

<b>Prüfbericht-Nr.:</b> <i>Test report no.:</i>	CN21BZ5K(P15C-WiFi) 001	<b>Auftrags-Nr.:</b> <i>Order no.:</i>	238522264	Seite 1 von 37 Page 1 of 37
<b>Kunden-Referenz-Nr.:</b> <i>Client reference no.:</i>	N/A	<b>Auftragsdatum:</b> <i>Order date:</i>	2021-11-10	
<b>Auftraggeber:</b> <i>Client:</i>	WatchGuard Technologies, Inc. 505 Fifth Avenue South, Suite 500, Seattle Washington United States 98104			
<b>Prüfgegenstand:</b> <i>Test item:</i>	Wireless Access Point			
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type no.:</i>	AP432			
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	FCC Part 15C Test report (WiFi 2.4GHz)			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.247PSD			
<b>Wareneingangsdatum:</b> <i>Date of sample receipt:</i>	2021-11-11			
<b>Prüfmuster-Nr.:</b> <i>Test sample no.:</i>	A003162916-019, 005 A003162916-001			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	2021-11-18 - 2021-12-22			
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	EMC/RF Taipei Testing Site			
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	Taipei Testing Laboratories			
<b>Prüfergebnis*:</b> <i>Test result*:</i>	Pass			
<b>überprüft von:</b> <i>compiled by:</i>		<b>genehmigt von:</b> <i>authorized by:</i>		
<b>Datum:</b> <i>Date:</i>	2021-12-22	<b>Ausstellungsdatum:</b> <i>Issue date:</i>	2021-12-22	
<b>Stellung / Position:</b>	Project Manager	<b>Stellung / Position:</b>	Senior Project Manager	
<b>Sonstiges / Other:</b>				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested
<p><b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b>  <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i></p>				

## TEST SUMMARY

Report Section	FCC Clause	Test Item	Result
5.1.1	15.247(b) & 15.203	Antenna Requirement	Pass
5.1.2	15.247(b)(3)	Average Output Power	Pass
5.1.3	15.247(a)(2)	6 dB Bandwidth	Pass
5.1.3	2.1049	99% Occupied Bandwidth	Pass
5.1.4	15.247(e)	Power Spectral Density	Pass
5.1.5	15.247(d)	Conducted Spurious Emissions and Band Edges	Pass
5.1.6	15.247(d) & 15.205 & 15.209	Radiated Spurious Emissions and Band Edges	Pass
5.2.1	15.207	Mains Conducted Emission	Pass

**Note:** Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

## Contents

<b>HISTORY OF THIS TEST REPORT .....</b>	<b>5</b>
<b>1. GENERAL REMARKS .....</b>	<b>6</b>
<b>1.1 COMPLEMENTARY MATERIALS.....</b>	<b>6</b>
<b>1.2 DECISION RULE OF CONFORMITY .....</b>	<b>6</b>
<b>2. TEST SITES .....</b>	<b>7</b>
<b>2.1 TEST LABORATORY .....</b>	<b>7</b>
<b>2.2 TEST FACILITY.....</b>	<b>7</b>
<b>2.3 TRACEABILITY .....</b>	<b>8</b>
<b>2.4 CALIBRATION .....</b>	<b>8</b>
<b>2.5 MEASUREMENT UNCERTAINTY .....</b>	<b>8</b>
<b>3. GENERAL PRODUCT INFORMATION.....</b>	<b>9</b>
<b>3.1 PRODUCT FUNCTION AND INTENDED USE .....</b>	<b>9</b>
<b>3.2 SYSTEM DETAILS AND RATINGS.....</b>	<b>9</b>
<b>3.3 NOISE GENERATING AND NOISE SUPPRESSING PARTS .....</b>	<b>11</b>
<b>3.4 SUBMITTED DOCUMENTS.....</b>	<b>11</b>
<b>4. TEST SET-UP AND OPERATION MODES.....</b>	<b>12</b>
<b>4.1 PRINCIPLE OF CONFIGURATION SELECTION .....</b>	<b>12</b>
<b>4.2 CARRIER FREQUENCY AND CHANNEL.....</b>	<b>13</b>
<b>4.3 TEST OPERATION AND TEST SOFTWARE.....</b>	<b>14</b>
<b>4.4 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT .....</b>	<b>17</b>
<b>4.5 TEST SETUP DIAGRAM .....</b>	<b>18</b>
<b>4.6 DUTY CYCLE OF TEST SIGNAL .....</b>	<b>20</b>
<b>5. TEST RESULTS .....</b>	<b>21</b>
<b>5.1 TRANSMITTER REQUIREMENT &amp; TEST SUITES.....</b>	<b>21</b>
5.1.1 <i>Antenna Requirement .....</i>	<i>21</i>
5.1.2 <i>Average Output Power.....</i>	<i>22</i>
5.1.3 <i>6 dB Bandwidth and 99% Occupied Bandwidth.....</i>	<i>28</i>
5.1.4 <i>Power Spectral Density.....</i>	<i>29</i>
5.1.5 <i>Conducted Spurious Emissions and Frequency Band Edges Measured in 100 kHz Bandwidth.....</i>	<i>30</i>
5.1.6 <i>Radiated Spurious Emissions and Band Edges .....</i>	<i>31</i>
<b>5.2 MAINS EMISSION .....</b>	<b>36</b>
5.2.1 <i>Mains Conducted Emission.....</i>	<i>36</i>

**Prüfbericht - Nr.: CN21BZ5K(P15C-WiFi) 001**  
Test Report No.

Seite 4 von 37  
Page 4 of 37

**APPENDIX A - TEST RESULT OF CONDUCTED**

**APPENDIX B - TEST RESULT OF RADIATED EMISSIONS & MAINS CONDUCTED EMISSION**

**APPENDIX SP - PHOTOGRAPHS OF TEST SETUP**

**APPENDIX EP - PHOTOGRAPHS OF EUT**

## HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
CN21BZ5K(P15C-WiFi) 001	Original Release	2021-12-22

## 1. General Remarks

### 1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

**Appendix A - Test Result of Conducted**

**Appendix B - Test Result of Radiated Emissions & Mains Conducted Emission**

**Appendix SP - Photographs of Test Setup**

**Appendix EP - Photographs of EUT**

### Applied Standard and Test Levels

Radio
FCC 47CFR Part 15: Subpart C Section 15.247
FCC 47CFR Part 2: Subpart J Section 2.1049
ANSI C63.10:2013
KDB 558074 D01 15.247 Meas Guidance v05r02
KDB 662911 D01 Multiple Transmitter Output v02r01

### 1.2 Decision Rule of Conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

## 2. Test Sites

### 2.1 Test Laboratory

Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.  
Taipei City 105  
Taiwan (R.O.C.)

