

## TEST REPORT

**Report No.: 22010420HKG-001**

Nacon (HK) Limited

Application For Certification  
FCC: Original Grant  
IC: Class II Permissive Change

**FCC ID: 2AVPR-700AR**  
**IC: 25872-700**

Transceiver – 2.4GHz wireless headphone

**Prepared and Checked by:**

**Approved by:**

Signed On File  
Wong Cheuk Ho, Herbert  
Lead Engineer

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Assistant Supervisor  
Date: March 22, 2022

## TEST REPORT

### GENERAL INFORMATION

|                                  |                                                                                                                                                    |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Grantee:</b>                  | Nacon (HK) Limited                                                                                                                                 |
| <b>Grantee Address:</b>          | Unit 1505, 148 Electric Road,<br>North Point, Hong Kong.                                                                                           |
| <b>Contact Person:</b>           | Johnny Wong                                                                                                                                        |
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| <b>Manufacturer:</b>             | Nacon (HK) Limited                                                                                                                                 |
| <b>Manufacturer Address:</b>     | Unit 1505, 148 Electric Road,<br>North Point, Hong Kong.                                                                                           |
| <b>Brand Name:</b>               | Nacon                                                                                                                                              |
| <b>Model:</b>                    | RIG 700                                                                                                                                            |
| <b>HVIN:</b>                     | 700                                                                                                                                                |
| <b>PMN:</b>                      | RIG 700                                                                                                                                            |
| <b>Type of EUT:</b>              | Transceiver                                                                                                                                        |
| <b>Description of EUT:</b>       | Gaming Headset                                                                                                                                     |
| <b>FCC ID / IC:</b>              | 2AVPR-700AR / 25872-700                                                                                                                            |
| <b>Date of Sample Submitted:</b> | January 12, 2022                                                                                                                                   |
| <b>Date of Test:</b>             | January 12, 2022 to March 01, 2022                                                                                                                 |
| <b>Report No.:</b>               | 22010420HKG-001                                                                                                                                    |
| <b>Report Date:</b>              | March 22, 2022                                                                                                                                     |
| <b>Environmental Conditions:</b> | Temperature: +10 to 40°C<br>Humidity: 10 to 90%                                                                                                    |
| <b>Conclusion:</b>               | Test was conducted by client submitted sample. The submitted sample as received complied with the 47 CFR Part 15 / RSS-210 Issue 10 Certification. |

## TEST REPORT

### SUMMARY OF TEST RESULT

| Test Specification                         | Reference                 | Results |
|--------------------------------------------|---------------------------|---------|
| Transmitter Power Line Conducted Emissions | 15.207 /<br>RSS-Gen 8.8   | Pass    |
| Radiated Emission                          | 15.249, 15.209 /          | Pass    |
| Radiated Emission on the Bandedge          | RSS-210 B.10, RSS-Gen 8.9 |         |
| Radiated Emission in Restricted Bands      | 15.205 /<br>RSS-Gen 8.10  | Pass    |

For Canada, all technical data which can be referred to Annex B – Report cover sheet.  
For electronic filing, the Annex B – Report cover sheet is saved with filename: Annex B.pdf.

The equipment under test is found to be complying with the following standards:

FCC Part 15, October 1, 2020 Edition

RSS-210 Issue 10 Amendment 1, April 2020

RSS-Gen Issue 5 Amendment 2, February 2021

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.  
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

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## TEST REPORT

### 1.0 GENERAL DESCRIPTION

#### 1.1 Product Description

The Equipment Under Test is a Gaming Headset of 2.4GHz Wireless Headphone with corresponding Dongle. The EUT operates at frequency range of 2402MHz to 2480MHz. There are total 79 channels with 1MHz channel spacing. The USB port on the Headphone is for charging purpose only. The EUT is powered by 3.7V rechargeable battery. After pairing with corresponding dongle, then the headphone will communicate with dongle for receiving the sounds and related commands.

