate Number: 5463.01
Shenzhen Tongzhou Testing Co.,Ltd has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

IC

ISED#: 22033
CAB identifier: CN0099
Shenzhen Tongzhou Testing Co.,Ltd has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010

1.6. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the Shenzhen Tongzhou Testing Co.,Ltd quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.7. Measurement Uncertainty

Test Item		Uncertainty	Note
Radiation Uncertainty(9KHz~30MHz)	:	±3.26dB	(1)
Radiation Uncertainty(30MHz~1000MHz)	:	±3.92dB	(1)
Radiation Uncertainty(1GHz~40GHz)	:	±5.62dB	(1)
Conduction Uncertainty	:	±2.71dB	(1)
Occupied Channel Bandwidth	:	±3.0%	(1)
RF power, conducted	:	±0.16dB	(1)
Power Spectral Density, conducted	:	±1.3dB	(1)
Unwanted Emissions, conducted	:	±1.3dB	(1)
Time	:	±1.0%	(1)
Duty Cycle	:	±3.0%	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.8. Description of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

Worst-case mode and channel used for 150 kHz-30 MHz power line conducted emissions was the mode and channel with the highest output power that was determined to be **802.11ax, MIMO Mode at 5955MHz**.

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be **802.11ax, MIMO Mode at 5955MHz**.

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case datarates used during the testing are as follows:

IEEE 802.11ax HE20 Mode: MCS0
IEEE 802.11ax HE40 Mode: MCS0
IEEE 802.11ax HE80 Mode: MCS0

Antenna & Bandwidth

Antenna	Antenna 1			Antenna 2			Simultaneously
Bandwidth Mode	20MHz	40MHz	80MHz	20MHz	40MHz	80MHz	/
IEEE 802.11ax	☑	☑	☑	☑	☑	☑	☑

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2020, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen Tongzhou Testing Co.,Ltd

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure 789033 D02 General UNII Test Procedures New Rules v02r01, KDB 662911 D01 Multiple Transmitter Output v02r01, KDB987594 D01 U-NII 6GHz General Requirements v01r02, KDB987594 D02 U-NII 6 GHz EMC Measurement v01v01 are required to be used for this kind of FCC 15.407 UII device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E.

2.3. Test Sample

Sample ID	Description
TZ0278250701–1#	Engineer sample – continuous transmit
TZ0278250701–2#	Normal sample – Intermittent transmit

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by engineer mode (QATest Application v0.0.0.39 at power level 0 for 802.11ax) provided by application.

3.3. Special Accessories

No.	Equipment	Manufacturer	Model No.	Serial No.	Length	shielded/ unshielded	Notes
1	PC	ASUS	X454L	15105-0038A100	/	/	/

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen Tongzhou Testing Co.,Ltd has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Sample ID	Result
§15.407(a)	Maximum Conducted Output Power	TZ0278250701–1#	Compliant
§15.407(a)	Power Spectral Density	TZ0278250701–1#	Compliant
§15.407(a)	26dB Bandwidth	TZ0278250701–1#	Compliant
/	99% Occupied Bandwidth	TZ0278250701–1#	Note 1
§15.407(b)	Radiated Emissions	TZ0278250701–1#& TZ0278250701–2#	Compliant
§15.407(b)	Band edge Emissions	TZ0278250701–1#	Compliant
§15.205	Emissions at Restricted Band	TZ0278250701–1#	Compliant
§15.407(g)	Frequency Stability	TZ0278250701–1#	Compliant
§15.407(d)	Contention-based Protocol	TZ0278250701–2#	Compliant
§15.207(a)	Line Conducted Emissions	TZ0278250701–2#	Compliant
§15.203	Antenna Requirements	TZ0278250701–2#	Compliant
Note 1: only for report purpose.			

Remark: The measurement uncertainty is not included in the test result.

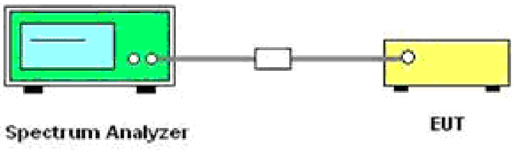
5. TEST RESULT

5.1. On Time and Duty Cycle

5.1.1. Standard Applicable

None. for reporting purpose only.

5.1.2. Block Diagram of Test Setup



5.1.3. Test Procedures

1. Set the centre frequency of the spectrum analyzer to the transmitting frequency.
2. Set the span=0MHz, RBW=8MHz, VBW=50MHz.
3. Detector = peak.
4. Trace mode = Single hold.

5.1.4. Test result

Pass

Remark:

1. Please refer to Appendix F of Appendix Test Data for U-NII-6G.

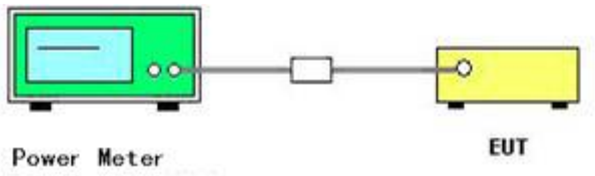
5.2. Maximum Conducted Output Power Measurement

5.2.1. Standard Applicable

i. For a standard power access point and fixed client device operating in the 5.925-6.425 GHz and 6.525-6.875 GHz bands, the maximum power spectral density must not exceed 23 dBm e.i.r.p in any 1-megahertz band. In addition, the maximum e.i.r.p. over the frequency band of operation must not exceed 36 dBm. For outdoor devices, the maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).
ii. For an indoor access point operating in the 5.925-7.125 GHz band, the maximum power spectral density must not exceed 5 dBm e.i.r.p. in any 1-megahertz band. In addition, the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm.
iii. For a subordinate device operating under the control of an indoor access point in the 5.925-7.125 GHz band, the maximum power spectral density must not exceed 5 dBm e.i.r.p in any 1-megahertz band, and the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm.
iv. For client devices, except for fixed client devices as defined in this subpart, operating under the control of a standard power access point in 5.925-6.425 GHz and 6.525-6.875 GHz bands, the maximum power spectral density must not exceed 17 dBm e.i.r.p. in any 1-megahertz band, and the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm and the device must limit its power to no more than 6 dB below its associated standard power access point's authorized transmit power.
v. For client devices operating under the control of an indoor access point in the 5.925-7.125 GHz bands, the maximum power spectral density must not exceed −1 dBm e.i.r.p. in any 1-megahertz band, and the maximum e.i.r.p. over the frequency band of operation must not exceed 24 dBm.
vi. For very low power devices operating in the 5.925-7.125 GHz band, the maximum power spectral density must not exceed −5 dBm e.i.r.p in any 1-megahertz band and the maximum e.i.r.p must not exceed 14 dBm.