### 2.2 Test Facility

Taipei Testing Laboratories

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,  
New Taipei City 244  
Taiwan (R.O.C.)  
FCC Registration No.: 226631  
ISED Registration No.: 25563

## 2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

## 2.4 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

## 2.5 Measurement Uncertainty

All measurement uncertainty values are shown with a coverage factor of  $k=2$  to indicate a 95% level of confidence.

### Emission Measurement Uncertainty

Parameter	Uncertainty
Radiated Emission (9 kHz ~ 30 MHz)	$\pm 1.15$ dB
Radiated Emission (30 MHz ~ 200 MHz)	$\pm 1.30$ dB
Radiated Emission (200 MHz ~ 1 GHz)	$\pm 1.30$ dB
Radiated Emission (1 GHz ~ 18 GHz)	$\pm 1.54$ dB
Radiated Emission (18 GHz ~ 40 GHz)	$\pm 2.52$ dB
Mains Conducted Emission	$\pm 1.65$ dB



### 3. General Product Information

#### 3.1 Product Function and Intended Use

The EUT is a Wireless Access Point. It contains a WLAN compatible module enabling the user to communicate data through a Wireless interface.

For details refer to the User Guide, Data Sheet and Circuit Diagram.

#### 3.2 System Details and Ratings

##### Basic Information of EUT

Item	EUT information
Kind of Equipment/Test Item	Wireless Access Point
Type Identification	AP432
FCC ID	Q6G-AP432

**Technical Specification of EUT**

Item	EUT information	
Operating Frequency	2412 MHz ~ 2462 MHz	
Channel Spacing	5 MHz	
Channel Number	802.11b/g/n HT20/ac VHT20 /ax HE20: 11 802.11n HT40/ac VHT40/ax HE40: 7	
Data Rate	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n HT20/40/ac VHT20/40 ax HE20/40: up to MCS11	
Operation Voltage	Adapter: Input: 100~240Vac; Output: 12 Vdc POE: Input: 100~240Vac; Output: 54 Vdc	
Modulation	802.11b: DSSS-DBPSK, DQPSK, CCK 802.11g, 802.11n HT20, 802.11n HT40: OFDM-BPSK, QPSK, 16QAM, 64QAM 802.11ac VHT20, 802.11ac VHT40: OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM 802.11ax HE20, 802.11ax HE40: OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM	
Maximum Output Power (mW)	CDD Mode	802.11b: 250.17
		802.11g: 346.81
		802.11n HT20: 309.45
		802.11n HT40: 114.32
		802.11ac VHT20: 312.19
		802.11ac VHT40: 113.73
	Beamforming Mode	802.11ax HE20: 319.6
		802.11ax HE40: 117.55
		802.11n HT20: 77.37
		802.11n HT40: 28.58
		802.11ac VHT20: 78.06
		802.11ac VHT40: 28.44
		802.11ax HE20: 79.91
		802.11ax HE40: 29.39
Antenna Information	Refer to 5.1.1	
Accessory Device	Refer to 4.4	

### **3.3 Noise Generating and Noise Suppressing Parts**

Refer to the Circuit Diagram.

### **3.4 Submitted Documents**

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

## 4. Test Set-up and Operation Modes

### 4.1 Principle of Configuration Selection

The test modes were adapted accordingly in reference to the instructions for use.

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

#### Table for Parameters of Test Software Setting

802.11b		802.11g		802.11n HT20		802.11n HT40	
Channel	Power Setting	Channel	Power Setting	Channel	Power Setting	Channel	Power Setting
1	18	1	15	1	15	3	14
6	18	2	16.5	2	17.5	6	14.5
11	18	3	18.5	3	18.5	9	13.5
		6	20	6	19.5		
		9	18	9	18		
		10	16.5	10	16		
		11	15	11	14		
802.11ac VHT20		802.11ac VHT40		802.11ax HE20		802.11ax HE40	
Channel	Power Setting	Channel	Power Setting	Channel	Power Setting	Channel	Power Setting
1	15	3	14	1	15	3	14
2	17.5	6	14.5	2	17.5	6	14.5
3	18.5	9	13.5	3	18.5	9	13.5
6	19.5			6	19.5		
9	18			9	18		
10	16			10	16		
11	14			11	14		

## 4.2 Carrier Frequency and Channel

802.11b, 802.11g, 802.11n HT20, 802.11ac VHT20, 802.11ax HE20:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

802.11n HT40, 802.11ac VHT40, 802.11ax HE40:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	7	2442
4	2427	8	2447
5	2432	9	2452
6	2437		

### 4.3 Test Operation and Test Software

Setup for testing: Test samples are provided with a USB interface which makes it possible to control them through a test software installed on a notebook computer.

This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed as below.

Test Software	QSPR
---------------	------

The samples were used as follows:

A003162916-019, 005 for radiated test

A003162916-001 for conducted test

Full test was applied on all test modes, but only worst case was shown.

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

Modulation Mode	Tx Function
802.11b	4TX (MIMO)
802.11g	4TX (MIMO)
802.11n HT20	4TX (MIMO)
802.11n HT40	4TX (MIMO)
802.11ac VHT20	4TX (MIMO)
802.11ac VHT40	4TX (MIMO)
802.11ax HE20	4TX (MIMO)
802.11ax HE40	4TX (MIMO)

\* The modulation and bandwidth are similar for 802.11n mode HT20/HT40 and 802.11ac/ax mode VHT20/VHT40/HE20/HE40, therefore investigated worse case as representative mode in test report.

\*\* For Beamforming (BFM) mode, only the output power is evaluated and presented in this report.