This report contains data of headphone only.

Antenna Type: Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

#### 1.2 Related Submittal(s) Grants

This is a single application for certification of a transceiver.

The transmitter for this transceiver has been authorized by Certification procedure.

For Canada, the purpose of change is saved with filename: product change.pdf

#### 1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). All radiated measurements were performed in an 3m Chamber. Preliminary scans were performed in the 3m Chamber only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the “**Justification Section**” of this Application.

#### 1.4 Test Facility

The 3m Chamber and conducted measurement facility used to collect the radiated data is located at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong SAR, China. This test facility and site measurement data have been placed on file with the FCC and IC No. 2042H, CABID is “HKAP01”.

## TEST REPORT

### 2.0 SYSTEM TEST CONFIGURATION

#### 2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The device was powered by DC 3.7V Rechargeable Battery.

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the centre of the loop antenna was placed 1 meter above the ground, and the antenna polarization was changed. For maximizing emission at and above 30 MHz, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data report in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

All packet types of modulation are also checked and measured, only the worst case data are shown on the report.

#### 2.2 EUT Exercising Software

The EUT exercise program (if any) used during radiated testing was designed to exercise the various system components in a manner similar to a typical use.

#### 2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

#### 2.4 Measurement Uncertainty

Decision Rule for compliance: For FCC/IC standard, the measured value must be within the limits of applicable standard without accounting for the measurement uncertainty. For EN/IEC/HKTA/HKTC standard, conformity rules will be used as per standard directly excepted EN/IEC 61000-3-2, EN/IEC 61000-3-3, HKTA1004, HKCA1008, HKTA1019, HKTA1020, HKTA1041 and HKTA1044. For these excepted or not mentioned standards, CI 4.2.2 of ILAC-G8:09/2019 decision rules will be reference and guard band will be equal to our measurement uncertainty with 95% confidence level ( $k=2$ ). In case, the measured value is within guard band region, undetermined decision will be used.

#### 2.5 Support Equipment List and Description

HP notebook computer (Adaptor Model: HSTNN-CA15) (Provided by Intertek)  
1 X LAN cable of 2m long (Provided by Intertek)  
1 X USB cable of 0.85m long (Provided by Client )

## TEST REPORT

### 3.0 EMISSION RESULTS

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

#### 3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG - AV$$

where FS = Field Strength in dB $\mu$ V/m

RA = Receiver Amplitude (including preamplifier) in dB $\mu$ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

where FS = Field Strength in dB $\mu$ V/m

RR = RA - AG - AV in dB $\mu$ V

LF = CF + AF in dB

Assume a receiver reading of 52.0 dB $\mu$ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V/m}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$AV = 5.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 18 + 9 = 27 \text{ dB}\mu\text{V/m}$$

$$RR = 18.0 \text{ dB}\mu\text{V}$$

$$LF = 9.0 \text{ dB}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(27 \text{ dB}\mu\text{V/m})/20] = 22.4 \mu\text{V/m}$$

## TEST REPORT

### 3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 2402 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

### 3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 6.6 dB

### 3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 0.150 MHz

For electronic filing, the worst case line-conducted configuration photographs are saved with filename: conducted photo.pdf.

