



<b>Prüfbericht-Nr.:</b> <i>Test report no.:</i>	CN22VVN0(FCC-Colocation) 001	<b>Auftrags-Nr.:</b> <i>Order no.:</i>	238519748	Seite 1 von 23 Page 1 of 23
<b>Kunden-Referenz-Nr.:</b> <i>Client reference no.:</i>	N/A	<b>Auftragsdatum:</b> <i>Order date:</i>	2021-09-06	
<b>Auftraggeber:</b> <i>Client:</i>	EnGenius Technologies 1580 Scenic Avenue, Costa Mesa, CA 92626			
<b>Prüfgegenstand:</b> <i>Test item:</i>	11ax Cloud Managed AP			
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type no.:</i>	ECW230S			
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	Spot Checking Emissions (FCC)			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.247 FCC 47CFR Part 15: Subpart E Section 15.407			
<b>Wareneingangsdatum:</b> <i>Date of sample receipt:</i>	2021-09-06			
<b>Prüfmuster-Nr.:</b> <i>Test sample no.:</i>	A003123611-011, 012 A003123611-014, 016			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	2022-03-09 - 2022-03-10			
<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>zusammengestellt von:</b> <i>compiled by:</i>	<b>genehmigt von:</b> <i>authorized by:</i>			
<b>Datum:</b> <i>Date:</i> 2022-06-13	 Ethan Shao	<b>Ausstellungsdatum:</b> <i>Issue date:</i> 2022-06-13	 Brenda Chen	
<b>Stellung / Position:</b>	Assistant Project Engineer	<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>		
<p>* Legende: 1 = sehr gut    2 = gut    3 = befriedigend    4 = ausreichend    5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n)    F(ail) = entspricht nicht o.g. Prüfgrundlage(n)    N/A = nicht anwendbar    N/T = nicht getestet</p> <p>* Legend: 1 = very good    2 = good    3 = satisfactory    4 = sufficient    5 = poor P(ass) = passed a.m. test specification(s)    F(ail) = failed a.m. test specification(s)    N/A = not applicable    N/T = not tested</p>				
<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>				

v05

## TEST SUMMARY

Report Section	FCC Clause	Test Item	Result
5.1.1	15.247(d) & 15.407(b) & 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.

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

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

**Appendix EP - Photographs of EUT**

### HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
CN22VVN0(FCC-Colocation) 001	Original Release	2022-06-13

## 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 Radiated Emissions & Mains Conducted Emission**

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

**Appendix EP - Photographs of EUT**

#### Applied Standard and Test Levels

Radio
FCC CFR47 Part 15: Subpart C Section 15.247
FCC CFR47 Part 15: Subpart E Section 15.407
FCC CFR47 Part 2: Subpart J Section 2.1091
ANSI C63.10:2013
KDB 558074 D01 15.247 Meas Guidance v05r02
KDB 996369 D04 Module Integration Guide v01

### 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 11ax Cloud Managed AP. It contains 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	11ax Cloud Managed AP
Type Identification	ECW230S
FCC ID	A8J-ECW230S

##### Technical Specification of EUT

Item	EUT Information
Operating Frequency	BLE: 2402 MHz ~ 2480 MHz WLAN 2.4G: 2412 MHz ~ 2462 MHz WLAN 5G: Band 1: 5180 MHz ~ 5240 MHz Band 2: 5260 MHz ~ 5320 MHz Band 3: 5500 MHz ~ 5700 MHz Band 4: 5745 MHz ~ 5825 MHz
Modulation	BLE: GFSK 802.11b: DSSS-DBPSK, DQPSK, CCK 802.11g, 802.11a, 802.11n HT20, 802.11n HT40: OFDM-BPSK, QPSK, 16QAM, 64QAM 802.11ac VHT20, 802.11ac VHT40, 802.11ac VHT80: OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM 802.11ax HE20, 802.11ax HE40, 802.11ax HE80 OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM
Operation Voltage	Adapter: Input: 100~240Vac; Output: 12 Vdc POE: Input: 100~240Vac; Output: 44~57 Vdc
Antenna Information	Refer to note as below

Note:

ANT	Antenna Type	Gain (dBi)				
		Traffic Mode				
		2412~ 2472 MHz	5180~ 5240 MHz	5260~ 5320 MHz	5500~ 5700 MHz	5745~ 5825 MHz
1	PIFA	3.70	5.13	5.13	5.19	5.19
2	PIFA	4.08	4.26	4.26	4.26	3.81
3	PIFA	4.12	4.03	4.03	4.56	4.56
4	PIFA	5.01	5.04	5.04	5.04	5.04
Max Peak Gain (dBi)		5.01	5.01	5.13	5.13	5.19
CDD Mode	Power Directional Gain =	5.01	5.13	5.13	5.19	5.19
	PSD Directional Gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] =$	10.26	10.65	10.65	10.79	10.69
Beamforming Mode	Power Directional Gain =	10.26	10.65	10.65	10.79	10.69
	PSD Directional Gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] =$	10.26	10.65	10.65	10.79	10.69
Antenna Type		Scanning Mode				
PIFA		4.33	6.17	6.17	5.72	6.17
Antenna Type		BLE Mode				
		2402~2480 MHz				
Dipole		5.9				

### **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.

## 4.2 Test Operation and Test Software

Setup for testing: The test sample itself is equipped with a touch screen. It was used to enable the operation modes listed as below.

The samples were used as follows:

A003123611-011, 012 for radiated test

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

EUT Configure Mode	Applicable To		Description
	Radiated Spurious Emissions	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.

### Radiated Spurious Emissions and 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
802.11ax HE20 2437(Traffic)+ 802.11a 5825 (Traffic)+ 802.11ac 2462(Scan)+BLE 2M 2402
802.11ax HE20 2437(Traffic)+ 802.11a 5825 (Traffic)+ 802.11ac HE40 5230(Scan)+BLE 2M 2402

### Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Radiated Spurious Emissions	23.1-25.1 °C	50-60 %	Hunter Wang
Mains Conducted Emission	24.6-25.8 °C	52-54 %	Hunter Wang