EUT Configure Mode	Applicable To				Description
	Antenna Port Conducted Measurement	Radiated Spurious Emissions above 1 GHz	Radiated Spurious Emissions below 1 GHz	Mains Conducted Emission	
-	√	√	√	√	-

Note:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when position on Y-plane.
2. "-" means no effect.
3. POE Mode has been verified the worst case of Radiated Spurious Emissions and Mains Conducted Emission tests.

**Antenna Port Conducted Measurement**

- Pre-Scan full test was applied on all test modes, but only worst case was shown.  
 Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Date Rate (Mbps)
CDD	802.11b	1 to 11	1, 6, 11	1.0
	802.11g	1 to 11	1, 6, 11	6.0
	802.11n HT20	1 to 11	1, 2, 3, 6, 9, 10, 11	MCS0
	802.11n HT40	3 to 9	3, 6, 9	MCS0
	802.11ac VHT20	1 to 11	1, 2, 3, 6, 9, 10, 11	NSS1 MCS0
	802.11ac VHT40	3 to 9	3, 6, 9	NSS1 MCS0
	802.11ax HE20	1 to 11	1, 2, 3, 6, 9, 10, 11	NSS1 MCS0
	802.11ax HE40	3 to 9	3, 6, 9	NSS1 MCS0
BFM	802.11n HT20	1 to 11	1, 2, 3, 6, 9, 10, 11	MCS0
	802.11n HT40	3 to 9	3, 6, 9	MCS0
	802.11ac VHT20	1 to 11	1, 2, 3, 6, 9, 10, 11	NSS1 MCS0
	802.11ac VHT40	3 to 9	3, 6, 9	NSS1 MCS0
	802.11ax HE20	1 to 11	1, 2, 3, 6, 9, 10, 11	NSS1 MCS0
	802.11ax HE40	3 to 9	3, 6, 9	NSS1 MCS0

**Radiated Spurious Emissions (Above 1 GHz)**

- Pre-Scan full test was applied on all test modes, but only worst case was shown.  
 Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Date Rate (Mbps)
Adapter	802.11b	1 to 11	1, 6, 11	1.0
	802.11g	1 to 11	1, 6, 11	6.0
	802.11n HT20	1 to 11	1, 11	MCS0
	802.11n HT40	3 to 9	3, 9	MCS0
	802.11ac VHT20	1 to 11	1, 11	NSS1 MCS0
	802.11ac VHT40	3 to 9	3, 9	NSS1 MCS0
	802.11ax HE20	1 to 11	1, 6, 11	NSS1 MCS0
	802.11ax HE40	3 to 9	3, 6, 9	NSS1 MCS0
POE	802.11b	1 to 11	6	1.0

**Radiated Spurious Emissions (Below 1 GHz)**

- Pre-Scan full test was applied on all test modes, but only worst case was shown.  
 Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Date Rate (Mbps)
Adapter	802.11b	1 to 11	6	1.0
POE	802.11b	1 to 11	6	1.0

**Mains Conducted Emission**

- Pre-Scan full test was applied on all test modes, but only worst case was shown.  
 Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Date Rate (Mbps)
Adapter	802.11b	1 to 11	6	1.0
POE	802.11b	1 to 11	6	1.0

**Prüfbericht - Nr.: CN21BZ5K(P15C-WiFi) 001**  
Test Report No.**Seite 16 von 37**  
Page 16 of 37**Test Condition**

Test Item	Ambient Temperature	Relative Humidity	Tested by
Conducted Measurement	21.8-22.5 °C	66-72 %	Nick Hsu
Radiated Spurious Emissions above 1 GHz	22.6-24.3 °C	50-60 %	Hunter Wang
Radiated Spurious Emissions below 1 GHz	22.6-24.3 °C	50-60 %	Hunter Wang
Mains Conducted Emission	22.1-23.6 °C	51-58 %	Hunter Wang



## 4.4 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

### Accessory of EUT

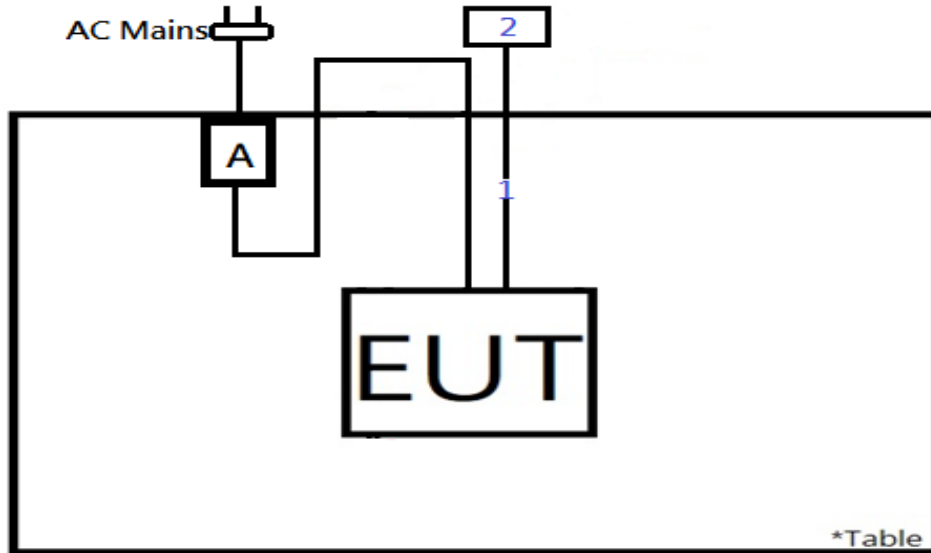
None.