### 3.5 Conducted Emission Data

For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgment: Pass by 4.69 dB



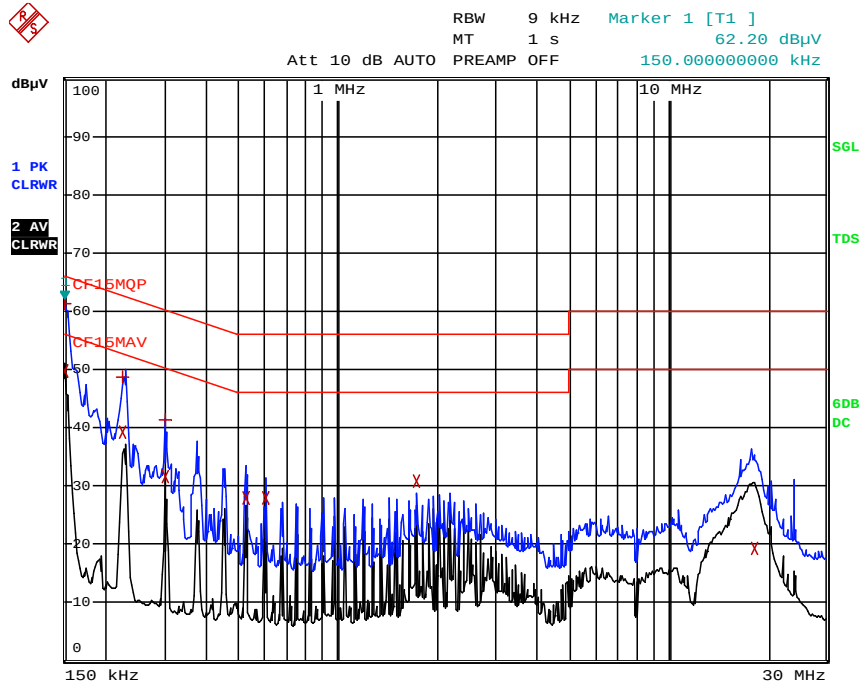
## TEST REPORT

### CONDUCTED EMISSION

Model: RIG 700 /700

Date of Test: March 01, 2022

Worst-Case Operating Mode: Transmitting



#### EDIT PEAK LIST (Final Measurement Results)

| Trace1:         | CF15MQP    |       |      |        |       |    |
|-----------------|------------|-------|------|--------|-------|----|
| Trace2:         | CF15MAV    |       |      |        |       |    |
| Trace3:         | ---        |       |      |        |       |    |
| TRACE           | FREQUENCY  | LEVEL | dBμV | DELTA  | LIMIT | dB |
| 1 Quasi Peak    | 150 kHz    | 61.30 | N    | -4.69  |       |    |
| 2 CISPR Average | 150 kHz    | 49.68 | N    | -6.31  |       |    |
| 1 Quasi Peak    | 226.5 kHz  | 48.80 | N    | -13.77 |       |    |
| 2 CISPR Average | 226.5 kHz  | 39.28 | N    | -13.29 |       |    |
| 1 Quasi Peak    | 298.5 kHz  | 41.40 | L1   | -18.88 |       |    |
| 2 CISPR Average | 298.5 kHz  | 31.52 | N    | -18.75 |       |    |
| 2 CISPR Average | 523.5 kHz  | 27.95 | L1   | -18.05 |       |    |
| 2 CISPR Average | 600 kHz    | 28.05 | N    | -17.95 |       |    |
| 2 CISPR Average | 1.725 MHz  | 30.84 | N    | -15.16 |       |    |
| 2 CISPR Average | 18.222 MHz | 19.27 | N    | -30.72 |       |    |

Note: Measurement Uncertainty is  $\pm 4.2$  dB at a level of confidence of 95%.

