

# ORANGE PEEL PROJECTS INC

# RF TEST REPORT

**Report Type:**

FCC Part 15.249 RF report

**Model:**

GL5000S-S

**REPORT NUMBER:**

2309A1230SHA-001

**ISSUE DATE:**

Oct 19, 2023

**DOCUMENT CONTROL NUMBER:**

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**Applicant:** ORANGE PEEL PROJECTS INC  
85 WEST STREET, WALPOLE, MA 02081

**Manufacturer:** ORANGE PEEL PROJECTS INC  
85 WEST STREET, WALPOLE, MA 02081

**Factory:** Hzsamko Technologies Co., Ltd.  
No.8,Jiaqi Road,Xianlin Street,Yuhang District,Hangzhou, China.

**Product Name:** Guardline alarm

**Type/Model:** GL5000S-S

**FCC ID:** 2AZCH-GLS5

### SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

**47CFR Part 15 (2021):** Radio Frequency Devices (Subpart C)

**ANSI C63.10 (2013):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

**PREPARED BY:**

**REVIEWED BY:**



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Project Engineer  
Teddy Yin

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Reviewer  
Wakeyou Wang

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**TEST REPORT**

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### Revision History

Report No.	Version	Description	Issued Date
210201706SHA-001	Rev. 01	Initial issue of report	March 22, 2021
2309A1230SHA-001	Rev. 01	<p>This report is based on 210201706SHA-001 with the following modifications:</p> <ol style="list-style-type: none"> <li>1. The standards are updated.</li> <li>2. Update the model name: GL5000S-S. GL5000S-S and GL5000 have the same RF circuit except that GL5000S-S is powered by Li-ion battery which is charged by solar energy or USB port, but GL5000 is powered by dry-batteries.</li> </ol> <p>Radiated emission and conducted emission were tested after evaluation.</p>	Oct 19, 2023

## Measurement result summary

TEST ITEM	FCC REFERANCE	RESULT
Radiated emission	15.249 & 15.209	Pass
Power line conducted emission	15.207	Pass
Assigned bandwidth (20dB bandwidth)	15.215(c)	Pass
Antenna requirement	15.203	Pass

*Notes: 1: NA =Not Applicable*

*2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.*

*3: Additions, Deviations and Exclusions from Standards: None.*

## 1 GENERAL INFORMATION

### 1.1 Description of Equipment Under Test (EUT)

Product name:	Guardline alarm
Type/Model:	GL5000S-S
Description of EUT:	The EUT is a guard line alarm work at 915MHz.
Rating:	DC 5V
Category of EUT:	Class B
EUT type:	<input checked="" type="checkbox"/> Table top <input type="checkbox"/> Floor standing
Software Version:	/
Hardware Version:	/
Sample No.:	A230919-11-001
Sample received date:	Sep 20, 2023
Date of test:	Sep 20~25, 2023

### 1.2 Technical Specification

Frequency Range:	902-928 MHz
Support Standards:	/
Type of Modulation:	2FSK
Channel Number:	1 channel at 915MHz
Data Rate:	1Mbps
Channel Separation:	/
Antenna Information:	Internal antenna

**TEST REPORT****1.3 Description of Test Facility**

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

## 2 TEST SPECIFICATIONS

### 2.1 Standards or specification

47CFR Part 15 (2021)

ANSI C63.10 (2013)

### 2.2 Mode of operation during the test

The EUT is a handheld device, so three axes (X, Y, Z) were observed while the test receiver worked as “max hold” continuously and the highest reading among the whole test procedure was recorded.

Within this test report, EUT was tested with modulation and tested under its rating voltage and frequency.

The EUT was set to work normal and as receiving and transmitting mode during test. No standby function.

### 2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

### 2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Adaptor	HUAWEI/HW-050200C01	Input: 100-240V~, 50/60Hz Output: DC 5V

**2.5 Test environment condition:**

Test items	Temperature	Humidity
Radiated emission	24°C	56% RH
Power line conducted emission	23°C	56% RH

## 2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESR7	EC 6194	2024-02-08
<input checked="" type="checkbox"/>	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-09
<input checked="" type="checkbox"/>	Shielded room	Zhongyu	-	EC 2838	2024-01-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESIB 26	EC 3045	2024-08-24
<input checked="" type="checkbox"/>	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2024-08-23
<input checked="" type="checkbox"/>	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2024-06-15
<input checked="" type="checkbox"/>	Horn antenna	ETS	3117	EC 4792-1	2024-08-28
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross	-	EC 3048	2024-07-08
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2024-03-08
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2024-03-08

**TEST REPORT****2.7 Measurement uncertainty**

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

<b>Test item</b>	<b>Measurement uncertainty</b>
Maximum peak output power	$\pm 0.74\text{dB}$
Radiated Emissions in restricted frequency bands below 1GHz	$\pm 4.90\text{dB}$
Radiated Emissions in restricted frequency bands above 1GHz	$\pm 5.02\text{dB}$
Emission outside the frequency band	$\pm 2.89\text{dB}$
Power line conducted emission	$\pm 3.19\text{dB}$

### 3 Radiated emission

Test result: Pass

#### 3.1 Limit

Fundamental Frequency (MHz)	Fundamental limit (dBuV/m)	Harmonic limit (dBuV/m)
<input checked="" type="checkbox"/> 902 - 928	94	54
<input type="checkbox"/> 2400 - 2483.5	94	54
<input type="checkbox"/> 5725 - 5875	94	54
<input type="checkbox"/> 24000 - 24250	108	68

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits:

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

#### 3.2 Measurement Procedure

##### For Radiated emission below 30MHz:

- 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- 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.
- 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 9kHz at frequency below 30MHz.