### Support Unit

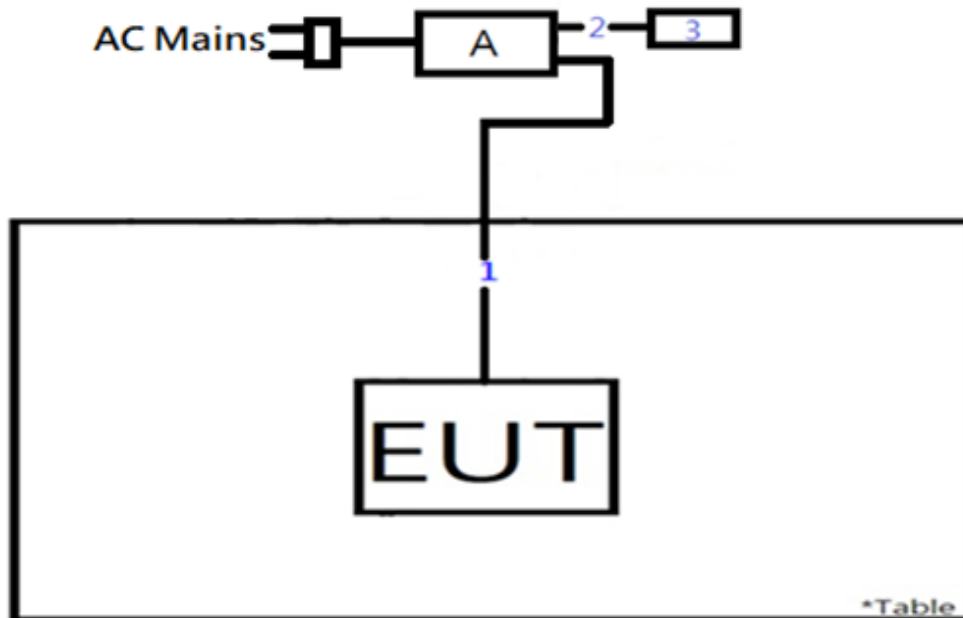
No.	Description	Brand	Model	S/N	Remark
Radiated Test for Adapter Mode					
A	Adapter	Asian Power Devices Inc.	WA-30J12R	-	148 cm non-shielded cable w/o core
1	LAN Cable	TUV-JP	TUV-JP-001	-	300 cm non-shielded cable w/o core
2	Notebook	HP	15s-du0007TX	CND93662VF	-
Radiated Test for Poe Mode					
A	PoE ADAPTER	QNO	QPE1011G-30W	-	55 cm non-shielded cable w/o core
1	LAN Cable	TUV-JP	TUV-JP-001	-	1000 cm non-shielded cable w/o core
2	LAN Cable	TUV-JP	TUV-JP-001	-	300 cm non-shielded cable w/o core
3	Notebook	HP	15s-du0007TX	CND93662VF	300 cm non-shielded cable w/o core
Mains Conducted Test for Adapter Mode					
A	Adapter	Asian Power Devices Inc.	WA-30J12R	-	148 cm non-shielded cable w/o core
1	LAN Cable	TUV-JP	TUV-JP-001	-	180 m shielded cable with core
2	Notebook	HP	15s-du0007TX	CND93662VF	-
Mains Conducted Test for Poe Mode					
A	PoE ADAPTER	EPA	EPA5006GAT	-	55 cm non-shielded cable w/o core
1	LAN Cable	TUV-JP	TUV-JP-001	-	120 cm non-shielded cable w/o core
2	LAN Cable	TUV-JP	TUV-JP-001	-	180 cm non-shielded cable w/o core
3	Notebook	HP	15s-du0007TX	CND93662VF	-

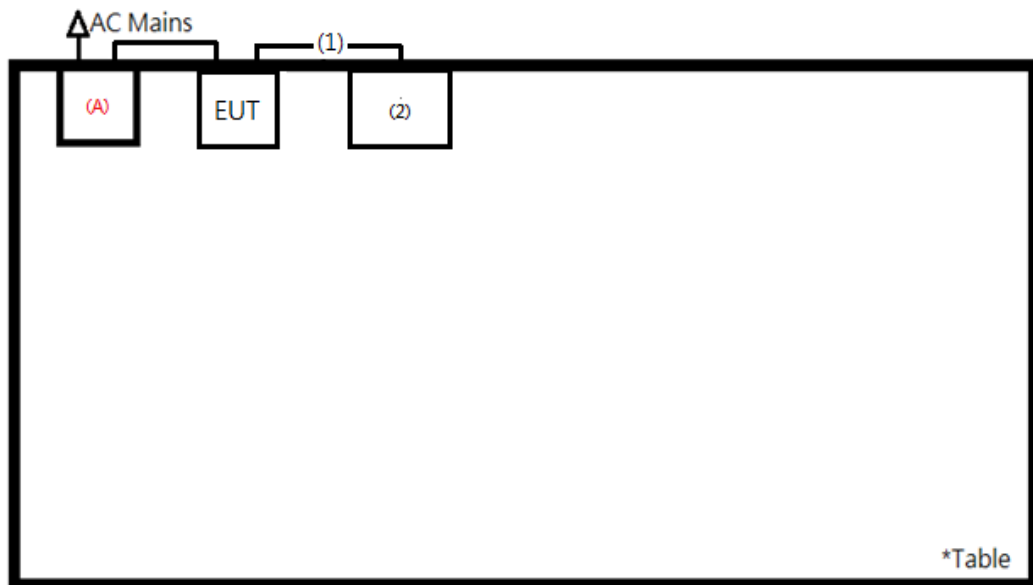
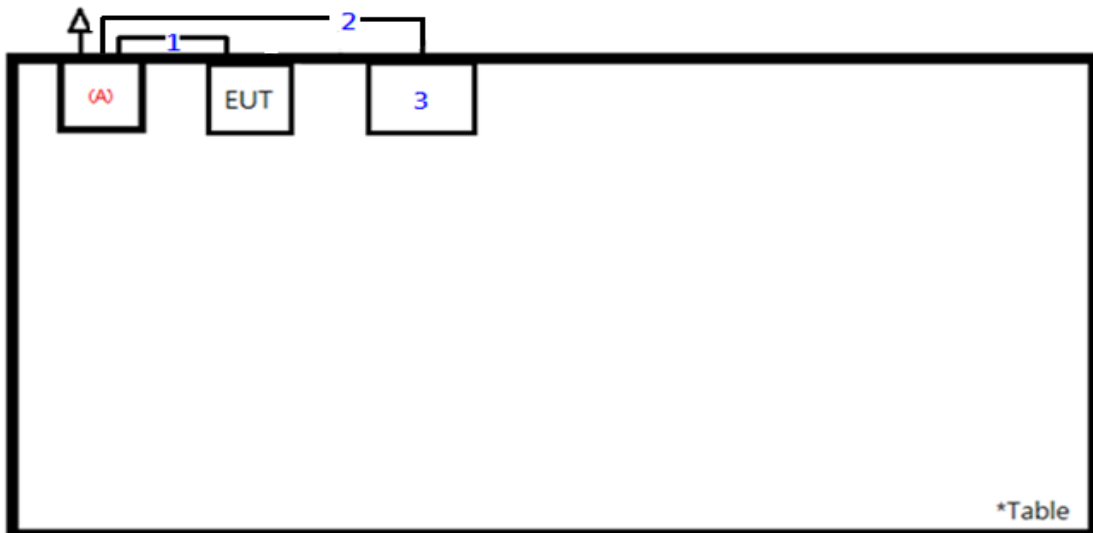
### 4.5 Test Setup Diagram