### 4.3 Special Accessories and Auxiliary Equipment

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

#### Accessory of EUT

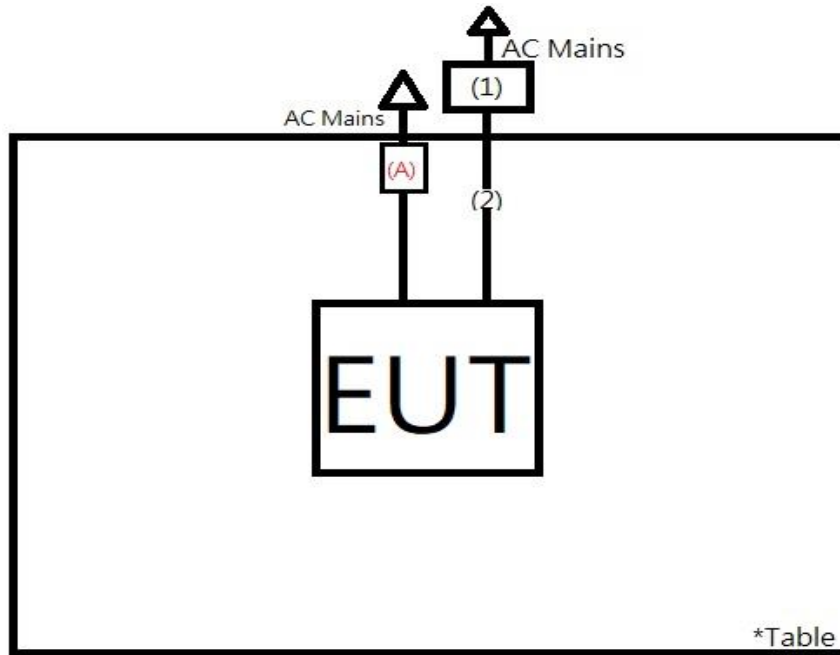
None

#### Support Unit

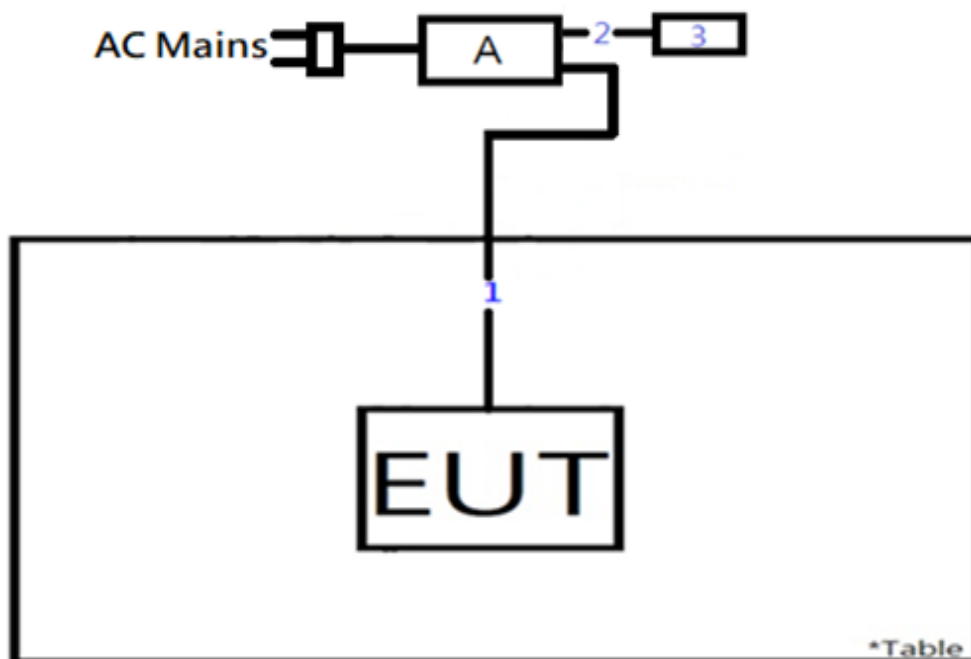
No.	Description	Brand	Model	S/N	Remark
Radiated Test for Adapter Mode					
A	Adapter	Powertron Electronics Corp	PA1024-120HEB200	--	150 cm non-shielded cable with core
1	Notebook	HP	15s-du0007TX	CND93662VF	--
2	LAN Cable	TUV	TUV-010	--	300 cm non-shielded cable w/o core
Radiated Test for POE Mode					
A	PoE Adapter	SENAO	EPA5006GPR	--	173 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	--
Mains Conducted Test for Adapter Mode					
A	Adapter	Powertron Electronics Corp	PA1024-120HEB200	--	150 cm non-shielded cable with core
1	LAN Cable	TUV-JP	TUV-JP-001	--	95 m non-shielded cable w/o core
2	Notebook	HP	15s-du0007TX	CND93662VF	-
Mains Conducted Test for Poe Mode					
A	PoE Adapter	EPA	EPA5006GAT	--	173 cm non-shielded cable w/o core
1	LAN Cable	TUV-JP	TUV-JP-001	--	95 cm non-shielded cable w/o core
2	LAN Cable	TUV-JP	TUV-JP-001	--	120 cm non-shielded cable w/o core
3	Notebook	HP	15s-du0007TX	CND93662VF	--
Conducted Test					
-	Notebook	HP	TPN-C139	CND93662VF	--