## TEST REPORT

### RADIATED EMISSIONS

Model: RIG 700 /700

Date of Test: March 01, 2022

Worst-Case Operating Mode: Transmitting

Table 1  
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 Requirement

#### Lowest Channel

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Factor (dB) | Calculated at 3m (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|---------------------|---------------------------|---------------------|---------------------------|------------------------------|-------------|
| V            | 2402.000        | 111.0          | 33                | 29.4                | 107.4                     | 24.6                | 82.8                      | 94.0                         | -11.2       |
| H            | 4804.000        | 39.9           | 33                | 34.9                | 41.8                      | 24.6                | 17.2                      | 54.0                         | -36.8       |
| V            | 7206.000        | 38.6           | 33                | 37.9                | 43.5                      | 24.6                | 18.9                      | 54.0                         | -35.1       |
| H            | 9608.000        | 38.9           | 33                | 40.4                | 46.3                      | 24.6                | 21.7                      | 54.0                         | -32.3       |
| V            | 12010.000       | 39.5           | 33                | 40.5                | 47.0                      | 24.6                | 22.4                      | 54.0                         | -31.6       |
| H            | 14412.000       | 42.6           | 33                | 40.0                | 49.6                      | 24.6                | 25.0                      | 54.0                         | -29.0       |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|---------------------|---------------------------|---------------------------|-------------|
| V            | 2402.000        | 111.0          | 33                | 29.4                | 107.4                     | 114.0                     | -6.6        |
| H            | 4804.000        | 39.9           | 33                | 34.9                | 41.8                      | 74.0                      | -32.2       |
| V            | 7206.000        | 38.6           | 33                | 37.9                | 43.5                      | 74.0                      | -30.5       |
| H            | 9608.000        | 38.9           | 33                | 40.4                | 46.3                      | 74.0                      | -27.7       |
| V            | 12010.000       | 39.5           | 33                | 40.5                | 47.0                      | 74.0                      | -27.0       |
| H            | 14412.000       | 42.6           | 33                | 40.0                | 49.6                      | 74.0                      | -24.4       |

- NOTES:
1. Peak Detector Data unless otherwise stated.
  2. All measurements were made at 3 meters.
  3. Negative sign in the column shows value below limit.
  4. Horn antenna is used for the emission over 1000MHz.
  5. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen 8.10.
  6. Measurement Uncertainty is  $\pm 5.3$ dB at a level of confidence of 95%.

## TEST REPORT

Model: RIG 700 /700

Date of Test: March 01, 2022

Worst-Case Operating Mode: Transmitting

Table 2  
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 Requirement

### Middle Channel

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Factor (dB) | Calculated at 3m (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|---------------------|---------------------------|---------------------|---------------------------|------------------------------|-------------|
| H            | 2440.000        | 110.4          | 33                | 29.4                | 106.8                     | 24.6                | 82.2                      | 94.0                         | -11.8       |
| V            | 4880.000        | 39.5           | 33                | 34.9                | 41.4                      | 24.6                | 16.8                      | 54.0                         | -37.2       |
| V            | 7320.000        | 39.1           | 33                | 37.9                | 44.0                      | 24.6                | 19.4                      | 54.0                         | -34.6       |
| H            | 9760.000        | 39.1           | 33                | 40.4                | 46.5                      | 24.6                | 21.9                      | 54.0                         | -32.1       |
| H            | 12200.000       | 38.6           | 33                | 40.5                | 46.1                      | 24.6                | 21.5                      | 54.0                         | -32.5       |
| H            | 14640.000       | 44.1           | 33                | 38.4                | 49.5                      | 24.6                | 24.9                      | 54.0                         | -29.1       |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|---------------------|---------------------------|---------------------------|-------------|
| H            | 2440.000        | 110.4          | 33                | 29.4                | 106.8                     | 114.0                     | -7.2        |
| V            | 4880.000        | 39.5           | 33                | 34.9                | 41.4                      | 74.0                      | -32.6       |
| V            | 7320.000        | 39.1           | 33                | 37.9                | 44.0                      | 74.0                      | -30.0       |
| H            | 9760.000        | 39.1           | 33                | 40.4                | 46.5                      | 74.0                      | -27.5       |
| H            | 12200.000       | 38.6           | 33                | 40.5                | 46.1                      | 74.0                      | -27.9       |
| H            | 14640.000       | 44.1           | 33                | 38.4                | 49.5                      | 74.0                      | -24.5       |

- NOTES:
1. Peak Detector Data unless otherwise stated.
  2. All measurements were made at 3 meters.
  3. Negative sign in the column shows value below limit.
  4. Horn antenna is used for the emission over 1000MHz. (for Over 1GHz)
  5. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen 8.10.
  6. Measurement Uncertainty is  $\pm 5.3$ dB at a level of confidence of 95%.