**TEST REPORT****For Radiated emission above 30MHz:**

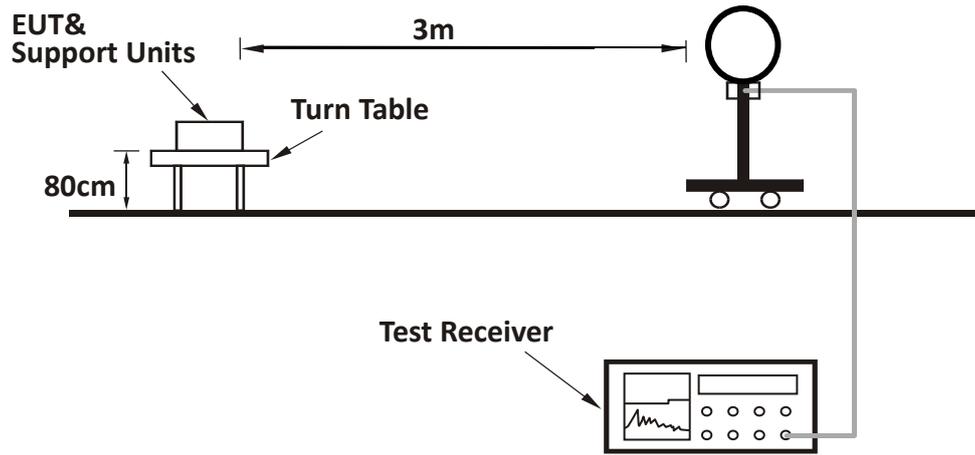
- a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving 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 detect 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:**

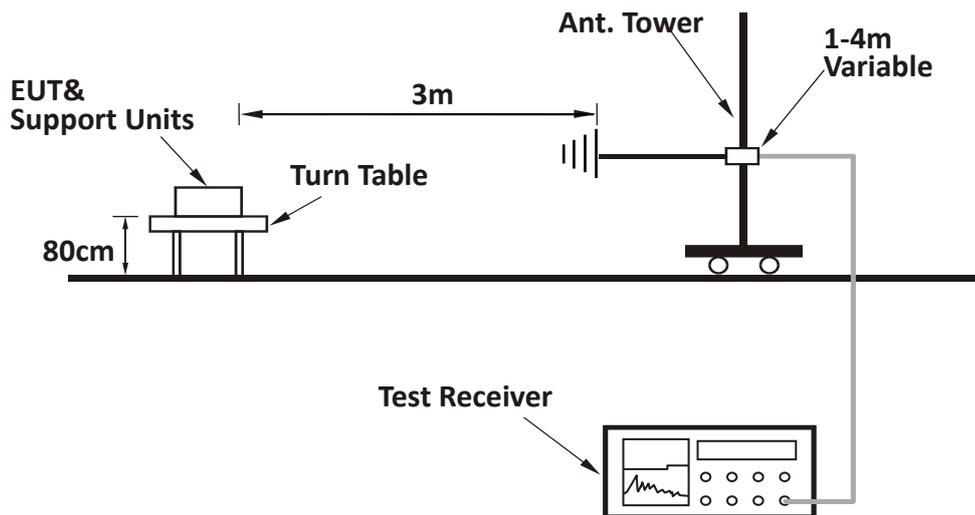
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or  $3 \times \text{RBW}$  (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported

### 3.3 Test Configuration

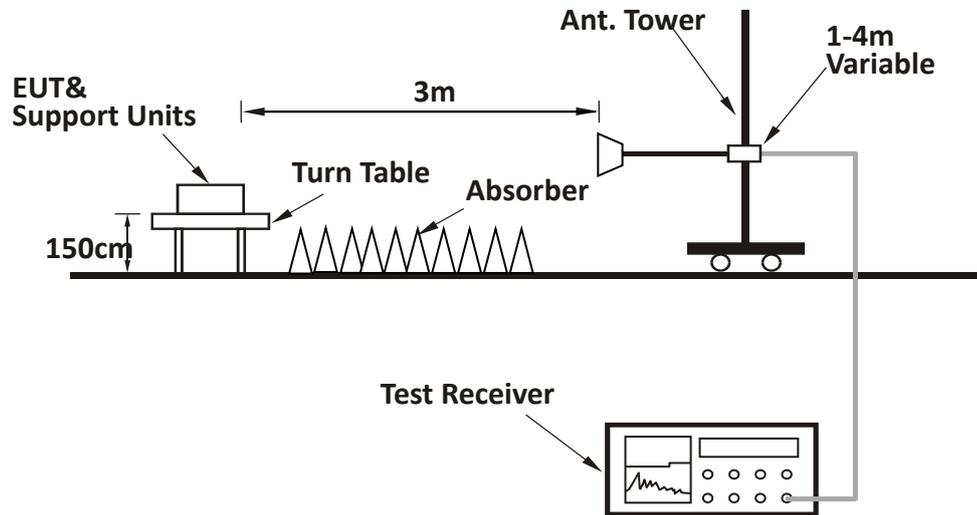
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