The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

5.2.2. Block Diagram of Test Setup



5.2.3. Test Procedures

The transmitter output (antenna port) was connected to the power meter.

According to KDB 789033 D02 Section 3 (a) Method PM (Measurement using an RF average power meter): Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

The EUT is configured to transmit continuously or to transmit with a constant duty cycle.

At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.

The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section II.B.

Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

Adjust the measurement in dBm by adding 10 log (1/x) where x is the duty cycle (e.g., 10 log (1/0.25) if the duty cycle is 25%).

5.2.4. Test Results

Pass

Remark:

1. Measured output power at difference data rate for each mode and recorded worst case for each mode.
2. Test results including cable loss.
3. For MIMO with CCD technology device, The Directional Gain= Gain of individual transmit antennas (dBi) + Array gain.
4. For power measurements on IEEE 802.11 devices, Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4; So the Directional Gain = 4.43 dBi.
5. Report conducted power = Measured conducted average power + Duty Cycle factor.
6. Please refer to Appendix B of Appendix Test Data for U-NII-6G.

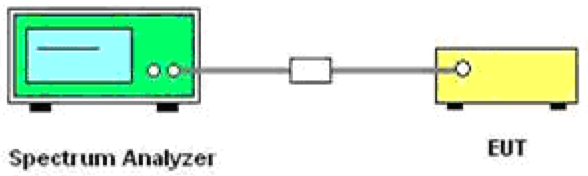
5.3. Power Spectral Density Measurement

5.3.1. Standard Applicable

i. For a standard power access point and fixed client device operating in the 5.925-6.425 GHz and 6.525-6.875 GHz bands, the maximum power spectral density must not exceed 23 dBm e.i.r.p in any 1-megahertz band. In addition, the maximum e.i.r.p. over the frequency band of operation must not exceed 36 dBm. For outdoor devices, the maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).
ii. For an indoor access point operating in the 5.925-7.125 GHz band, the maximum power spectral density must not exceed 5 dBm e.i.r.p. in any 1-megahertz band. In addition, the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm.
iii. For a subordinate device operating under the control of an indoor access point in the 5.925-7.125 GHz band, the maximum power spectral density must not exceed 5 dBm e.i.r.p in any 1-megahertz band, and the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm.
iv. For client devices, except for fixed client devices as defined in this subpart, operating under the control of a standard power access point in 5.925-6.425 GHz and 6.525-6.875 GHz bands, the maximum power spectral density must not exceed 17 dBm e.i.r.p. in any 1-megahertz band, and the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm and the device must limit its power to no more than 6 dB below its associated standard power access point's authorized transmit power.
v. For client devices operating under the control of an indoor access point in the 5.925-7.125 GHz bands, the maximum power spectral density must not exceed −1 dBm e.i.r.p. in any 1-megahertz band, and the maximum e.i.r.p. over the frequency band of operation must not exceed 24 dBm.
vi. For very low power devices operating in the 5.925-7.125 GHz band, the maximum power spectral density must not exceed −5 dBm e.i.r.p in any 1-megahertz band and the maximum e.i.r.p must not exceed 14 dBm.

Power spectral density measurement: The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.895 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in all other bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

5.3.2. Block Diagram of Test Setup



5.3.3. Test Procedures

1. The transmitter was connected directly to a Spectrum Analyzer through a directional couple.
2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
3. Set the RBW = 1MHz.
4. Set the VBW ≥ 3MHz
5. Span=Encompass the entire emissions bandwidth (EBW) of the signal (or, alternatively, the entire 99% occupied bandwidth) of the signal.
6. Number of points in sweep ≥ 2 × span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
7. Manually set sweep time ≥ 10 × (number of points in sweep) × (total on/off period of the transmitted signal).
8. Set detector = power averaging (rms).
9. Sweep time = auto couple.
10. Trace mode = max hold.
11. Allow trace to fully stabilize.

12. Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively,
13. Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add 10 log (1/0.25) = 6 dB if the duty cycle is 25%.
14. Use the peak marker function to determine the maximum power level in any 1MHz band segment within the fundamental EBW.

5.3.4. Test Results

Pass

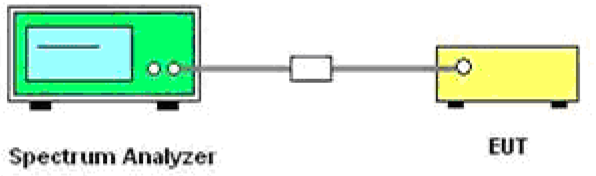
Remark:
1. Measured power spectrum density at difference data rate for each mode and recorded worst case for each mode.
2. Test results including cable loss.
3. For MIMO with CCD technology device, The Directional Gain= Gain of individual transmit antennas (dBi) + Array gain.
4. Array Gain = 10 log(NANT/NSS), (NSS = 1); So the Directional Gain = 6.72 dBi.
5. Report conducted PSD = Measured conducted PSD + Duty Cycle factor.
6. Please refer to Appendix C of Appendix Test Data for U-NII-6G.

5.4. 99% Occupied Bandwidth and 26dB Emission Bandwidth Measurement

5.4.1. Standard Applicable

No restriction limits. But resolution bandwidth within band edge measurement is 1% of the 99% occupied bandwidth.

5.4.2. Block Diagram of Test Setup



5.4.3. Test Procedures

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

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

5.4.4. Test Results

Pass

Remark:
1. Measured 99% and 26dB bandwidth at difference data rate for each mode and recorded worst case for each mode.
2. Please refer to Appendix A of Appendix Test Data for U-NII-6G.

5.5. Radiated Emissions Measurement

5.5.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
\2\ Above 38.6
For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz. (68.2dBuV/m at 3m).
In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

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

5.5.2. Measuring Instruments and Setting

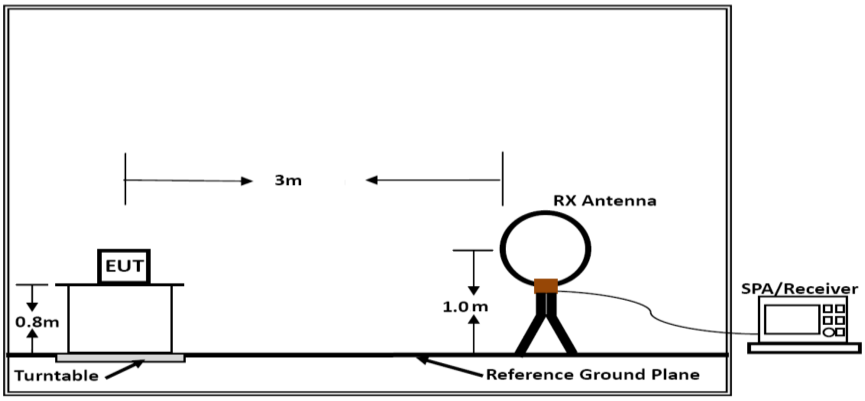
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10^{th} carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 3 MHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 3 MHz for Average