### 4.4 Test Setup Diagram

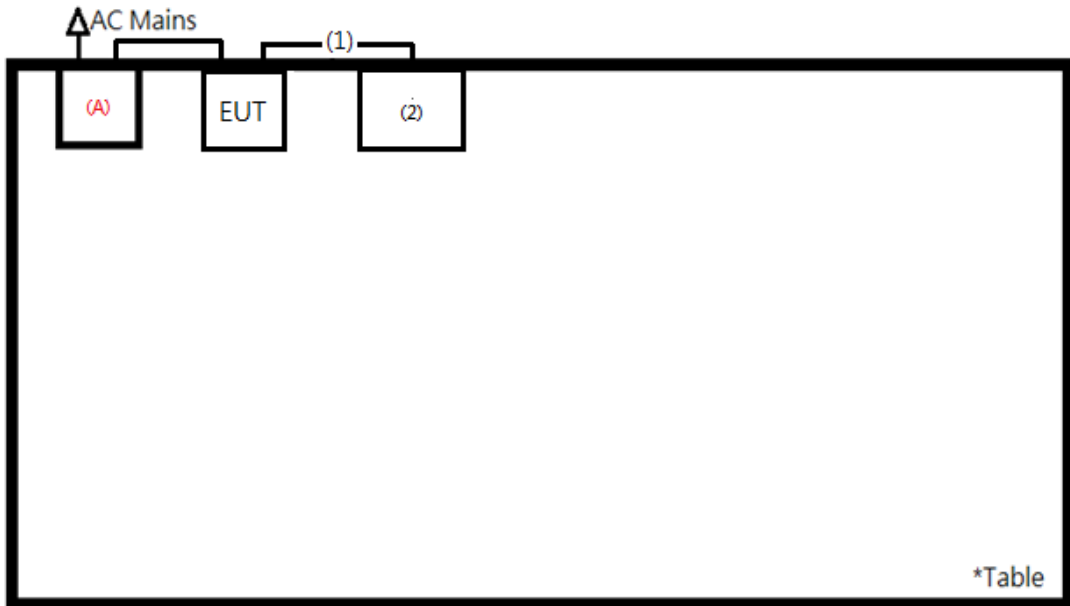
<Radiated Spurious Emissions, Adapter Mode>