**For Radiated emission above 1GHz:**



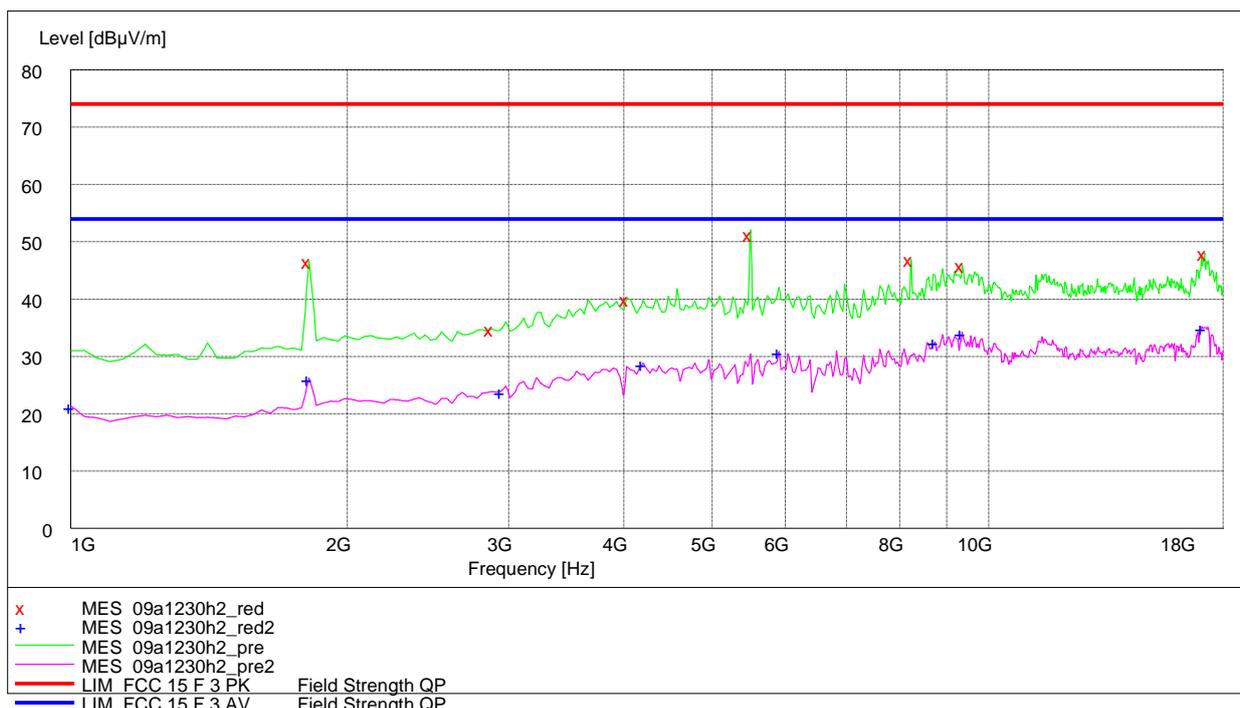
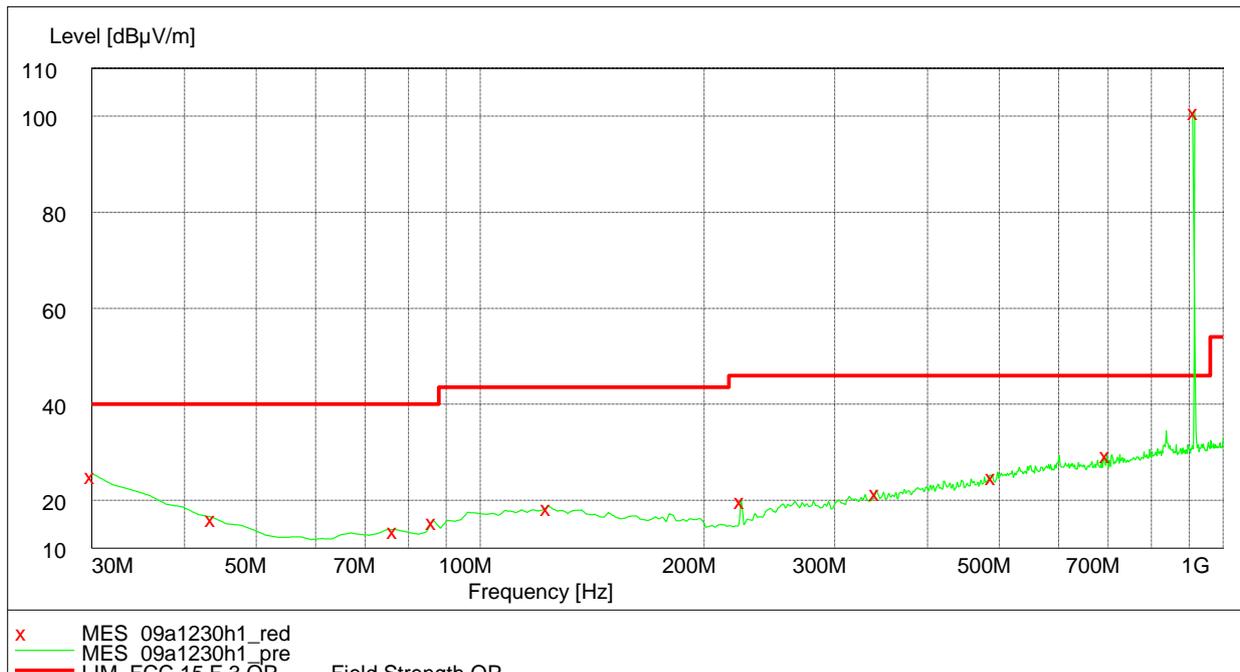
## TEST REPORT