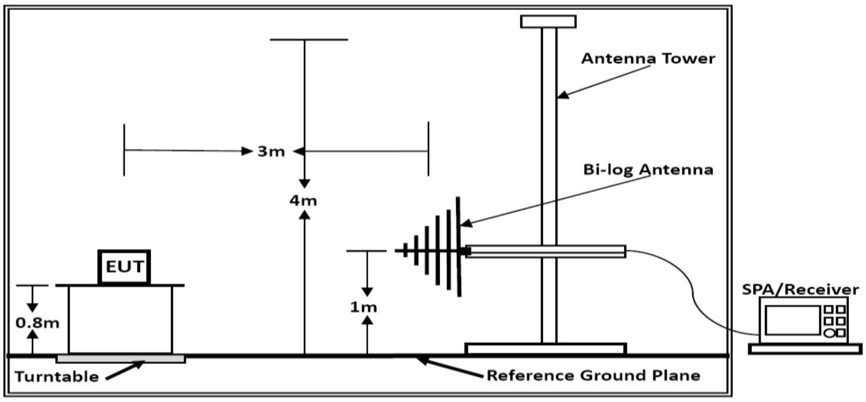
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

5.5.3. Block Diagram of Test Setup

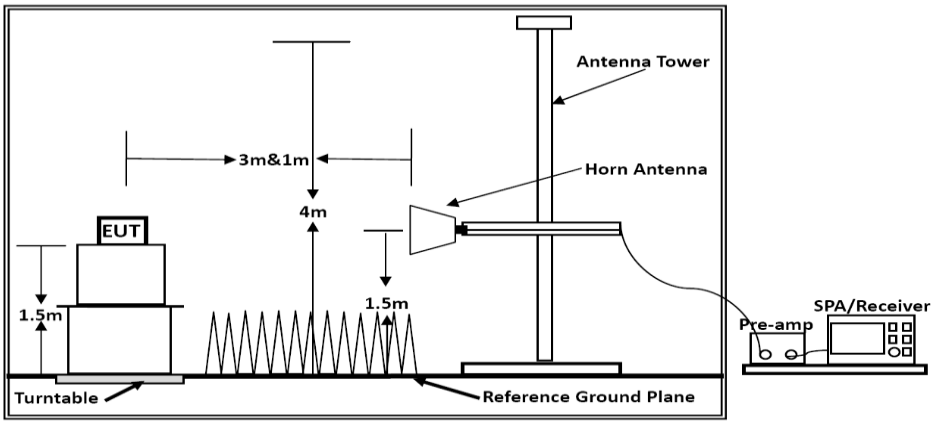
For radiated emissions below 30MHz



Below 30MHz



Below 1GHz



Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.
Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1m]) (dB).
Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.5.4. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 3 meter.
--- The EUT was set into operation.

Premeasurement:
--- The turntable rotates from 0° to 315° using 45° steps.
--- The antenna height is 1.0 meter.
--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:
--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.
--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 3 meter.
--- The EUT was set into operation.

Premeasurement:
--- The turntable rotates from 0° to 315° using 45° steps.
--- The antenna is polarized vertical and horizontal.
--- The antenna height changes from 1 to 3 meter.
--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:
--- The final measurement will be performed with minimum the six highest peaks.
--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.
--- The final measurement will be done with QP detector with an EMI receiver.
--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 40 GHz

Setup:
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 3 meter.
--- The EUT was set into operation.

Premeasurement:
--- The turntable rotates from 0° to 315° using 45° steps.
--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.
--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.
--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meters. This procedure is repeated for both antenna polarizations.
--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 1 meter.
--- The EUT was set into operation.

Premeasurement:

--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

5.5.5. Test Results

Pass

Results of Radiated Emissions (9 KHz~30MHz)

Temperature	22.5℃	Humidity	56%
Test Engineer	Tony Luo	Configurations	IEEE 802.11 ax
Test Voltage	DC 3.7V	/	/

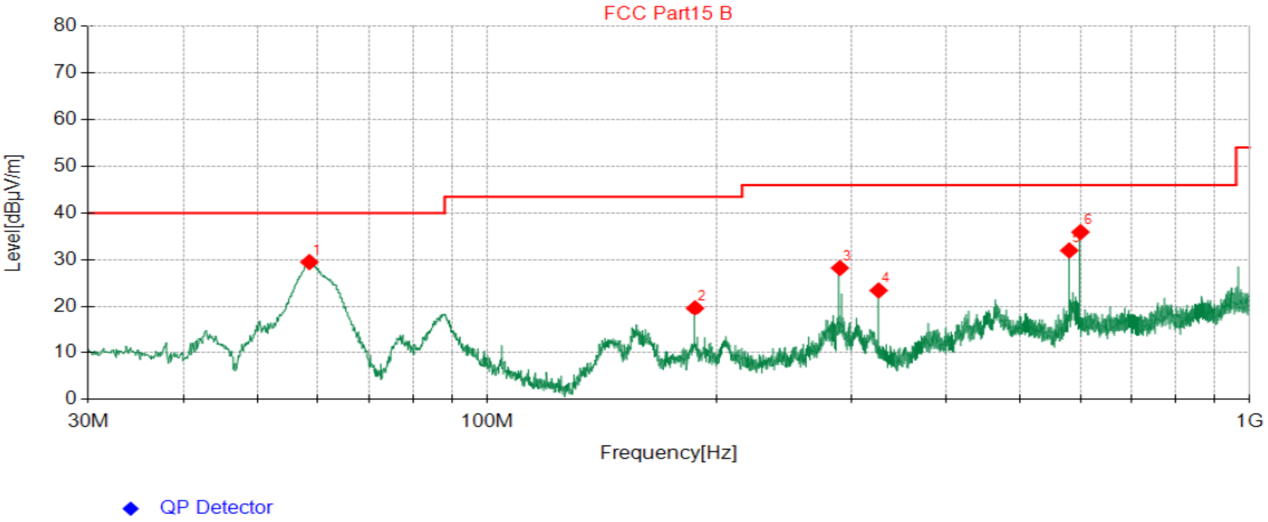
Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
Limit line = specific limits (dBuV) + distance extrapolation factor.

