TEST REPORT

Applicant Name :	Grandstream Networks, Inc.
Address :	126 Brookline Ave, 3rd Floor Boston, MA 02215, USA
ReportNumber:	SZNS210408-55720E-RF-00A
FCC ID:	YZZGWN7660LR

Test Standard (s)

FCC PART 15B, CLASS B

Sample Description

Product Type:	Outdoor Long-Range Wi-Fi 6 Access Point
Model No.:	GWN7660LR
Trade Mark:	GRANDSTREAM
Date Received:	2021/04/08
Date of Test:	2021/11/08
Report Date:	2021/11/10

Test Result:	Pass*

* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Ting Lü

EMC Engineer

Approved By:

Candy Li

EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

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Test Report Declaration

Applicant	:	Grandstream Networks, Inc.
Manufacturer	:	Grandstream Networks, Inc.
Product	:	Outdoor Long-Range Wi-Fi 6 Access Point
Model No.	:	GWN7660LR
Trade Mark	:	GRANDSTREAM

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart B Class B
ANSI C63.4: 2014

The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart B Class B limits both radiated and conducted emissions.The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

1. TEST RESULTS SUMMARY

Test Items	Test Standard	Test Results
Power Line Conducted Emission (0.15-30MHz)	FCC Part 15 Subpart B	Pass
Radiated Emission (30-1000MHz)	FCC Part 15 Subpart B	Pass
Radiated Emission (Above 1GHz)	FCC Part 15 Subpart B	Pass

2. GENERAL INFORMATION

2.1.Description of Device (EUT)

Product	:	Outdoor Long-Range Wi-Fi 6 Access Point
Model No.	:	GWN7660LR
Rating	:	DC 48V from POE
Trade Mark	:	GRANDSTREAM
Remark(s)	:	The highest operation frequency is 5825MHz.
Applicant	:	Grandstream Networks, Inc.
Address	:	126 Brookline Ave, 3rd Floor Boston, MA 02215, USA
Manufacturer	:	Grandstream Networks, Inc.
Address	:	126 Brookline Ave, 3rd Floor Boston, MA 02215, USA
Date of sample received	:	Apr. 08, 2021
Date of Test	:	Nov. 08, 2021
Sample Number	:	SZNS210408-55720E-RF-S1

2.2.Test Mode

Mode: Data Transmission

Accessory and Auxiliary Equipment

POE	:	Model:VX-PI1000GB Output:DC 48V
Notebook	:	DELL Model: Latitude E6410 S/N: 11429208685
Router	:	Model: DS-3WR03-E S/N: 10021642429

2.3.Description of Test Facility

EMC Lab : Accredited by American Association for Laboratory Accreditation (A2LA)
The Certificate Number is 4297.01

Listed by Innovation, Science and Economic Development Canada (ISEDC)
The Registration Number is 5077A

Accredited by China National Accreditation Service for Conformity Assessment (CNAS)
The Registration Number is CNAS L3193

Name of Firm : Shenzhen Accurate Technology Co., Ltd.

Site Location : 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

2.4.Measurement Uncertainty

Radiated emission expanded uncertainty (30MHz-1000MHz) : *U=4.28dB, k=2*

Radiated emission expanded uncertainty (1GHz -18GHz) : *U=4.98dB, k=2*

Radiated emission expanded uncertainty (18GHz - 26.5GHz) : *U=5.06dB, k=2*

Radiated emission expanded uncertainty (26.5GHz - 40GHz) : *U=4.72dB, k=2*

Conduction Emission Expanded Uncertainty (0.15kHz-30MHz) : *U=2.72dB, k=2*

3. MEASURING DEVICE AND TEST EQUIPMENT

3.1.For Conducted Emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI	100784	Feb. 03, 2021	1 Year
2.	L.I.S.N.	Rohde & Schwarz	ENV216	101314	Dec. 25, 2020	1 Year
3.	50Ω Coaxial Switch	Anritsu Corp	MP59B	6200506474	Dec. 25, 2020	1 Year
4.	Conducted Emission Test Software: e3 19821b (V9)					