<Radiated Spurious Emissions, Adapter Mode>



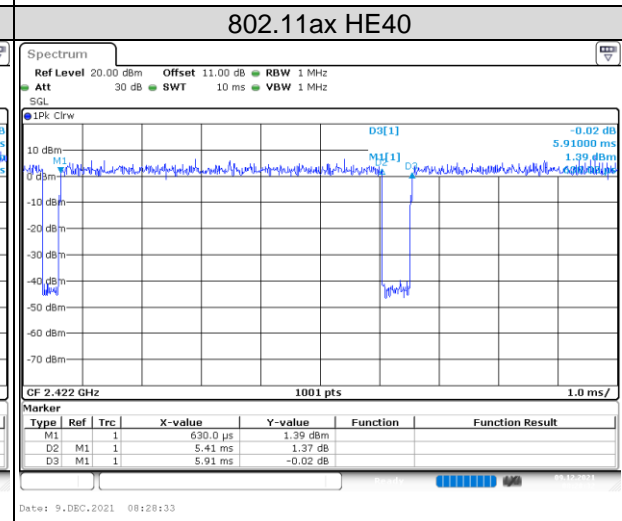
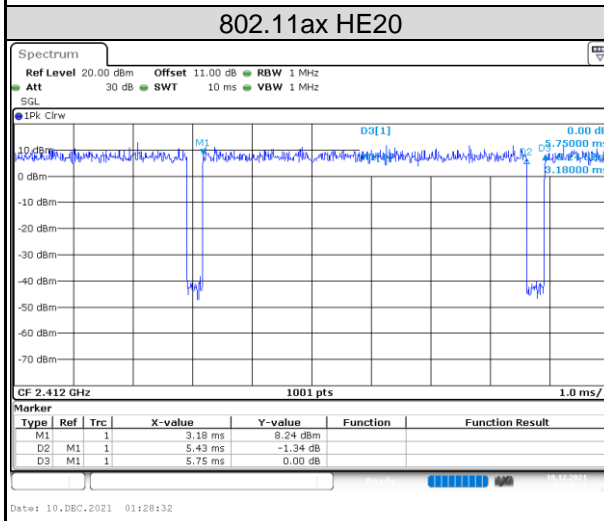
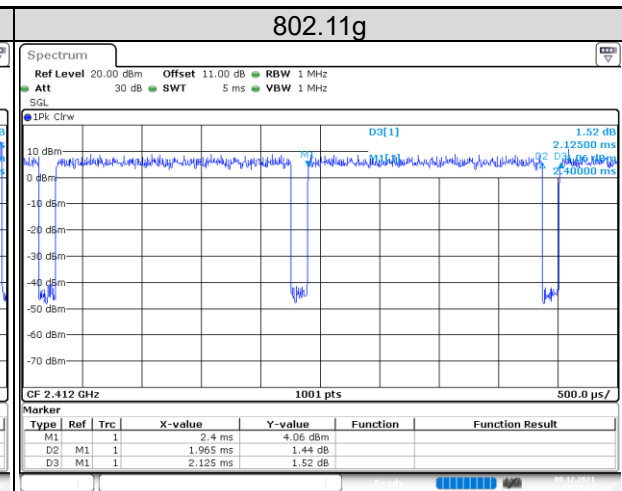
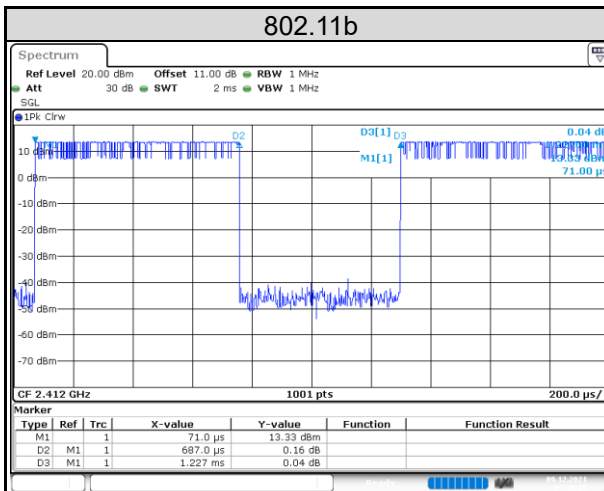
<Radiated Spurious Emissions, POE Mode>



**<Mains Conducted Emission, Adapter Mode>**

**<Mains Conducted Emission, POE Mode>**


## 4.6 Duty Cycle of Test Signal

Mode	On + Off Time (ms)	On Time (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11b	1.23	0.69	55.99	2.52
802.11g	2.13	1.97	92.47	0.34
802.11ax HE20	5.75	5.43	94.43	0.25
802.11ax HE40	5.91	5.41	91.54	0.38



## 5. Test Results

### 5.1 Transmitter Requirement & Test Suites

#### 5.1.1 Antenna Requirement

**Requirement** Use of approved antennas only

According to the manufacturer declaration, the EUT's antenna specifications are described as below. The antenna is used with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

ANT		Gain (dBi)	Antenna Type
1		3.70	PIFA
2		4.08	PIFA
3		4.12	PIFA
4		5.01	PIFA
Max Peak Gain		5.01	-
CDD Mode	Power Directional Gain =	5.01	-
	PSD Directional Gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] =$	10.26	-
Beamforming Mode	Power Directional Gain =	10.26	-
	PSD Directional Gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] =$	10.26	-

Refer to EUT photo for details.