Results of Radiated Emissions (30MHz~1GHz)

Temperature	22.5℃	Humidity	56%
Test Engineer	Tony Luo	Configurations	IEEE 802.11 ax
Test Voltage	DC 3.7V	/	/

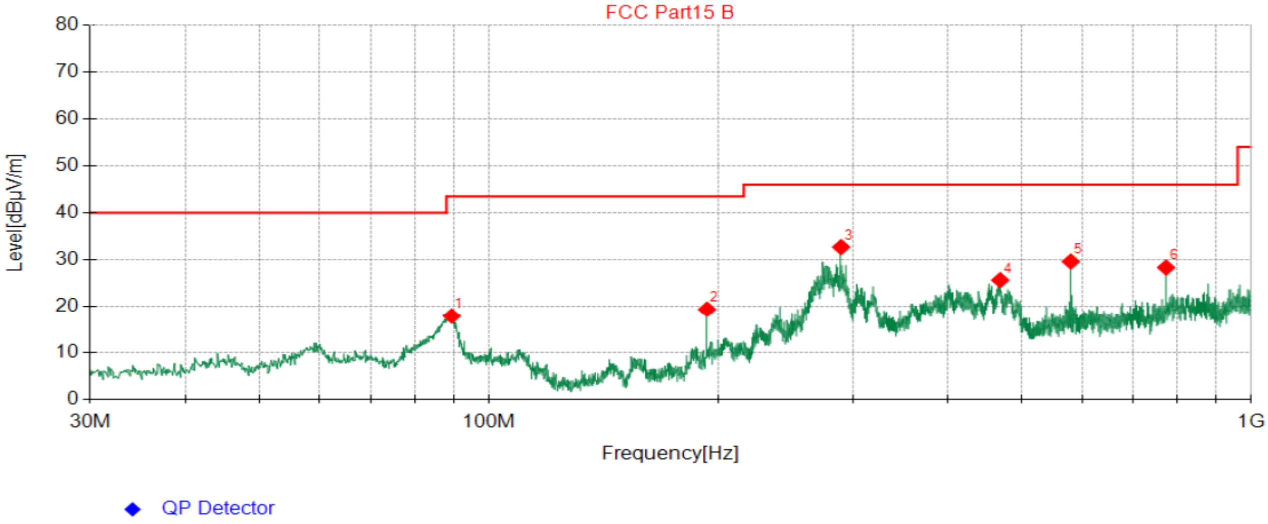
Vertical



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	58.49	44.99	-15.42	29.57	40.00	10.43	100	50	Vertical
2	187.3	36.43	-16.72	19.71	43.50	23.79	100	110	Vertical
3	290.2	41.32	-13.02	28.30	46.00	17.70	100	120	Vertical
4	326.2	35.60	-12.09	23.51	46.00	22.49	100	120	Vertical
5	579.9	38.14	-6.09	32.05	46.00	13.95	100	270	Vertical
6	599.9	41.56	-5.59	35.97	46.00	10.03	100	120	Vertical

***Note:
1. Level [dBμV/m] = Reading [dBμV] + Factor [dB/m]
2. Margin [dB] = Limit [dBμV/m] - Level [dBμV/m]
3.Pre-scan all modes and recorded the worst case results in this report.

Horizontal



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV]	Factor [dB/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	89.41	35.75	-17.83	17.92	43.50	25.58	100	130	Horizontal
2	193.3	35.51	-16.11	19.40	43.50	24.10	100	120	Horizontal
3	289.8	45.75	-13.02	32.73	46.00	13.27	100	130	Horizontal
4	468.5	34.37	-8.68	25.69	46.00	20.31	100	20	Horizontal
5	579.9	35.74	-6.09	29.65	46.00	16.35	100	330	Horizontal
6	773.3	31.67	-3.29	28.38	46.00	17.62	100	210	Horizontal

***Note:
1. Level [dBµV/m] = Reading [dBµV] + Factor [dB/m]
2. Margin [dB] = Limit [dBµV/m] - Level [dBµV/m]
3.Pre-scan all modes and recorded the worst case results in this report.

Results for Radiated Emissions (1GHz to 40GHz)

Temperature	24℃	Humidity	55.2%
Test Engineer	Tony Luo	Configurations	IEEE 802.11 ax
Test Voltage	DC 3.7V	/	/

Remark: Measured all modes and recorded worst case.

IEEE 802.11ax HE20 MIMO Mode

5955 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
11910.00	52.66	36.07	38.86	5.70	55.57	74.00	18.43	Peak	Horizontal
11910.00	45.33	36.07	38.86	5.70	48.24	54.00	5.76	Average	Horizontal
11910.00	53.48	36.07	38.86	5.70	56.39	74.00	17.61	Peak	Vertical
11910.00	47.35	36.07	38.86	5.70	50.27	54.00	3.73	Average	Vertical

6415 MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
12830.00	52.50	36.83	39.46	5.91	55.78	88.20	32.42	Peak	Horizontal
12830.00	46.09	36.83	39.46	5.91	49.37	68.20	18.83	Average	Horizontal
12830.00	53.05	36.83	39.46	5.91	56.33	88.20	31.87	Peak	Vertical
12830.00	47.12	36.83	39.46	5.91	50.39	68.20	17.81	Average	Vertical

6435MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
12870.00	52.36	36.86	39.49	5.92	55.65	88.20	32.55	Peak	Horizontal
12870.00	46.48	36.86	39.49	5.92	49.77	68.20	18.43	Average	Horizontal
12870.00	53.75	36.86	39.49	5.92	57.04	88.20	31.16	Peak	Vertical
12870.00	46.12	36.86	39.49	5.92	49.42	68.20	18.78	Average	Vertical

6515MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
13030.00	51.96	36.99	39.59	5.96	55.32	88.20	32.88	Peak	Horizontal
13030.00	46.23	36.99	39.59	5.96	49.59	68.20	18.61	Average	Horizontal
13030.00	54.57	36.99	39.59	5.96	57.93	88.20	30.27	Peak	Vertical
13030.00	46.70	36.99	39.59	5.96	50.05	68.20	18.15	Average	Vertical

6535MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
13070.00	52.76	37.02	39.62	5.97	56.13	88.20	32.07	Peak	Horizontal
13070.00	46.43	37.02	39.62	5.97	49.80	68.20	18.40	Average	Horizontal
13070.00	53.32	37.02	39.62	5.97	56.69	88.20	31.51	Peak	Vertical
13070.00	45.80	37.02	39.62	5.97	49.17	68.20	19.03	Average	Vertical