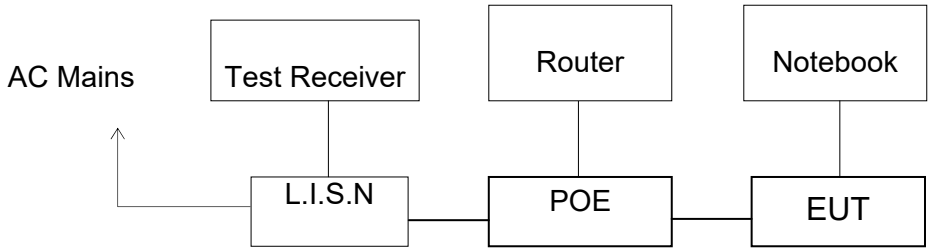
3.2.For Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde& Schwarz	ESR	101817	Dec. 24, 2020	1 Year
2.	Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 05, 2020	3 Year
3.	Amplifier	SONOMA INSTRUMENT	310 N	186131	Dec. 24, 2020	1 Year
4.	50 Coaxial Switch	Anritsu Corp	MP59B	6200237248	Dec. 24, 2020	1 Year
5.	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1067	Jan. 04,2020	3 Year
6.	Preamplifier	A.H. Systems, inc.	PAM-0118P	531	Jun. 08, 2021	1 Year
7.	Spectrum Analyzer	Rohde&Schwarz	FSV40	101495	Dec. 24, 2020	1 Year
8	Quinstar	Amplifier	QLW-18405536-J0	15964001002	Nov.28 2020	1 Year
9	Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	Jan. 04 2020	3 Year
10	Radiated Emission Test Software: e3 19821b (V9)					

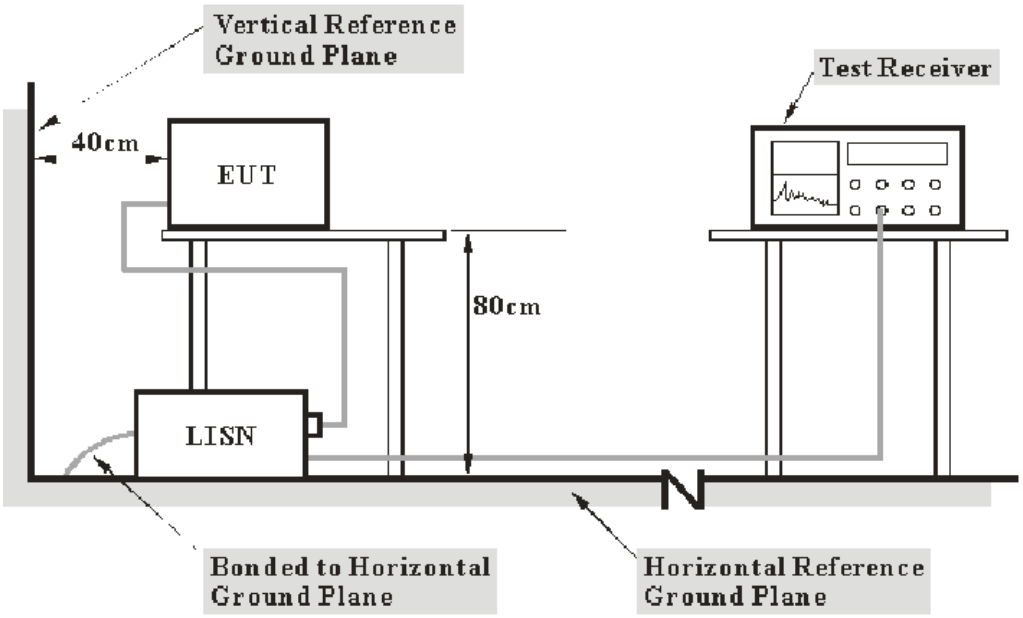
4. POWER LINE CONDUCTED MEASUREMENT

4.1.Block Diagram of Test Setup

4.1.1.Block diagram of connection between the EUT and simulators



4.1.2.Test System Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

4.2.Power Line Conducted Emission Measurement Limits (Class B)