## 5.1.2 Average Output Power

**Limit** 1 watt (30 dBm)

**Kind of Test Site** Shielded room

### Test Setup



### Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Power Meter	Anritsu	ML2495A	1901008	2021/03/24	2022/03/23	2021/11/18	2021/12/17
Power Sensor	Anritsu	MA2411B	1725269	2021/03/24	2022/03/23	2021/11/18	2021/12/17

### Test Procedures

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst.

Duty factor is not added to measured value.

**Test Result**
**Average Power, CDD Mode**
**<802.11b>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
1	2412	18.04	18.13	17.62	17.75	23.91	246.07	30
6	2437	17.96	17.99	17.65	17.76	23.86	243.38	30
11	2462	18.00	18.09	17.75	18.00	23.98	250.17	30

**<802.11g>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
1	2412	14.92	15.19	14.78	14.88	20.97	124.90	30
2	2417	16.37	16.63	16.25	16.14	22.37	172.66	30
3	2422	18.23	18.57	18.23	18.21	24.33	271.22	30
6	2437	19.43	19.43	19.31	19.35	25.40	346.81	30
9	2452	17.87	17.94	17.70	17.80	23.85	242.61	30
10	2457	16.41	16.48	16.23	16.40	22.40	173.84	30
11	2462	14.83	15.04	14.78	15.01	20.94	124.08	30

**<802.11n HT20>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
1	2412	14.88	14.92	14.64	14.62	20.79	119.89	30
2	2417	16.98	17.15	16.75	16.67	22.91	195.54	30
3	2422	18.14	18.24	18.02	17.92	24.10	257.17	30
6	2437	19.11	18.94	18.73	18.75	24.91	309.45	30
9	2452	17.88	17.81	17.43	17.59	23.70	234.52	30
10	2457	15.93	16.12	15.77	15.88	21.95	156.58	30
11	2462	14.03	13.97	13.64	13.84	19.89	97.57	30

**<802.11n HT40>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
3	2422	14.17	14.26	13.95	14.17	20.16	103.74	30
6	2437	14.58	14.65	14.43	14.58	20.58	114.32	30
9	2452	13.69	13.40	13.48	13.78	19.61	91.43	30

**<802.11ac VHT20>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
1	2412	14.92	14.96	14.69	14.59	20.81	120.60	30
2	2417	17.00	17.08	16.80	16.71	22.92	195.91	30
3	2422	18.11	18.22	18.05	17.98	24.11	257.72	30
6	2437	19.03	18.99	18.89	18.78	24.94	312.19	30
9	2452	17.93	17.67	17.55	17.62	23.72	235.26	30
10	2457	15.88	16.02	15.79	16.02	21.95	156.65	30
11	2462	13.97	14.06	13.72	13.93	19.94	98.68	30

**<802.11ac VHT40>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
3	2422	14.17	14.32	13.95	14.12	20.16	103.82	30
6	2437	14.61	14.72	14.26	14.55	20.56	113.73	30
9	2452	13.64	13.59	13.52	13.84	19.67	92.68	30



**<802.11ax HE20>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
1	2412	14.96	15.15	14.74	15.00	20.99	125.47	30
2	2417	17.05	17.25	16.98	17.01	23.09	203.91	30
3	2422	18.27	18.44	18.17	18.26	24.31	269.57	30
6	2437	19.08	19.10	18.95	18.97	25.05	319.60	30
9	2452	17.81	17.97	17.63	17.80	23.82	241.26	30
10	2457	15.95	16.15	15.74	16.03	21.99	158.15	30
11	2462	13.96	14.20	13.81	14.04	20.03	100.59	30

**<802.11ax HE40>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
3	2422	14.21	14.25	14.16	14.28	20.25	105.82	30
6	2437	14.75	14.77	14.48	14.72	20.70	117.55	30
9	2452	13.82	13.73	13.66	13.90	19.80	95.48	30

**Average Power, Beamforming Mode**
**<802.11n HT20>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
1	2412	8.86	8.90	8.62	8.60	14.77	29.98	25.74
2	2417	10.96	11.13	10.73	10.65	16.89	48.89	25.74
3	2422	12.12	12.22	12.00	11.90	18.08	64.30	25.74
6	2437	13.09	12.92	12.71	12.73	18.89	77.37	25.74
9	2452	11.86	11.79	11.41	11.57	17.68	58.64	25.74
10	2457	9.91	10.10	9.75	9.86	15.93	39.15	25.74
11	2462	8.01	7.95	7.62	7.82	13.87	24.40	25.74

**<802.11n HT40>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
3	2422	8.15	8.24	7.93	8.15	14.14	25.94	25.74
6	2437	8.56	8.63	8.41	8.56	14.56	28.58	25.74
9	2452	7.67	7.38	7.46	7.76	13.59	22.86	25.74

**<802.11ac VHT20>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
1	2412	8.90	8.94	8.67	8.57	14.79	30.15	25.74
2	2417	10.98	11.06	10.78	10.69	16.90	48.99	25.74
3	2422	12.09	12.20	12.03	11.96	18.09	64.44	25.74
6	2437	13.01	12.97	12.87	12.76	18.92	78.06	25.74
9	2452	11.91	11.65	11.53	11.60	17.70	58.82	25.74
10	2457	9.86	10.00	9.77	10.00	15.93	39.17	25.74
11	2462	7.95	8.04	7.70	7.91	13.92	24.67	25.74

**<802.11ac VHT40>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
3	2422	8.15	8.30	7.93	8.10	14.14	25.96	25.74
6	2437	8.59	8.70	8.24	8.53	14.54	28.44	25.74
9	2452	7.62	7.57	7.50	7.82	13.65	23.17	25.74

**<802.11ax HE20>**

Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
1	2412	8.94	9.13	8.72	8.98	14.97	31.37	25.74
2	2417	11.03	11.23	10.96	10.99	17.07	50.98	25.74
3	2422	12.25	12.42	12.15	12.24	18.29	67.40	25.74
6	2437	13.06	13.08	12.93	12.95	19.03	79.91	25.74
9	2452	11.79	11.95	11.61	11.78	17.80	60.32	25.74
10	2457	9.93	10.13	9.72	10.01	15.97	39.54	25.74
11	2462	7.94	8.18	7.79	8.02	14.01	25.15	25.74