### 3.4 Test Results of Radiated Emissions

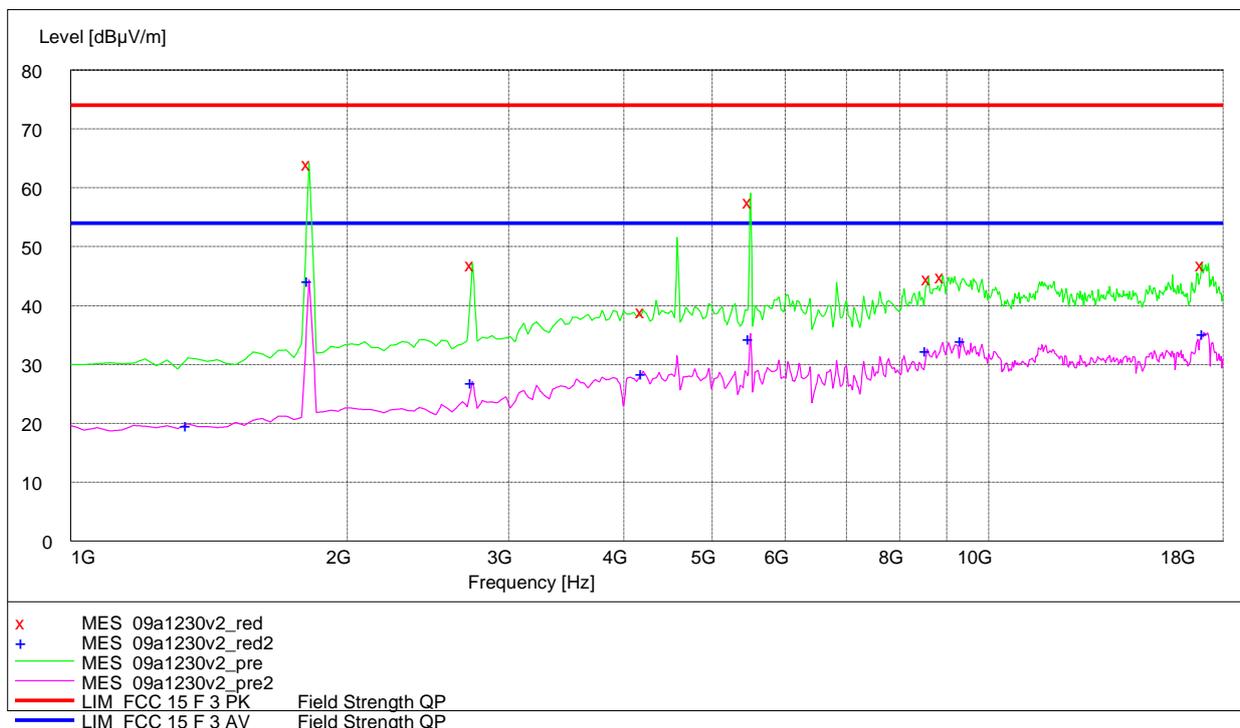
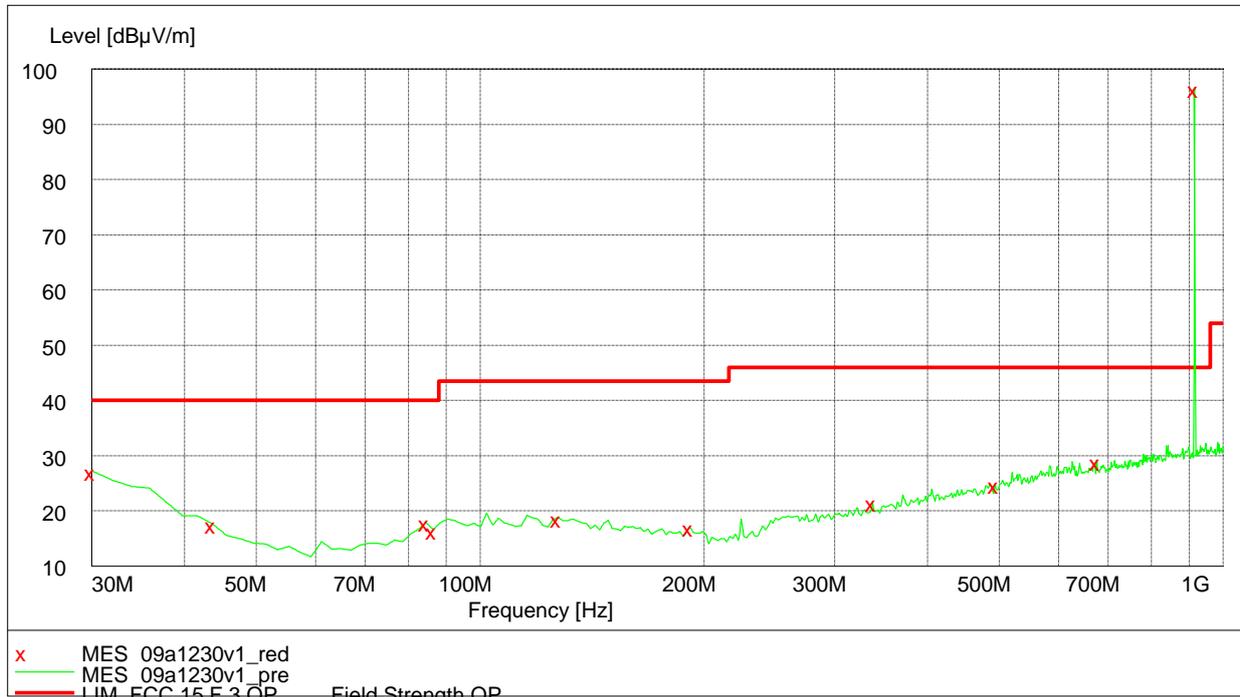
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

The worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



## Vertical



**TEST REPORT**

**Test data below 1GHz**

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	30.00	25.50	21.40	40.00	14.50	PK
H	43.61	16.40	13.20	40.00	23.60	PK
H	341.02	22.00	16.90	46.00	24.00	PK
H	488.76	25.30	20.10	46.00	20.70	PK
H	696.75	29.80	22.60	46.00	16.20	PK
H	902.00	29.90	24.50	46.00	16.10	PK
H	915.00	101.30	24.50	114.00	12.70	PK
H	928.00	30.60	24.50	46.00	15.40	PK
V	30.00	27.20	21.40	40.00	12.80	PK
V	43.61	17.60	13.20	40.00	22.40	PK
V	84.43	17.90	9.80	40.00	22.10	PK
V	492.65	24.90	20.20	46.00	21.10	PK
V	675.37	29.10	22.40	46.00	16.90	PK
V	902.00	29.50	24.50	46.00	16.50	PK
V	915.00	96.60	24.50	114.00	17.40	PK
V	928.00	30.50	24.50	46.00	15.50	PK

**TEST REPORT**

**Test result above 1GHz:**

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	H	1830.00	46.60	-8.50	74.00	27.40	PK
	V	1830.00	64.20	-8.50	74.00	9.80	PK
	H	2745.00	34.30	-5.30	74.00	39.70	PK
	V	2745.00	47.20	-5.30	74.00	26.80	PK
	H	4575.00	42.40	0.90	74.00	31.60	PK
	V	4575.00	51.70	0.90	74.00	22.30	PK
	H	5490.00	51.40	2.60	74.00	22.60	PK
	V	5490.00	57.90	2.60	74.00	16.10	PK

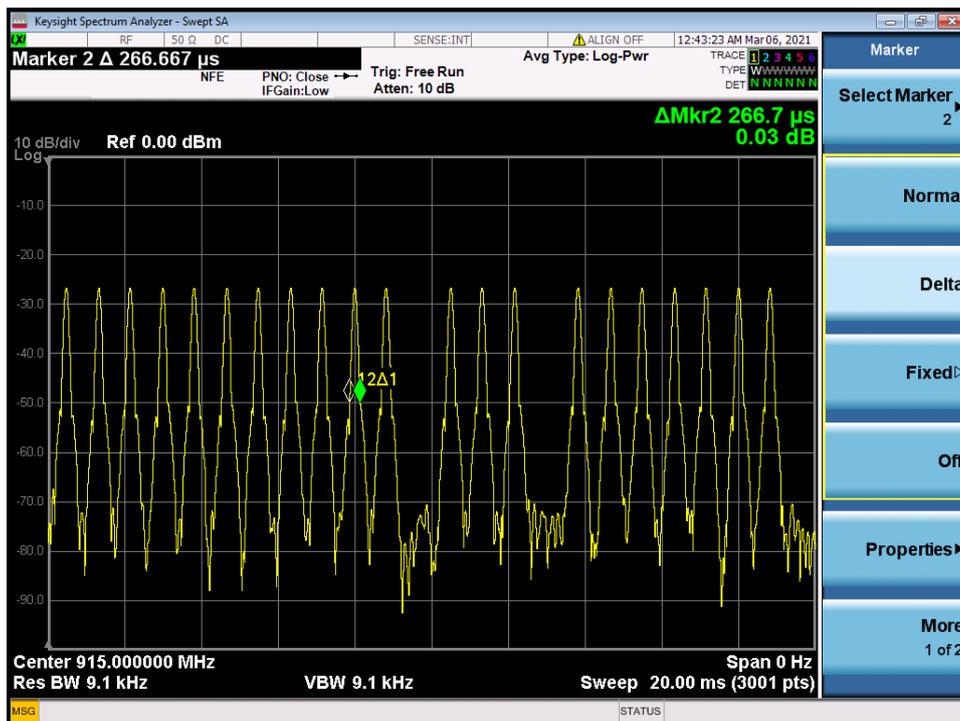
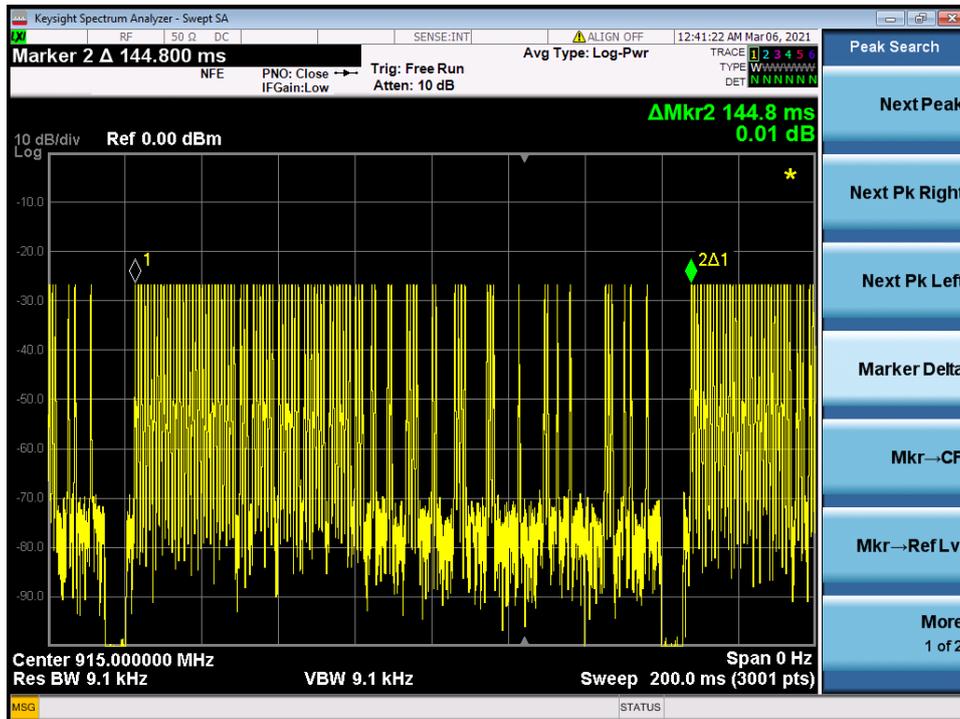
- Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.  
 2. Corrected Reading = Original Receiver Reading + Correct Factor  
 3. Margin = Limit - Corrected Reading  
 4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,  
 Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,  
 Limit = 40.00dBuV/m.  
 Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;  
 Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;  
 Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