Frequency (MHz)	Limit dB(μV)	
	Quasi-peak Level	Average Level
0.15 - 0.50	66.0 – 56.0 *	56.0 – 46.0 *
0.50 - 5.00	56.0	46.0
5.00 - 30.00	60.0	50.0
NOTE1: The lower limit shall apply at the transition frequencies. NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		

4.3.Test mode description

Mode: Data Transmission

4.4.Manufacturer

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

4.4.1.Outdoor Long-Range Wi-Fi 6 Access Point

Model Number : GWN7660LR

Manufacturer : Grandstream Networks, Inc.

4.5.Operating Condition of EUT

4.5.1.Setup the EUT and simulator as shown as Section 4.1.

4.5.2.Turn on the power of all equipment.

4.5.3.Let the EUT work in test mode and measure it.

4.6.Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.4: 2014 on Conducted Emission Measurement.

The bandwidth of test receiver is set at 9kHz.
The frequency range from 150kHz to 30MHz is checked.

4.7.DataExplain

Over Limit = Level (dBμV) - Limit(dBμV)

4.8.Power Line Conducted Emission Measurement Results

PASS.

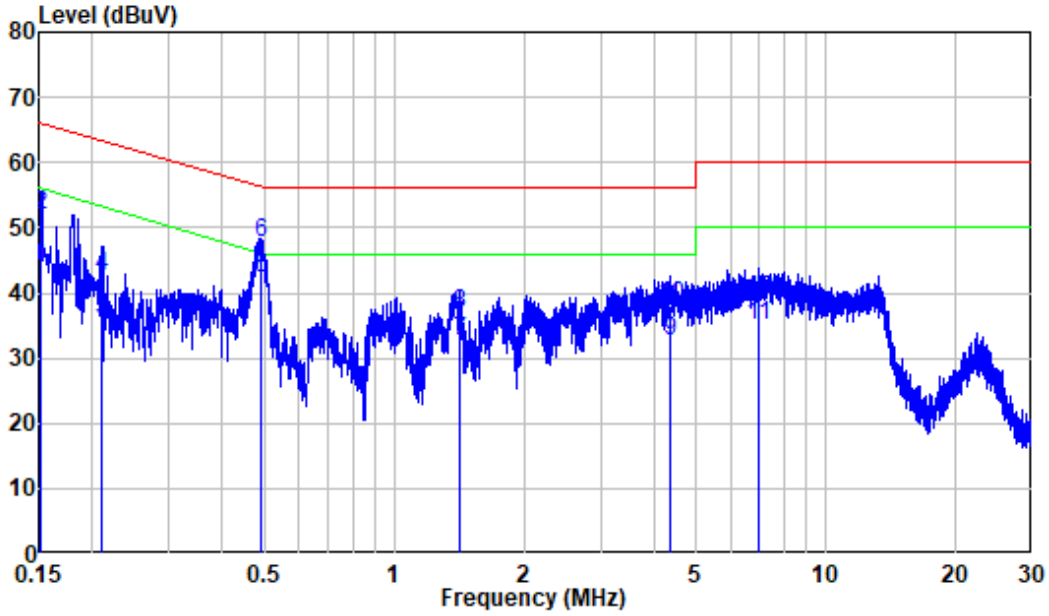
The frequency range from 150kHz to 30MHz is checked.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.Emissions attenuated more than 20 dB below the permissible value are not reported.

All data was recorded in the Quasi-peak and average detection mode.