**<802.11ax HE40>**

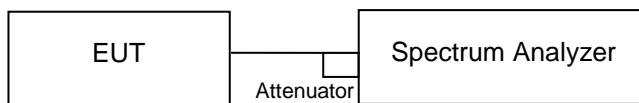
Channel	Channel Frequency (MHz)	Average Power (dBm)				Total Power		Limit (dBm)
		Ant 1	Ant 2	Ant 3	Ant 4	(dBm)	(mW)	
3	2422	8.19	8.23	8.14	8.26	14.23	26.46	25.74
6	2437	8.73	8.75	8.46	8.70	14.68	29.39	25.74
9	2452	7.80	7.71	7.64	7.88	13.78	23.87	25.74

### 5.1.3 6 dB Bandwidth and 99% Occupied Bandwidth

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

**Kind of Test Site** Shielded room

#### Test Setup



#### Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV40	101512	2021/01/29	2022/01/28	2021/12/09	2021/12/17

#### Test Procedure

- a. Set resolution bandwidth (RBW) = 100 kHz
- b. Set the video bandwidth (VBW)  $\geq 3 \times$  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.
- f. For 99% occupied bandwidth measurement, 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 PEAK. 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.

#### Test Results

Please refer to Appendix A.

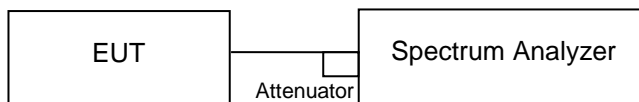
## 5.1.4 Power Spectral Density

### Limit

The power spectral density shall not be greater than 8 dBm in any 3 kHz band.

**Kind of Test Site**                      Shielded room

### Test Setup



### Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV40	101512	2021/01/29	2022/01/28	2021/12/16	2021/12/16

### Test Procedure

- a. Set instrument center frequency to DTS channel center frequency.
- b. Set span to at least 1.5 times the OBW.
- c. Set RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d. Set VBW  $\geq [3 \times \text{RBW}]$ .
- e. Detector = power averaging (rms) or sample detector (when rms not available).
- f. Ensure that the number of measurement points in the sweep  $\geq [2 \times \text{span} / \text{RBW}]$ .
- g. Sweep time = auto couple
- h. Do not use sweep triggering; allow sweep to "free run."
- i. Employ trace averaging (rms) mode over a minimum of 100 traces.
- j. Use the peak marker function to determine the maximum amplitude level.
- k. Add  $[10 \log (1 / D)]$ , where  $D$  is the duty cycle measured in step a), to the measured PSD to compute the average PSD during the actual transmission time. If measured value exceeds requirement specified by regulatory agency, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

### Test Results

Please refer to Appendix A

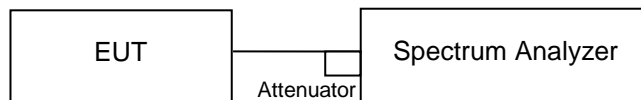
## 5.1.5 Conducted Spurious Emissions and Frequency Band Edges Measured in 100 kHz Bandwidth

### Limit

30 dB (below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.)

**Kind of Test Site**                      Shielded room

### Test Setup



### Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV40	101512	2021/01/29	2022/01/28	2021/12/09	2021/12/17

### Test Procedure

Measurement procedure REF

1. Set the RBW = 100 kHz.
2. Set the VBW  $\geq$  300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

Measurement procedure OOBE

1. Set RBW = 100 kHz.
2. Set VBW  $\geq$  300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

### Test Results

Please refer to Appendix A.

## 5.1.6 Radiated Spurious Emissions and Band Edges

### Limit

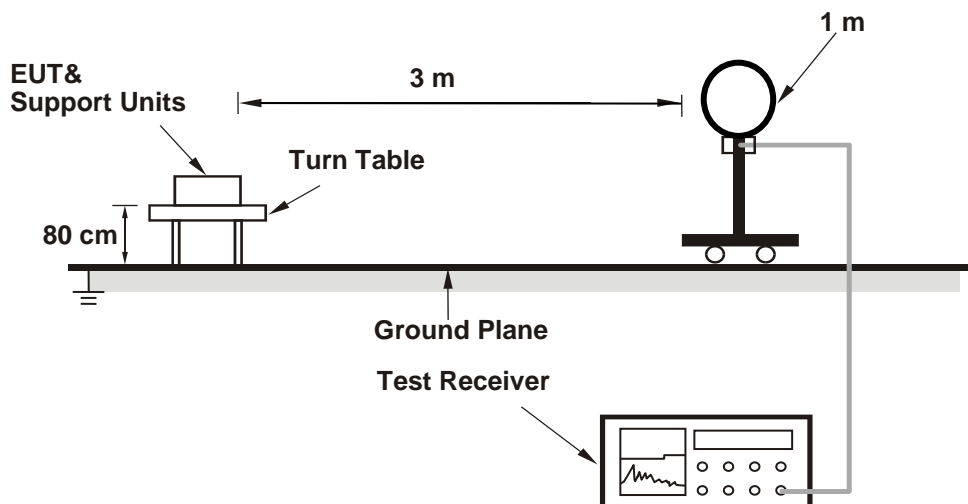
Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a).

Emissions radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in §15.247(d).

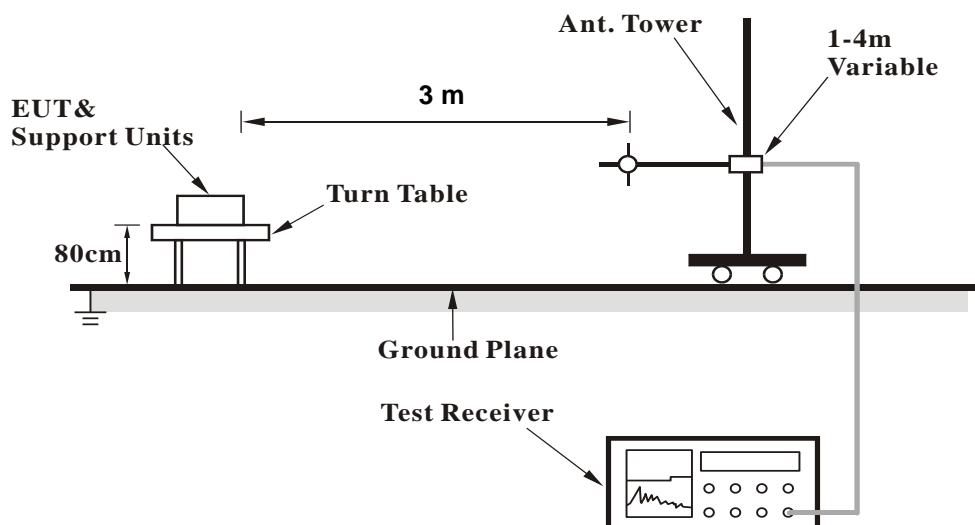
**Kind of Test Site**                      3m Semi-Anechoic Chamber