6855MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
13710.00	53.34	37.55	40.04	6.11	56.96	88.20	31.24	Peak	Horizontal
13710.00	44.49	37.55	40.04	6.11	48.11	68.20	20.09	Average	Horizontal
13710.00	52.44	37.55	40.04	6.11	56.06	88.20	32.14	Peak	Vertical
13710.00	47.30	37.55	40.04	6.11	50.93	68.20	17.27	Average	Vertical

6875MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
13750.00	52.05	37.58	40.07	6.12	55.69	88.20	32.51	Peak	Horizontal
13750.00	45.06	37.58	40.07	6.12	48.70	68.20	19.50	Average	Horizontal
13750.00	52.54	37.58	40.07	6.12	56.18	88.20	32.02	Peak	Vertical
13750.00	45.91	37.58	40.07	6.12	49.54	68.20	18.66	Average	Vertical

7115MHz

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
14230.00	53.14	37.98	40.38	6.23	56.97	88.20	31.23	Peak	Horizontal
14230.00	45.45	37.98	40.38	6.23	49.28	68.20	18.92	Average	Horizontal
14230.00	53.46	37.98	40.38	6.23	57.29	88.20	30.91	Peak	Vertical
14230.00	46.76	37.98	40.38	6.23	50.59	68.20	17.61	Average	Vertical

Notes:
1. Measuring frequencies from 9 KHz ~40 GHz, No emission found between lowest internal used/generated frequencies to 30MHz.
2. Radiated emissions measured in frequency range from 9 KHz ~40GHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. Level= Reading + Ant. Fac - Pre. Fac. + Cab. Loss. Margin = Limit – Level

Results for Radiated Emissions at band edge

Temperature	24.3℃	Humidity	55.4%
Test Engineer	Tony Luo	Configurations	802.11 ax
Test Voltage	DC 3.7V	/	/

Mode	Channel	Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cab. Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
IEEE 802.11ax HE20 MIMO	5955	5925	15.23	29.56	10.65	55.44	88.2	32.76	Peak	Horizontal
		5925	9.62	29.56	10.65	49.83	68.2	18.37	AV[1]	Horizontal
		5925	17.58	29.56	10.65	57.79	88.2	30.41	Peak	Vertical
		5925	11.41	29.56	10.65	51.62	68.2	16.58	AV[1]	Vertical
	7115	7125	24.30	30.22	10.65	65.17	88.2	23.03	Peak	Horizontal
		7125	18.34	30.22	10.65	59.21	68.2	8.99	AV[1]	Horizontal
		7125	26.43	30.22	10.65	67.30	88.2	20.90	Peak	Vertical
		7125	20.82	30.22	10.65	61.69	68.2	6.51	AV[1]	Vertical
		7250	12.14	30.22	10.95	53.31	74	20.69	Peak	Horizontal
		7250	6.95	30.22	10.95	48.12	54	5.88	AV[1]	Horizontal
		7250	14.13	30.22	10.95	55.30	74	18.70	Peak	Vertical
		7250	7.40	30.22	10.95	48.57	54	5.43	AV[1]	Vertical

Mode	Channel	Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cab. Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
IEEE 802.11ax HE40 MIMO	5955	5925	15.55	29.56	10.65	55.76	88.2	32.44	Peak	Horizontal
		5925	10.35	29.56	10.65	50.56	68.2	17.64	AV[1]	Horizontal
		5925	15.83	29.56	10.65	56.04	88.2	32.16	Peak	Vertical
		5925	8.96	29.56	10.65	49.17	68.2	19.03	AV[1]	Vertical
	7115	7125	24.63	30.22	10.65	65.50	88.2	22.70	Peak	Horizontal
		7125	19.51	30.22	10.65	60.38	68.2	7.82	AV[1]	Horizontal
		7125	27.29	30.22	10.65	68.16	88.2	20.04	Peak	Vertical
		7125	21.16	30.22	10.65	62.03	68.2	6.17	AV[1]	Vertical
		7250	12.79	30.22	10.95	53.96	74	20.04	Peak	Horizontal
		7250	7.61	30.22	10.95	48.78	54	5.22	AV[1]	Horizontal
		7250	13.73	30.22	10.95	54.90	74	19.10	Peak	Vertical
		7250	7.03	30.22	10.95	48.20	54	5.80	AV[1]	Vertical

Mode	Channel	Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cab. Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Remark	Pol.
IEEE 802.11ax HE80 MIMO	5955	5925	15.17	29.56	10.65	55.38	88.2	32.82	Peak	Horizontal
		5925	9.03	29.56	10.65	49.24	68.2	18.96	AV[1]	Horizontal
		5925	16.11	29.56	10.65	56.32	88.2	31.88	Peak	Vertical
		5925	10.27	29.56	10.65	50.48	68.2	17.72	AV[1]	Vertical
	7115	7125	25.46	30.22	10.65	66.33	88.2	21.87	Peak	Horizontal
		7125	19.36	30.22	10.65	60.23	68.2	7.97	AV[1]	Horizontal
		7125	27.40	30.22	10.65	68.27	88.2	19.93	Peak	Vertical
		7125	20.63	30.22	10.65	61.50	68.2	6.70	AV[1]	Vertical
		7250	12.11	30.22	10.95	53.28	74	20.72	Peak	Horizontal
		7250	5.12	30.22	10.95	46.29	54	7.71	AV[1]	Horizontal
		7250	13.12	30.22	10.95	54.29	74	19.71	Peak	Vertical
		7250	6.95	30.22	10.95	48.12	54	5.88	AV[1]	Vertical

Remark:
1. Measured Undesirable emission at difference data rate for each mode and recorded worst case for each mode.
2. Level = Read Level + Antenna Factor + Cable Loss
3. Margin =Limit - Level

5.6. Power line conducted emissions

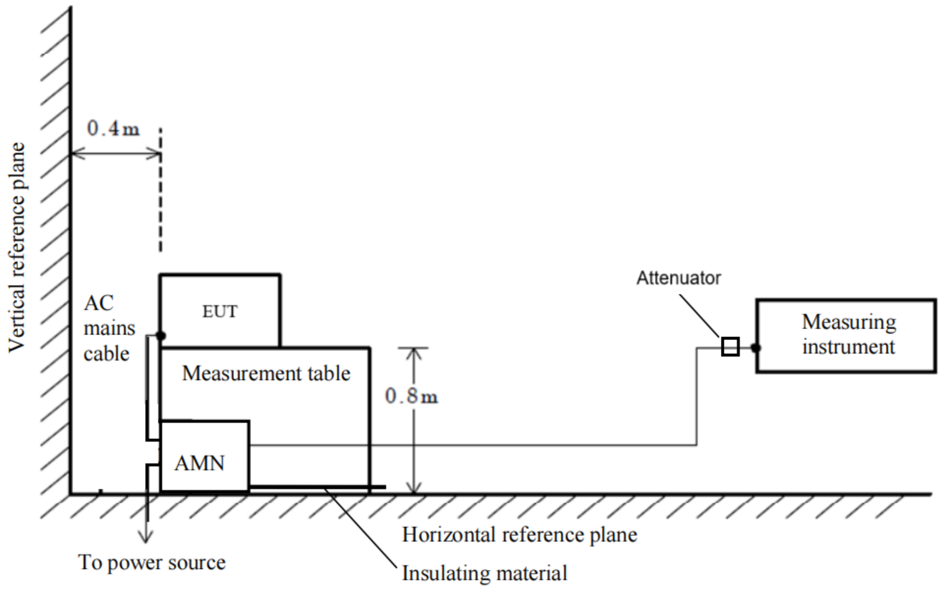
5.6.1. Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