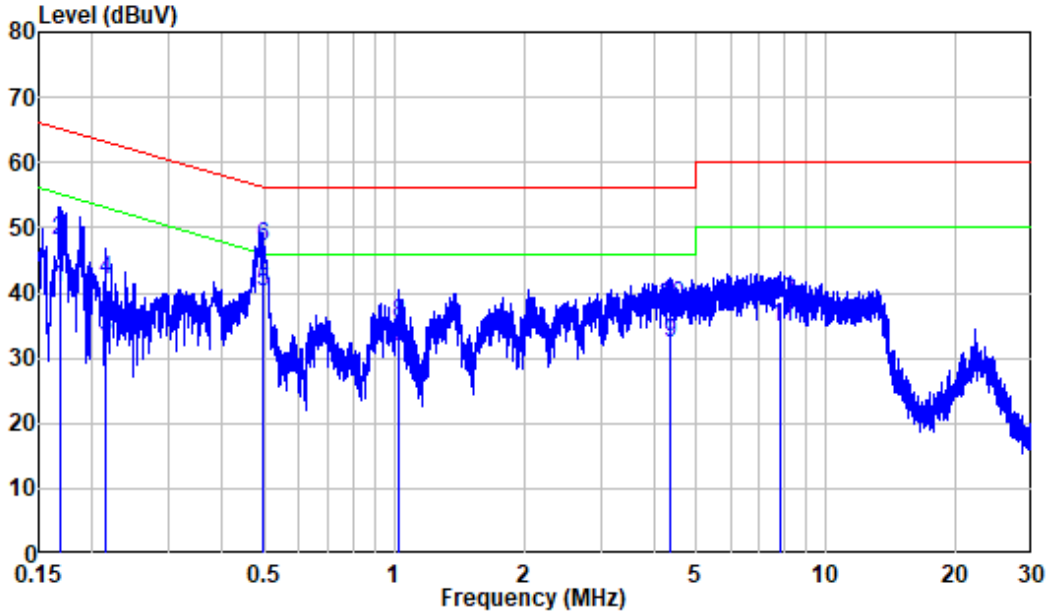
The spectral diagrams are attached as below.

Job No.:	**SZNS210408-55720E-RF**	**Power:**	**AC 120V 60Hz**
Mode:	**Data Transmission**	**Test By:**	**Bin Duan**
Limit:	**FCC PART 15B**	**Test item:**	**Conduction Test**
Climatic:	**25° C 64%RH**	**Date:**	**2021.11.08**



Site : Shielding Room
Condition: Line
EUT : Outdoor Long-Range Wi-Fi 6 Access Point
M/N : GWN7660LR

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.152	9.89	33.77	43.66	55.87	-12.21	Average
2	0.152	9.89	42.16	52.05	65.87	-13.82	QP
3	0.209	9.80	26.11	35.91	53.24	-17.33	Average
4	0.209	9.80	32.86	42.66	63.24	-20.58	QP
5	0.493	9.80	32.37	42.17	46.11	-3.94	Average
6	0.493	9.80	37.99	47.79	56.11	-8.32	QP
7	1.413	9.86	22.84	32.70	46.00	-13.30	Average
8	1.413	9.86	26.83	36.69	56.00	-19.31	QP
9	4.352	9.96	22.73	32.69	46.00	-13.31	Average
10	4.352	9.96	28.02	37.98	56.00	-18.02	QP
11	6.951	10.07	24.84	34.91	50.00	-15.09	Average
12	6.951	10.07	28.86	38.93	60.00	-21.07	QP



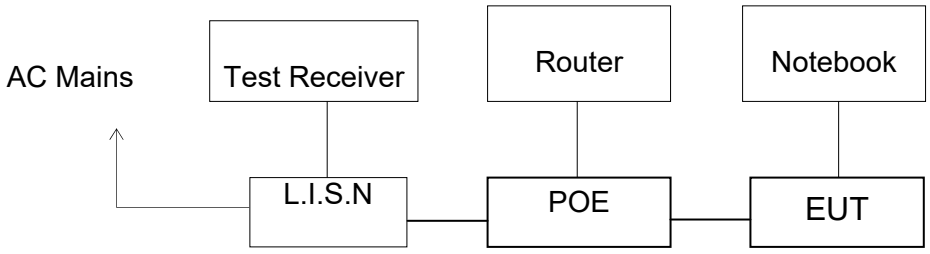
Site : Shielding Room
Condition: Neutral
EUT : Outdoor Long-Range Wi-Fi 6 Access Point
M/N : GWN7660LR