### Duty Cycle:

The test data with maximum duty cycle was listed below.

The worst Duty cycle=  $(0.2667 * 88) / 144.8 = 0.1621$



**TEST REPORT**

Calculating the AV value according to the duty cycle

Antenna	Frequency (MHz)	PK Reading (dBuV/m)	Correct Factor (dB)	AV Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
H	915.00	101.30	<b>-15.80</b>	85.50	94.00	8.50
V	915.00	96.60		80.80	94.00	13.20
H	1830.00	46.60		30.80	54.00	23.20
V	1830.00	64.20		48.40	54.00	5.60
H	2745.00	34.30		18.50	54.00	35.50
V	2745.00	47.20		31.40	54.00	22.60
H	4575.00	42.40		26.60	54.00	27.40
V	4575.00	51.70		35.90	54.00	18.10
H	5490.00	51.40		35.60	54.00	18.40
V	5490.00	57.90		42.10	54.00	11.90

Remark:

1. Correct Factor =  $20\lg(\text{duty cycle}) = 20\lg(23.4696 / 144.8) = -15.80$ ;
2. AV Reading = PK Reading + Correct Factor;
3. Margin = limit - AV Reading.

## 4 Power line conducted emission

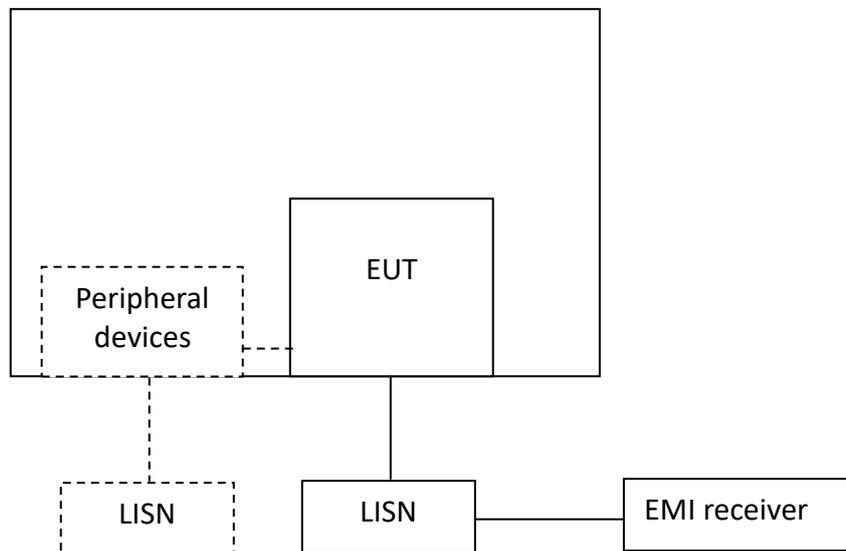
Test result: Pass

### 4.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

### 4.2 Test Configuration



**TEST REPORT**

**4.3 Measurement Procedure**

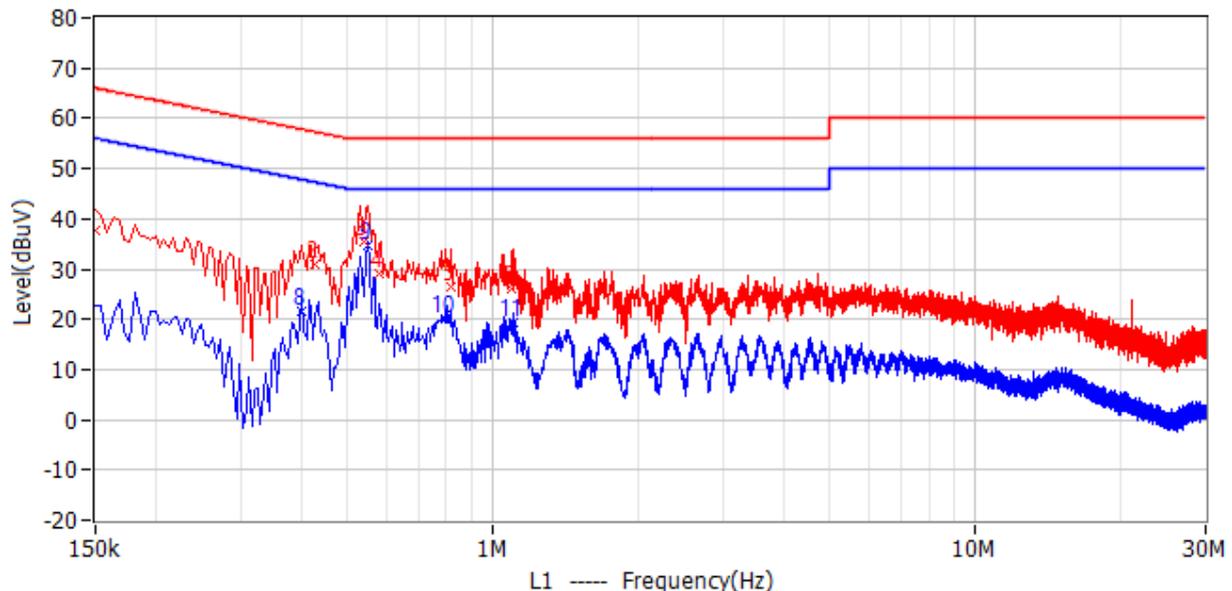
Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

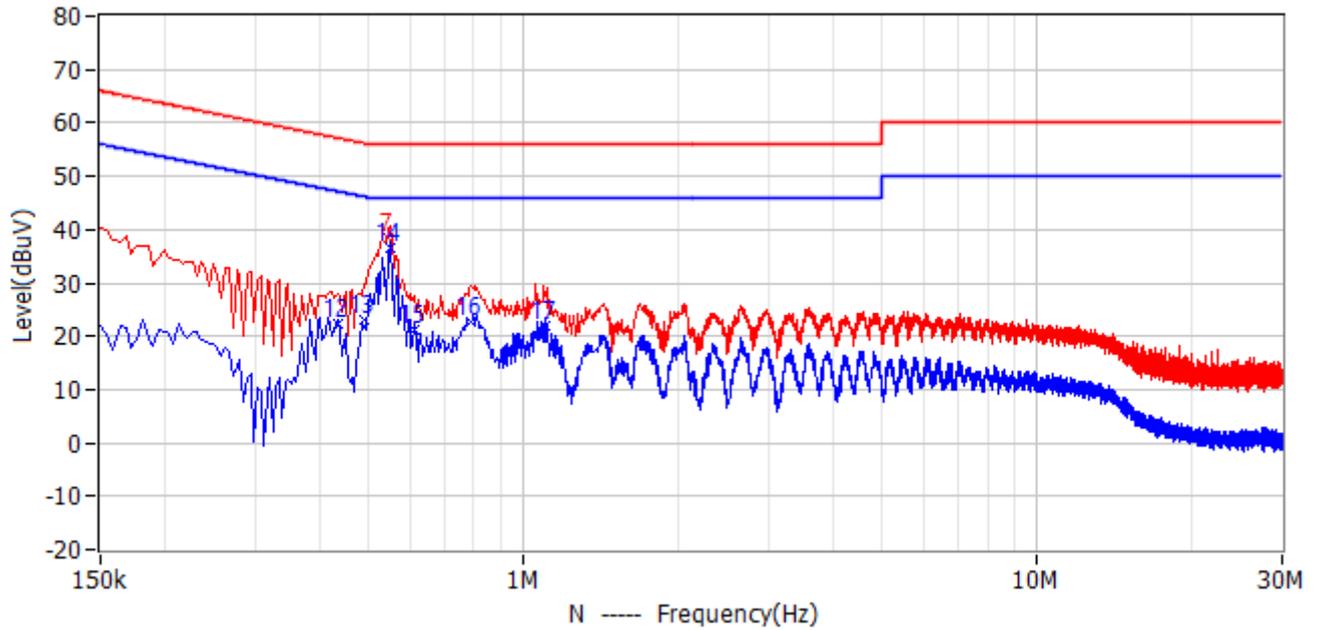
The bandwidth of the test receiver is set at 9 kHz.