5.6.2. Block Diagram of Test Setup



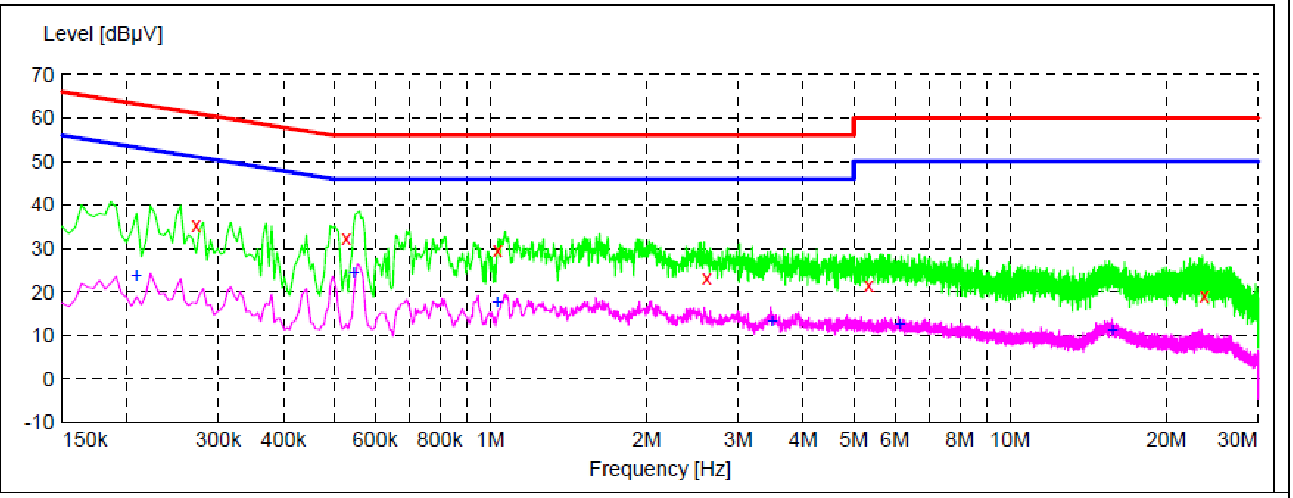
Note: the distance between LISN and Vertical reference plane is 40 cm and the distance between LISN and EUT is 80 cm.

5.6.3. Test Results

PASS.

Temperature	24.3℃	Humidity	55.4%
Test Engineer	Tony Luo	Configurations	802.11 ax
Test Voltage	AC 120V/60Hz	/	/

Neutral Line

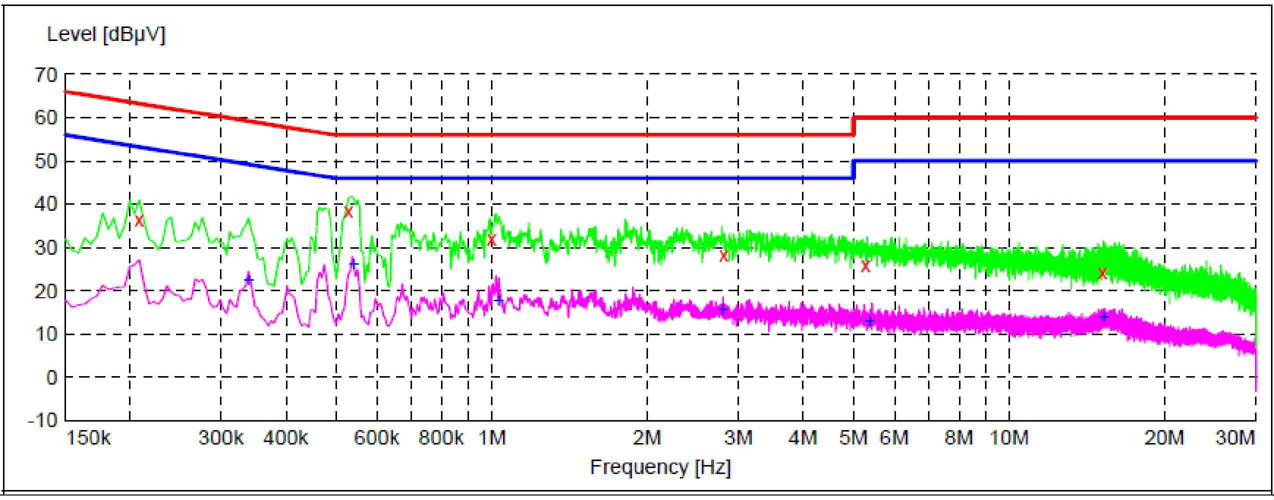


Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.271500	35.40	10.3	61	25.7	QP	N	GND
0.528000	32.50	9.9	56	23.5	QP	N	GND
1.032000	29.60	9.7	56	26.4	QP	N	GND
2.607000	23.10	9.7	56	32.9	QP	N	GND
5.347500	21.70	9.8	60	38.3	QP	N	GND
23.640000	19.20	10.1	60	40.8	QP	N	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.208500	23.90	10.6	53	29.4	AV	N	GND
0.546000	24.70	9.9	46	21.3	AV	N	GND
1.032000	17.70	9.7	46	28.3	AV	N	GND
3.484500	13.50	9.7	46	32.5	AV	N	GND
6.135000	12.70	9.8	50	37.3	AV	N	GND
15.729000	11.30	10.0	50	38.7	AV	N	GND

Note:
1. Margin(dB)= Limit(dBµV) - Level(dBµV)
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.
4. Pre-scan all modes and recorded the worst case results in this report.