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.168	9.94	30.74	40.68	55.08	-14.40	Average
2	0.168	9.94	38.14	48.08	65.08	-17.00	QP
3	0.214	9.99	23.36	33.35	53.05	-19.70	Average
4	0.214	9.99	32.04	42.03	63.05	-21.02	QP
5	0.495	9.90	30.25	40.15	46.09	-5.94	Average
6	0.495	9.90	37.17	47.07	56.09	-9.02	QP
7	1.026	9.91	21.68	31.59	46.00	-14.41	Average
8	1.026	9.91	25.56	35.47	56.00	-20.53	QP
9	4.372	10.04	22.32	32.36	46.00	-13.64	Average
10	4.372	10.04	27.87	37.91	56.00	-18.09	QP
11	7.867	10.08	24.54	34.62	50.00	-15.38	Average
12	7.867	10.08	28.53	38.61	60.00	-21.39	QP

5. RADIATED EMISSION MEASUREMENT

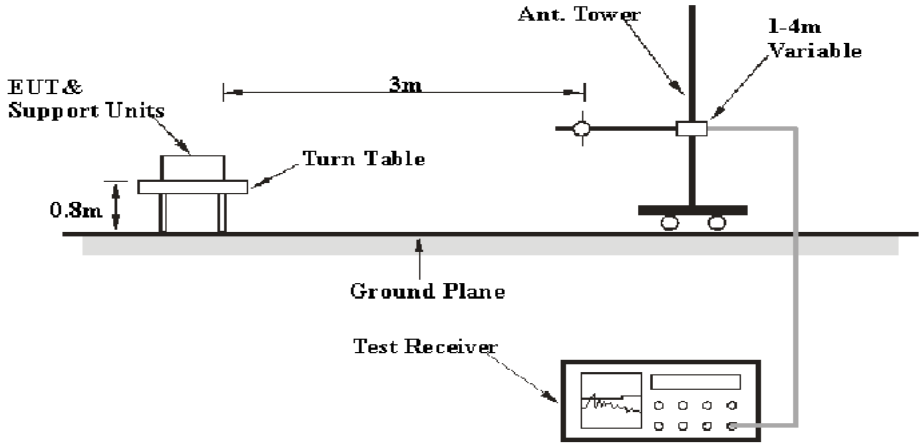
5.1.Block Diagram of Test Setup

5.1.1.Block diagram of connection between the EUT and simulators

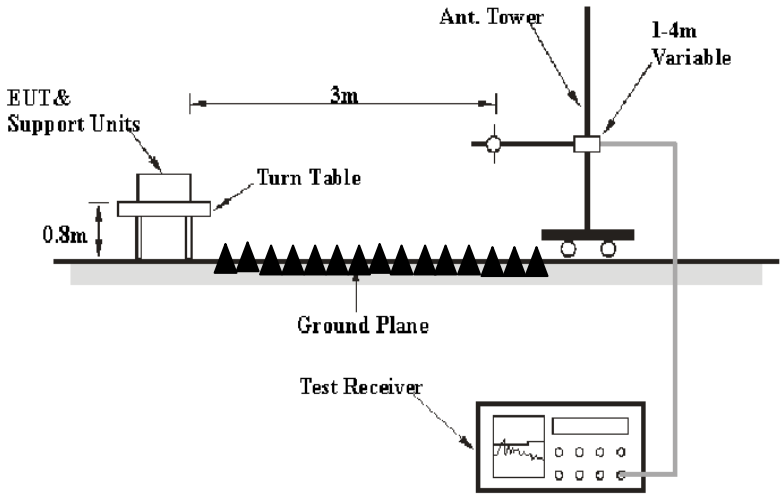


5.1.2.Test System Setup

Below 1GHz:



Above 1GHz:



5.2.Radiated Emission Limit (Class B)

All emanations from a class B device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below:

Frequency MHz	Distance Meters	Field Strengths QP Limit	
		μV/m	dB(μV/m)
30-88	3	100	40.0
88-216	3	150	43.5
216-960	3	200	46.0
Above 960	3	500	54.0
Remark: (1) Emission level dB(μV) = 20 log Emission level μV/m. (2)The smaller limit shall apply at the cross point between two frequency bands. (3) Distance is the distance in meters between the measuring instrument antenna and the closest point of any part of the device or system.			