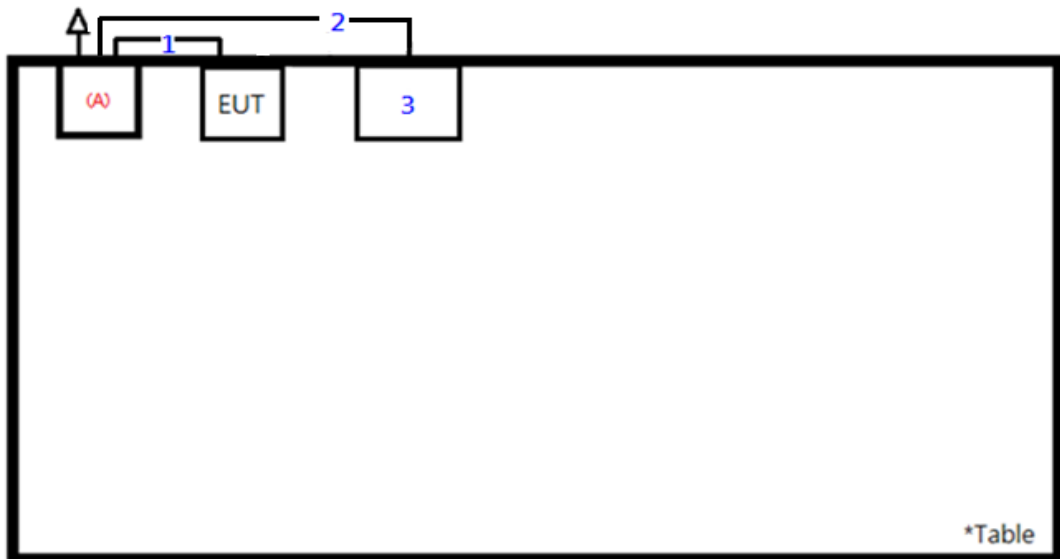
<Radiated Spurious Emissions, POE Mode>



<Mains Conducted Emission, Adapter Mode>



<Mains Conducted Emission, POE Mode>





## 5. Test Results

### 5.1 Transmitter Requirement & Test Suites

#### 5.1.1 Radiated Spurious Emissions

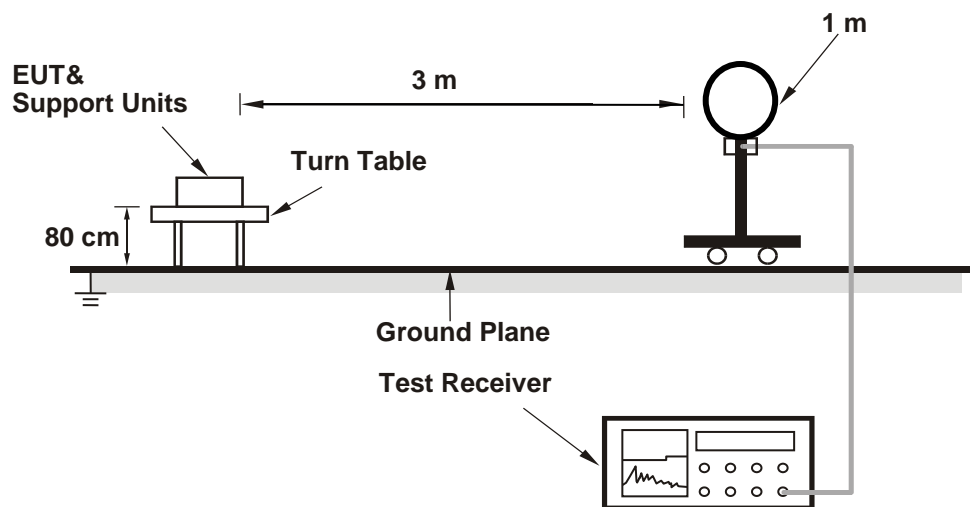
##### Limit

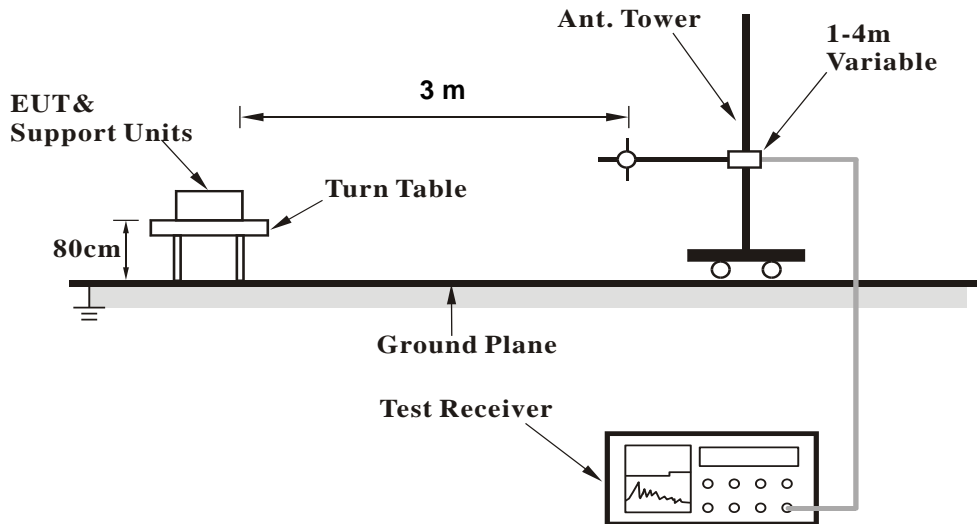
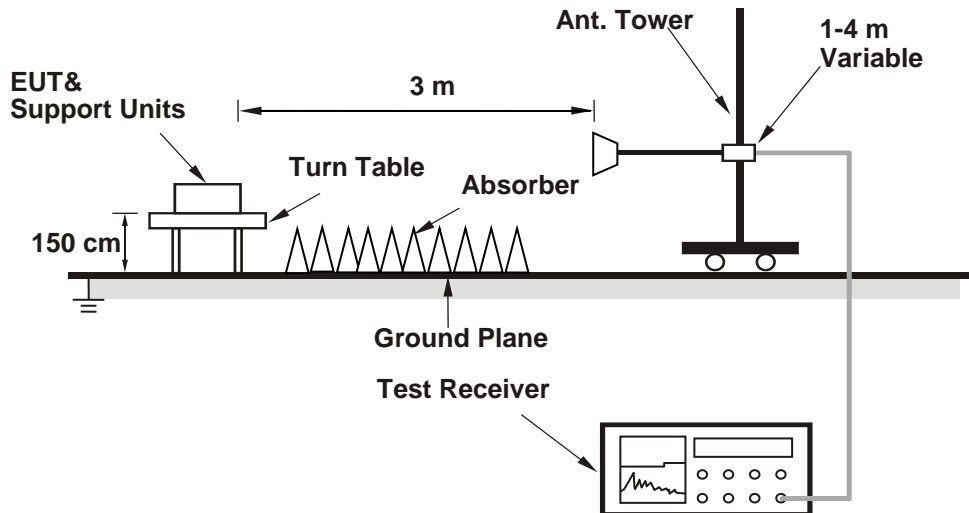
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