Live Line



Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.208500	36.50	10.6	63	26.8	QP	L1	GND
0.528000	38.30	9.9	56	17.7	QP	L1	GND
1.000500	32.00	9.7	56	24.0	QP	L1	GND
2.809500	28.30	9.7	56	27.7	QP	L1	GND
5.280000	26.00	9.8	60	34.0	QP	L1	GND
15.171000	24.10	9.9	60	35.9	QP	L1	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.339000	22.50	10.1	49	26.7	AV	L1	GND
0.541500	26.30	9.9	46	19.7	AV	L1	GND
1.032000	17.80	9.7	46	28.2	AV	L1	GND
2.791500	15.60	9.7	46	30.4	AV	L1	GND
5.370000	13.20	9.8	50	36.8	AV	L1	GND
15.202500	14.10	9.9	50	35.9	AV	L1	GND

Note:
1. Margin(dB)= Limit(dBµV) - Level(dBµV)
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.
4. Pre-scan all modes and recorded the worst case results in this report.

5.7. Undesirable Emissions Measurement

5.7.1. Limit

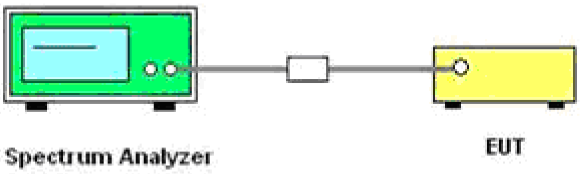
For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz.

For transmitters operating within the 5.925-7.125 GHz bands: Power spectral density must be suppressed by 20 dB at 1 MHz outside of channel edge, by 28 dB at one channel bandwidth from the channel center, and by 40 dB at one- and one-half times the channel bandwidth away from channel center. At frequencies between one megahertz outside an unlicensed device's channel edge and one channel bandwidth from the center of the channel, the limits must be linearly interpolated between 20 dB and 28 dB suppression, and at frequencies between one and one- and one-half times an unlicensed device's channel bandwidth, the limits must be linearly interpolated between 28 dB and 40 dB suppression. Emissions removed from the channel center by more than one- and one-half times the channel bandwidth must be suppressed by at least 40 dB.

The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

5.7.2. Block Diagram of Test Setup



5.7.3. Test Procedure

Unwanted Emission Measurement
Use guidance in KDB 789033 for measurements below 1000 MHz and above 1000 MHz. Unwanted emissions outside of restricted bands are measured with a RMS detector. In addition, 15.35(b) applies where the peak emissions must be limited to no more than 20 dB above the average limit.

In-Band Emissions
1. Connect output of the antenna port to a spectrum analyzer or EMI receiver, with appropriate attenuation, as to not damage the instrumentation.
2. Set the reference level of the measuring equipment in accordance with procedure 4.1.5.2 of ANSI C63.10-2020.
3. Measure the 26 dB EBW using the test procedure 12.4.1 of ANSI C63.10-2020. (This will be used to determine the channel edge.)
4. Measure the power spectral density (which will be used for emissions mask reference) using the following procedure:
   a) Set the span to encompass the entire 26 dB EBW of the signal.
   b) Set RBW = same RBW used for 26 dB EBW measurement.
   c) Set VBW ≥ 3 X RBW
   d) Number of points in sweep ≥ [2 X span / RBW].
   e) Sweep time = auto.
   f) Detector = RMS (i.e., power averaging)
   g) Trace average at least 100 traces in power averaging (rms) mode.
   h) Use the peak search function on the instrument to find the peak of the spectrum.
5. For the purposes of developing the emission mask, the channel bandwidth is defined as the 26 dB EBW.
6. Using the measuring equipment limit line function, develop the emissions mask based on the following requirements. The emissions power spectral density must be reduced below the peak power spectral density (in dB) as follows:
   a. Suppressed by 20 dB at 1 MHz outside of the channel edge. (The channel edge is defined as the 26-dB point on either side of the carrier center frequency.)
   b. Suppressed by 28 dB at one channel bandwidth from the channel center.
   c. Suppressed by 40 dB at one- and one-half times the channel bandwidth from the channel center.
7. Adjust the span to encompass the entire mask as necessary.
8. Clear trace.
9. Trace average at least 100 traces in power averaging (rms) mode.
10. Adjust the reference level as necessary so that the crest of the channel touches the top of the emission mask.

5.7.4. Test Results

Please refer to Appendix D of Appendix Test Data for U-NII-6G.
Please refer to Appendix F of Appendix Test Data for U-NII-6G.

5.8. Contention Based Protocol

5.8.1. Limit

Indoor access points, subordinate devices, all client devices (except for Fixed clients), and VLP devices operating in the 5.925-7.125 GHz band (herein referred to as unlicensed devices) must use a contention based protocol to avoid co-channel interference with incumbent devices sharing the band. To ensure incumbent co-channel operations are technology-agnostic, unlicensed devices are required to detect co channel radio frequency energy (energy detection) and avoid simultaneous transmission.

Unlicensed devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low-power indoor devices must vacate the channel (in which the incumbent signal is transmitted) and stay off the incumbent channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm). The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain.

To ensure incumbent operations are reliably detected in the band, low-power indoor devices must detect RF energy throughout their intended operating channel. For example, an 802.11 device that plans to transmit a 40 MHz-wide signal (on a primary 20 MHz channel and a secondary 20 MHz channel) must detect energy throughout the entire 40 MHz channel. Additionally, these devices must detect co-channel energy with 90% or greater certainty.