Frequency MHz	Distance Meters	Field StrengthsLimit	
		Peak dB(μV/m)	AVGdB(μV/m)
Above 1GHz	3	74	54

5.3.Test Mode Description

Mode: Data Transmission

5.4.Manufacturer

The following equipments are installed on Radiated Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

5.5.Operating Condition of EUT

5.5.1. Setup the EUT and simulator as shown as Section 5.1.

5.5.2. Turn on the power of all equipment.

5.5.3. Let the EUT work in test mode and measure it.

5.6.Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4: 2014 on radiated emission measurement.

The bandwidth of the Receiver/Spectrum Analyzer is set at 9kHz in 9kHz-30MHz, 120 kHz in 30-1000MHz, and 1MHz in above 1000MHz.

Note:The EUT's highest operating frequency provided by Manufacturer is less than108MHz, the radiated emission measurement shall be made up to 1GHz.

The frequency range from 30MHz to 1000MHz is investigated.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705–108	1000.
108–500	2000.
500–1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

5.7.Data Sample

Over limit (dB) = Result(dBμv/m) - Limit (dBμv/m)
QP = Quasi-peak Reading

The “Over limit” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7dB means the emission is 7dB below the limit.

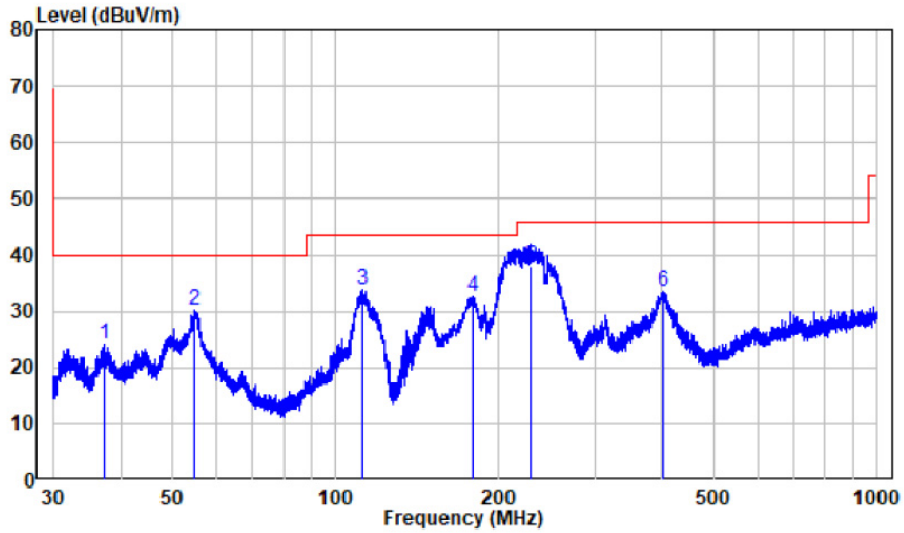
5.8.Radiated Emission Measurement Result

PASS.

The frequency range from 30MHz to 29.125GHz is investigated.
The spectral diagrams are attached as below.