**4.4 Test Results of Power line conducted emission**

**Power supply: 120V~, 60Hz**



## TEST REPORT



No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Reading dBuV	Factor dB	Detector	Phase
1	150.000kHz	66.0	37.7	-28.3	31.5	6.2	QP	L1
2	429.000kHz	57.3	31.0	-26.3	24.8	6.2	QP	L1
3	541.500kHz	56.0	35.5	-20.5	29.2	6.3	QP	L1
4	582.000kHz	56.0	28.9	-27.1	22.6	6.3	QP	L1
5	820.500kHz	56.0	26.4	-29.6	20.1	6.3	QP	L1
6	1.095MHz	56.0	26.2	-29.8	19.8	6.4	QP	L1
7	546.000kHz	56.0	38.4	-17.6	32.2	6.2	QP	N
8	402.000kHz	47.8	21.4	-26.4	15.2	6.2	CAV	L1
9	550.500kHz	46.0	34.6	-11.4	28.3	6.3	CAV	L1
10	793.500kHz	46.0	20.1	-25.9	13.8	6.3	CAV	L1
11	1.100MHz	46.0	19.2	-26.8	12.8	6.4	CAV	L1
12	433.500kHz	47.2	22.4	-24.8	16.2	6.2	CAV	N
13	487.500kHz	46.2	23.2	-23.0	17.0	6.2	CAV	N
14	550.500kHz	46.0	36.7	-9.3	30.5	6.2	CAV	N
15	613.500kHz	46.0	21.3	-24.7	15.1	6.2	CAV	N
16	789.000kHz	46.0	22.7	-23.3	16.4	6.3	CAV	N
17	1.100MHz	46.0	21.9	-24.1	15.6	6.3	CAV	N

Remark: 1. Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Level = Original Receiver Reading + Factor

3. Delta = Level- Limit

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

## 5 Assigned bandwidth (20dB bandwidth)

Test result: Pass

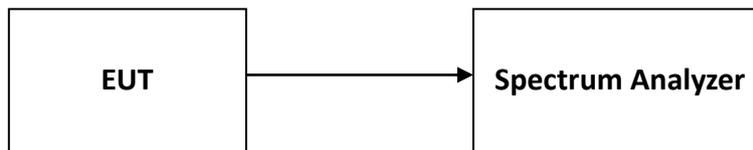
### 5.1 Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emission is contained within the allocated frequency band.

### 5.2 Measurement Procedure

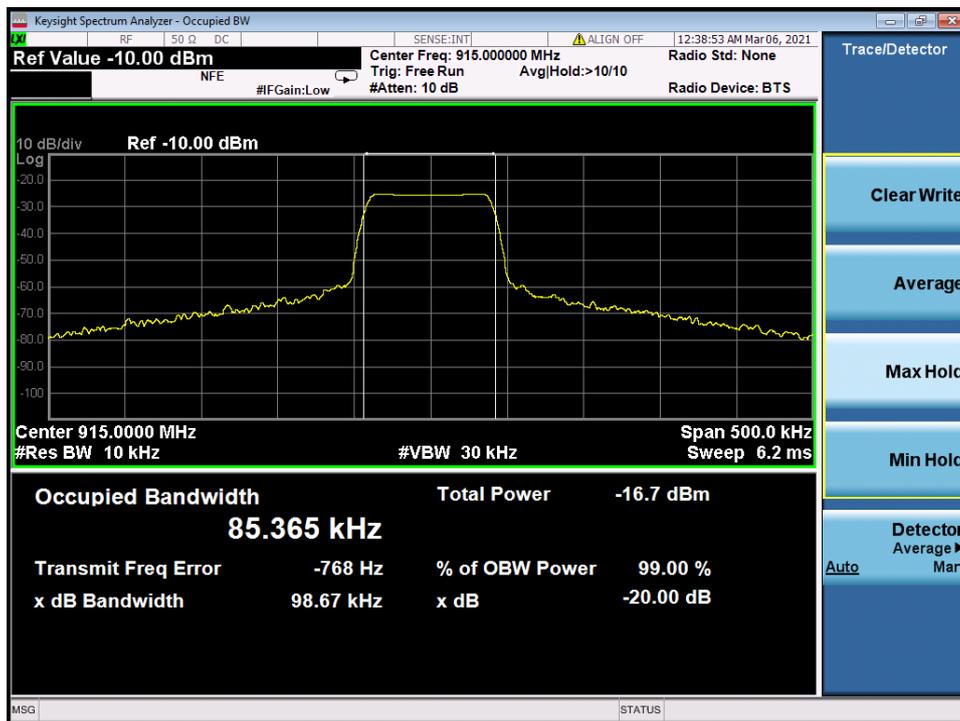
The 20dB Bandwidth is measured using the Spectrum Analyzer.  
Set Span = 2 to 3 times the 20 dB bandwidth, RBW = approximately 1% of the 20 dB bandwidth, VBW>RBW, Sweep = auto, Detector = peak, Trace = max hold.  
The test was performed at 2 channels (lowest and highest channel).

### 5.3 Test Configuration



## 5.4 The results

Test Mode	Frequency (MHz)	20dB Bandwidth (KHz)
1	915	98.67



## 6 Antenna requirement

**Requirement:**

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 shall be considered sufficient to comply with the provisions of this section.

**Result:**

EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

\*\*\*\*\* END \*\*\*\*\*