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

##### Test Setup

<Radiated Emissions below 30 MHz>



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

**<Radiated Emissions above 1 GHz>**


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

**Test Instruments**

Test Date: 2022/3/9

## Above 1GHz

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV40	101513	2021/5/28	2022/5/27
Horn Antenna	ETS-Lindgren	3117	00218930	2021/12/20	2022/12/19
HF-AMP + AC source	EMCI	EMC051845SE	980633	2022/2/16	2023/2/15
HF-AMP + AC source	EMCI	EMC184045SE	980657	2022/2/16	2023/2/15
Horn Antenna	SCHWARZBECK	BBHA 9170	00887	2021/4/8	2022/4/7
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	800898/2EA	2021/4/16	2022/4/15
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	800901/2EA	2021/4/16	2022/4/15
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	801027/2EA	2021/4/16	2022/4/15

## 30MHz-1GHz

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Receiver	R&S	ESR7	102109	2022/2/25	2023/2/24
Bilog Antenna	SCHWARZBECK	VULB-9168	00949	2021/5/30	2022/5/29
LF-AMP	Agilent	8447D	2727A05146	2022/2/16	2023/2/15
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104EA	800056/4EA	2021/3/11	2022/3/10
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104	804680/4	2021/3/11	2022/3/10
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104	MY37202/4	2021/3/11	2022/3/10

## 9kHz-30MHz

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Receiver	R&S	ESR7	102109	2022/2/25	2023/2/24
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104EA	800056/4EA	2021/3/11	2022/3/10
Loop Antenna	SCHWARZBECK	FMZB 1519B	00215	2021/12/8	2022/12/7

**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, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

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

**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.

**Test Results**

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

Please refer to Appendix A and B.

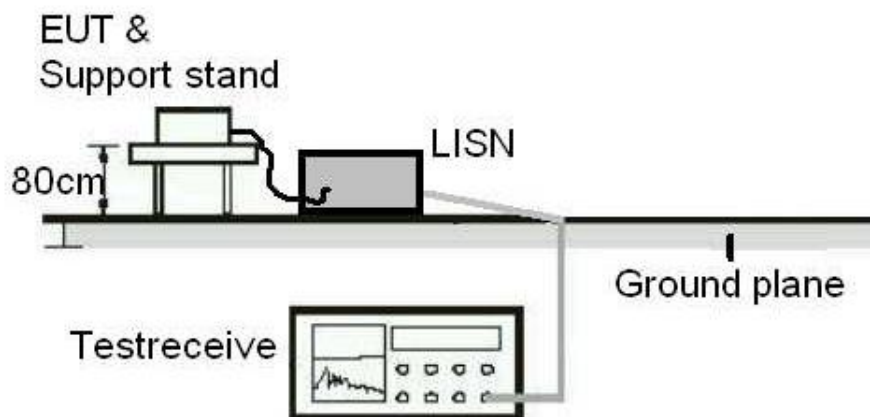
## 5.2 Mains Emission

### 5.2.1 Mains Conducted Emission

**Limit**

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

**Kind of Test Site**                      Shielded room

**Test Setup**

**Test Instruments**
**<POE>**

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
RF Cable	N/A	N/A	EMC-003	2021/3/16	2022/3/15	2022/03/10	2022/03/10
Two-Line V-Network	Rohde & Schwarz	ENV216	101938	2021/9/23	2022/9/22	2022/03/10	2022/03/10
EMI Test Receiver	R&S	ESCI	1816063	2021/11/15	2022/11/14	2022/03/10	2022/03/10

**<Adapter>**

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
RF Cable	N/A	N/A	EMC-003	2021/3/16	2022/3/15	2022/03/10	2022/03/10
Two-Line V-Network	Rohde & Schwarz	ENV216	101938	2021/9/23	2022/9/22	2022/03/10	2022/03/10
EMI Test Receiver	R&S	ESCI	1816063	2021/11/15	2022/11/14	2022/03/10	2022/03/10

**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 A and B.