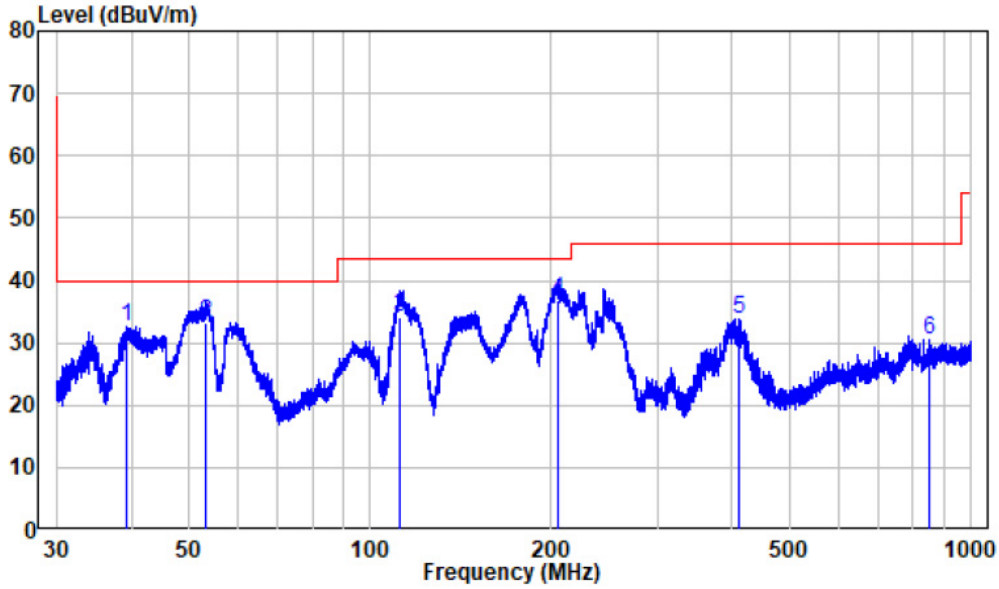
Note 1: Pre-scan in the X,Y and Z axes of orientation, the worst case Z-axis of orientation was recorded.
Note 2: The test result of peak was less than the limit of average, so just peak values were recorded.
Note 3: For above 18GHz, the spurious emission is 20dB below to the limit or in the noise floor was not recorded.

30MHz~1GHz



Site : chamber
Condition : 3m HORIZONTAL
Temp.(℃)/Hum.(%RH): 23℃ 52%RH
Job No. : SZNS210408-55720E-RF
Test Mode : Data transmission
EUT Name : Outdoor Long-Range Wi-Fi 6 Access Point
Model : GWN7660LR
Test By : Bin.D
Power : AC120V/60Hz

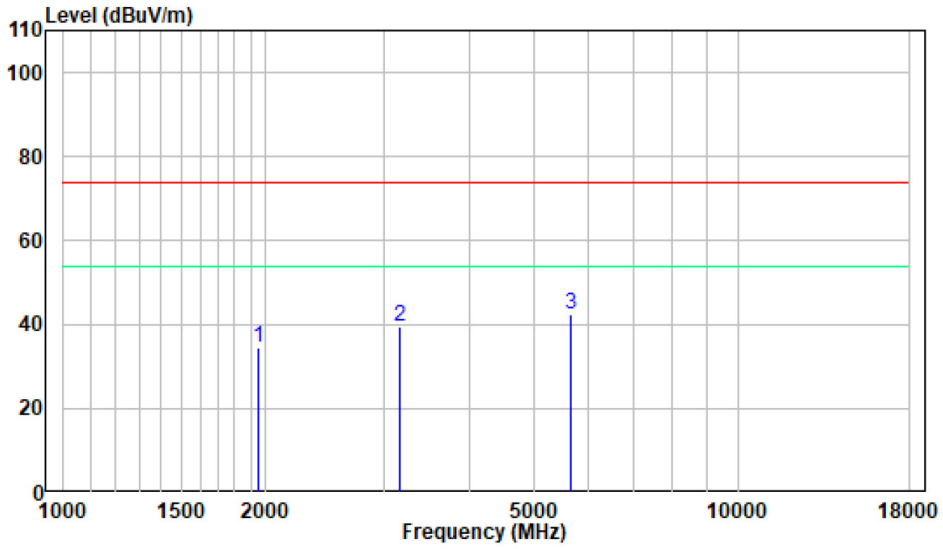
	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	37.33	-19.08	43.16	24.08	40.00	-15.92	Peak
2	54.91	-18.36	48.44	30.08	40.00	-9.92	Peak
3	111.98	-19.43	53.09	33.66	43.50	-9.84	Peak
4	179.07	-21.33	54.02	32.69	43.50	-10.81	Peak
5	228.19	-18.89	56.78	37.89	46.00	-8.11	QP
6	401.13	-15.76	49.31	33.55	46.00	-12.45	Peak