5.8.2. Block Diagram of Test Setup

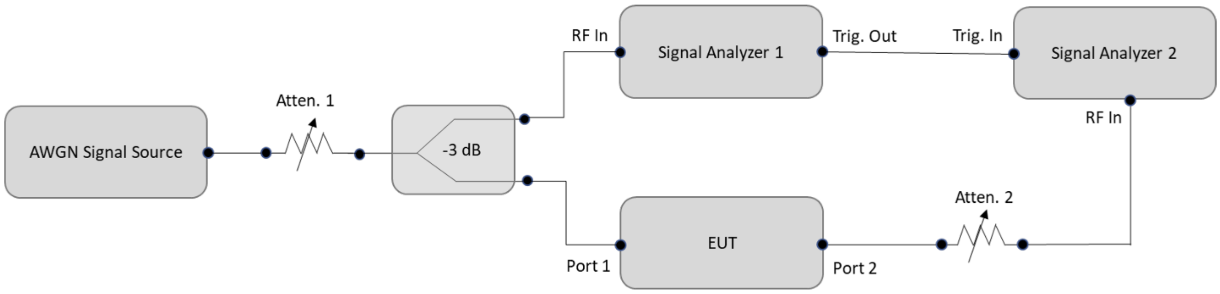


Figure 2. Contention-based protocol test setup conducted method

5.8.3. Test Procedure

1. Configure the EUT to transmit with a constant duty cycle.
2. Set the EUT's operating parameters, including power level, operating frequency, modulation, and bandwidth.
3. Set the signal analyzer center frequency to the nominal EUT channel center frequency. The signal analyzer's span range shall be between two times and five times the EUT's OBW. Connect the EUT's output port to signal analyzer 2, as shown in Figure 2. Ensure that the attenuator 2 provides enough attenuation to prevent the signal analyzer two receiver overloading.
4. Monitor signal analyzer 2 and verify that the EUT operates and transmits with the parameters set in step 2.
5. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
6. Set the AWGN signal power to a shallow level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source via a 3-dB splitter to signal analyzer one and the EUT, as shown in Figure 2.
7. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.
8. Monitor signal analyzer 2 to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, incrementally increase the AWGN signal power level until it stops transmitting.
9. (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least ten times to verify the EUT can detect an AWGN signal with a 90% (or better) level of certainty.
10. Refer to Table 1 to determine the number of times the detection threshold testing needs to be repeated. If testing is required more than once, go back to step 5, choose a different center frequency for the AWGN signal, and repeat the process.

5.8.4. Test Results

Please refer to Appendix H of Appendix Test Data for U-NII-6G.

5.9. **Antenna Requirements**

5.9.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited
And according to FCC 47 CFR Section 15.407 (a), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

5.9.2. Antenna Connector Construction

The directional gains of antenna refer to section 1.3, and the antenna is an internal antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

5.9.3. Results

Compliance

5.10. Frequency Stability

5.10.1. Standard Applicable

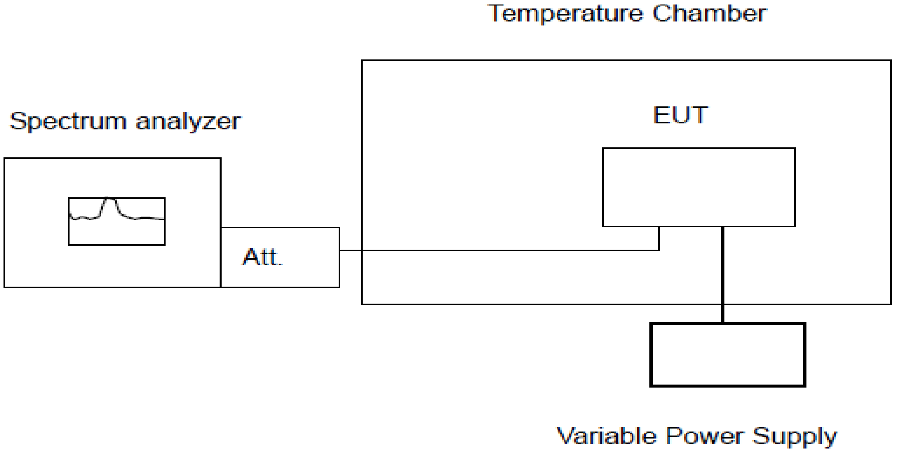
According to FCC §15.407(g) “Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user manual.”
According to FCC §2.1055(a) “The frequency stability shall be measured with variation of ambient temperature as follows:”

(1) From −30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(2) From −20° to + 50° centigrade for equipment to be licensed for use in the Maritime Services under part 80 of this chapter, except for Class A, B, and S Emergency Position Indicating Radio beacons (EPIRBS), and equipment to be licensed for use above 952 MHz at operational fixed stations in all services, stations in the Local Television Transmission Service and Point-to-Point Microwave Radio Service under part 21 of this chapter, equipment licensed for use aboard aircraft in the Aviation Services under part 87 of this chapter, and equipment authorized for use in the Family Radio Service under part 95 of this chapter.

(3) From 0° to + 50° centigrade for equipment to be licensed for use in the Radio Broadcast Services under part 73 of this chapter.

5.10.2. Block Diagram of Test Setup



5.10.3. Test Procedure

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum anzlyer via feed through attenators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low engouh to obtain the desired frequency resoluation and measure EUT 20 degree operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30 degree. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10 degree increased per stage until the highest temperature of +50 degree reached.

5.10.4. Test Results

Pass

Remark:
1. Measured all conditions and recorded worst case.
2. Please refer to Appendix E of Appendix Test Data for U-NII-6G.

6. LIST OF MEASURING EQUIPMENT

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	MXA Signal Analyzer	Keysight	N9020A	MY52091623	2024-12-31	2025-12-30
2	Power Sensor	Agilent	U2021XA	MY5365004	2024-12-31	2025-12-30
3	Power Meter	Agilent	U2531A	TW53323507	2024-12-31	2025-12-30
4	Loop Antenna	schwarzbeck	FMZB1519B	00023	2022-11-13	2025-11-12
5	Wideband Antenna	schwarzbeck	VULB 9163	958	2022-11-13	2025-11-12
6	Horn Antenna	schwarzbeck	BBHA 9120D	01989	2022-11-13	2025-11-12
7	EMI Test Receiver	R&S	ESCI	100849/003	2024-12-31	2025-12-30
8	Controller	MF	MF7802	N/A	N/A	N/A
9	Amplifier	schwarzbeck	BBV 9743	209	2024-12-31	2025-12-30
10	Amplifier	Tonscend	TSAMP-0518SE	--	2024-12-31	2025-12-30
11	RF Cable(below 1GHz)	HUBER+SUHNER	RG214	N/A	2024-12-31	2025-12-30
12	RF Cable(above 1GHz)	HUBER+SUHNER	RG214	N/A	2024-12-31	2025-12-30
13	Artificial Mains	ROHDE & SCHWARZ	ENV 216	101333-IP	2024-12-31	2025-12-30
14	EMI Test Software	ROHDE & SCHWARZ	ESK1	V1.71	N/A	N/A
15	Amplifier	Chengyi	EMC184045SE	980508	2024-9-20	2025-9-19
16	Horn Antenna	A-INFO	LB-180400-KF	J211020657	2023-10-12	2025-10-11
17	Spectrum Analyzer	R&S	FSV40	101321	2024-09-20	2025-09-19
18	Fixed Attenuator	Mini circuits	BW-S6-2W263A+	N/A	2024-12-31	2025-12-30
19	Climate Chamber	KRUOMR	KRM-1000	KRM16072901	2024-12-31	2025-12-30
20	Frequency Mixer	Mini-Circuits	ZX05-153LH-S+	/	Each time	Each time

Test software used:

Item	Test Software	Manufacturer	Name	Version
1	EMI Test Software	ROHDE & SCHWARZ	ESK1	V1.71
2	RE test software	Tonscend	JS32-RE	V5.0.0.0
3	Test Software	Tonscend	JS1120-3	V3.2.22

7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

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