### Test Setup

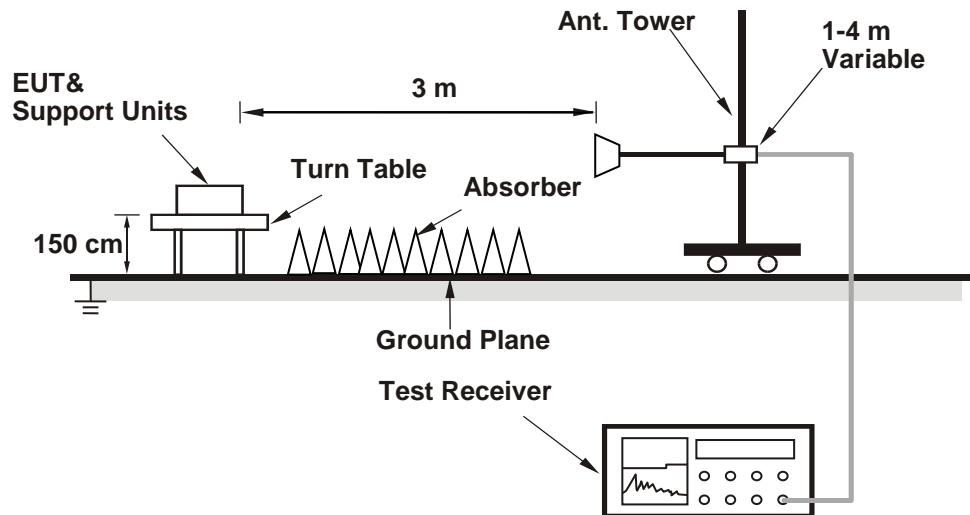
**<Radiated Emissions below 30 MHz>**



**<Radiated Emissions 30 MHz to 1 GHz>**



## &lt;Radiated Emissions above 1 GHz&gt;



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



**Test Instruments**

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Receiver	R&S	ESR7	102109	2021/03/16	2022/03/15
Signal Analyzer	R&S	FSV40	101508	2021/03/16	2022/03/15
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2021/02/18	2022/02/17
Horn Antenna	ETS-Lindgren	3117	00218929	2021/11/25	2022/11/24
Horn Antenna	SCHWARZBECK	BBHA 9170	00887	2021/04/08	2022/04/07
LF-AMP	Agilent	8447D	2944A10772	2021/02/18	2022/02/17
HF-AMP + AC source	EMCI	EMC051845SE	980633	2021/02/09	2022/02/08
HF-AMP + AC source	EMCI	EMC184045SE	980657	2021/02/01	2022/01/31
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104EA	800056/4EA	2021/03/17	2022/03/16
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104	804680/4	2021/03/17	2022/03/16
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104	MY37202/4	2021/03/17	2022/03/16
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	800898/2EA	2021/04/16	2022/04/15
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	800901/2EA	2021/04/16	2022/04/15
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	801027/2EA	2021/04/16	2022/04/15
Loop Antenna	SCHWARZBECK	FMZB1519B	00215	2021/12/08	2022/12/07

**Test Procedures****For Radiated Emissions below 30 MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel (OPEN), perpendicular (CLOSE), and ground-parallel (GROUND) orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

## Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

**For Radiated Emissions above 30 MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

## Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98 %) or 10 Hz (Duty cycle  $\geq 98$  %) for Average detection (AV) at frequency above 1 GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The Radiated Emissions testing was performed in the X(E1), Y(H) and Z(E2) axis orientation. The worst-case Axis orientation is recorded in this test report.

**Prüfbericht - Nr.: CN21BZ5K(P15C-WiFi) 001**  
*Test Report No.*

**Seite 35 von 37**  
*Page 35 of 37*

**Test Results**

Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)  
Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

Please refer to Appendix B.

## 5.2 Mains Emission

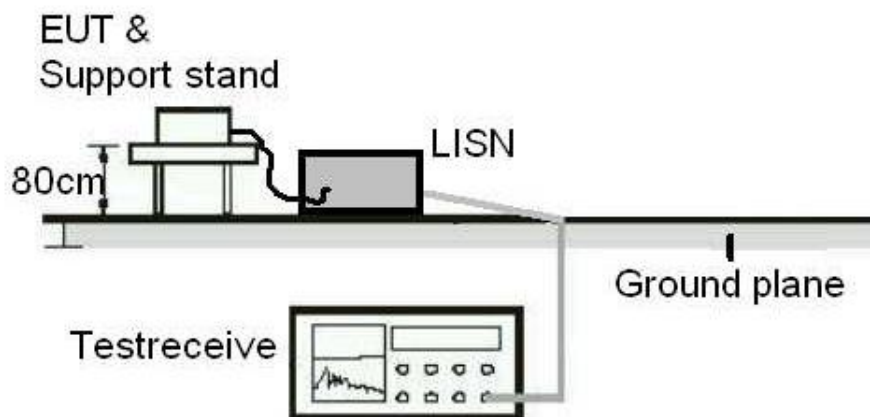
### 5.2.1 Mains Conducted Emission

#### Limit

Mains Conducted Emission as defined in §15.207 must comply with the mains conducted emission limits.

**Kind of Test Site**                      Shielded room

#### Test Setup



#### Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
RF Cable	N/A	N/A	EMC-003	2021/03/16	2022/03/15
Two-Line V-Network	Rohde & Schwarz	ENV216	101938	2021/09/23	2022/09/22
EMI Test Receiver	R&S	ESCI	1816063	2021/11/15	2022/11/14

#### **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/50 uH 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 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

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

#### **Test Results**

Please refer to Appendix B.