Site : chamber
Condition : 3m VERTICAL
Temp.(℃)/Hum.(%RH): 23℃ 52%RH
Job No. : SZNS210408-55720E-RF
Test Mode : Data transmission
EUT Name : Outdoor Long-Range Wi-Fi 6 Access Point
Model : GWN7660LR
Test By : Bin.D
Power : AC120V/60Hz

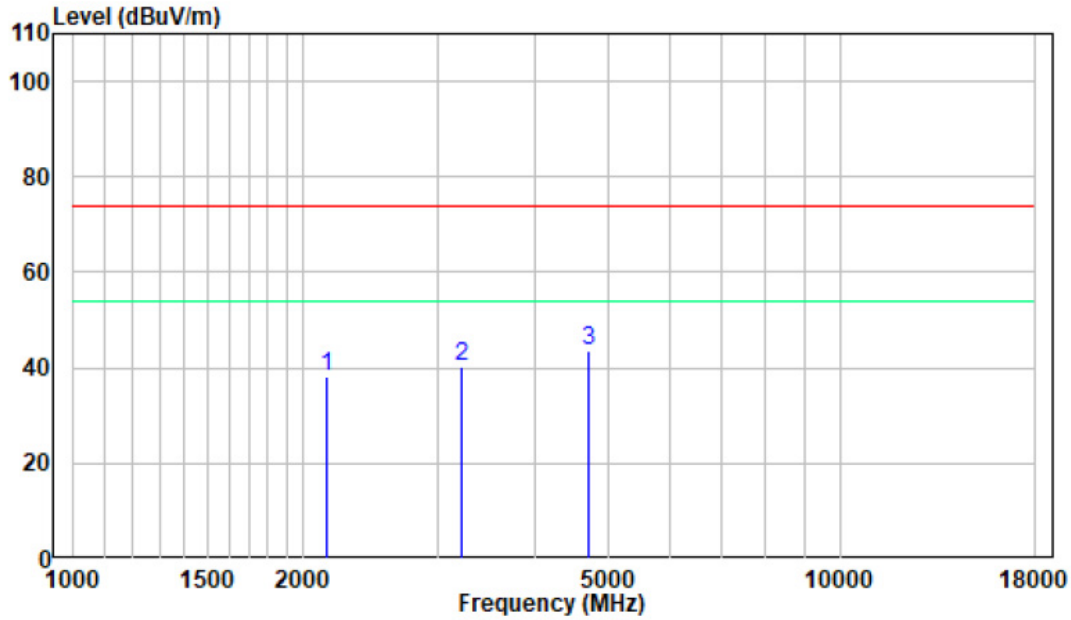
	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	39.35	-18.75	51.25	32.50	40.00	-7.50	Peak
2	53.25	-17.98	51.32	33.34	40.00	-6.66	QP
3	112.18	-19.45	53.46	34.01	43.50	-9.49	QP
4	205.59	-19.04	55.77	36.73	43.50	-6.77	QP
5	411.46	-15.17	49.06	33.89	46.00	-12.11	Peak
6	850.29	-9.52	39.94	30.42	46.00	-15.58	Peak

1GHz ~18GHz



Site : chamber
Condition: 3m Vertical
Job NO : :SZNS210408-55720E-RF
Test Mode: Data transmission

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	1946.00	-5.63	40.19	34.56	74.00	-39.44	Peak
2	3152.70	-2.93	42.34	39.41	74.00	-34.59	Peak
3	5673.00	4.71	37.50	42.21	74.00	-31.79	Peak



Site : chamber
Condition: 3m Horizontal
Job NO : :SZNS210408-55720E-RF
Test Mode: Data transmission

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2141.60	-5.00	43.13	38.13	74.00	-35.87	Peak
2	3219.00	-2.91	43.02	40.11	74.00	-33.89	Peak
3	4712.00	0.02	43.66	43.68	74.00	-30.32	Peak

---------- THE END OF TEST REPORT ----------