## TEST REPORT

Model: RIG 700 /700

Date of Test: March 01, 2022

Worst-Case Operating Mode: Transmitting

Table 3  
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 Requirement

### Highest Channel

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Average Factor (dB) | Calculated at 3m (dBμV/m) | Average Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|---------------------|---------------------------|---------------------|---------------------------|------------------------------|-------------|
| V            | 2480.000        | 108.7          | 33                | 29.4                | 105.1                     | 24.6                | 80.5                      | 94.0                         | -13.5       |
| V            | 4960.000        | 39.6           | 33                | 34.9                | 41.5                      | 24.6                | 16.9                      | 54.0                         | -37.1       |
| V            | 7440.000        | 38.9           | 33                | 37.9                | 43.8                      | 24.6                | 19.2                      | 54.0                         | -34.8       |
| V            | 9920.000        | 38.8           | 33                | 40.4                | 46.2                      | 24.6                | 21.6                      | 54.0                         | -32.4       |
| V            | 12400.000       | 38.6           | 33                | 40.5                | 46.1                      | 24.6                | 21.5                      | 54.0                         | -32.5       |
| V            | 14880.000       | 44.3           | 33                | 38.4                | 49.7                      | 24.6                | 25.1                      | 54.0                         | -28.9       |

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBμV/m) | Peak Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|-------------------|---------------------|---------------------------|---------------------------|-------------|
| V            | 2480.000        | 108.7          | 33                | 29.4                | 105.1                     | 114.0                     | -8.9        |
| V            | 4960.000        | 39.6           | 33                | 34.9                | 41.5                      | 74.0                      | -32.5       |
| V            | 7440.000        | 38.9           | 33                | 37.9                | 43.8                      | 74.0                      | -30.2       |
| V            | 9920.000        | 38.8           | 33                | 40.4                | 46.2                      | 74.0                      | -27.8       |
| V            | 12400.000       | 38.6           | 33                | 40.5                | 46.1                      | 74.0                      | -27.9       |
| V            | 14880.000       | 44.3           | 33                | 38.4                | 49.7                      | 74.0                      | -24.3       |

- NOTES:
1. Peak Detector Data unless otherwise stated.
  2. All measurements were made at 3 meters.
  3. Negative sign in the column shows value below limit.
  4. Horn antenna is used for the emission over 1000MHz. (for Over 1GHz)
  5. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen 8.10.
  6. Measurement Uncertainty is  $\pm 5.3$ dB at a level of confidence of 95%.

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Model: RIG 700 /700

Date of Test: March 01, 2022

Worst-Case Operating Mode: Transmitting

Table 4  
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10 Requirement

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-amp (dB) | Antenna Factor (dB) | Net at 3m (dBμV/m) | Limit at 3m (dBμV/m) | Margin (dB) |
|--------------|-----------------|----------------|--------------|---------------------|--------------------|----------------------|-------------|
| V            | 112.141         | 17.8           | 16           | 14.0                | 15.8               | 43.5                 | -27.7       |
| V            | 118.600         | 20.6           | 16           | 14.0                | 18.6               | 43.5                 | -24.9       |
| V            | 131.031         | 23.9           | 16           | 14.0                | 21.9               | 43.5                 | -21.6       |
| V            | 137.856         | 16.7           | 16           | 14.0                | 14.7               | 43.5                 | -28.9       |
| V            | 149.922         | 16.5           | 16           | 14.0                | 14.5               | 43.5                 | -29.0       |
| V            | 160.403         | 13.9           | 16           | 16.0                | 13.9               | 43.5                 | -29.6       |

- NOTES:
1. Peak Detector Data unless otherwise stated.
  2. All measurements were made at 3 meters.
  3. Negative sign in the column shows value below limit.
  4. Horn antenna is used for the emission over 1000MHz.
  5. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen 8.10.
  6. Measurement Uncertainty is  $\pm 5.3$ dB at a level of confidence of 95%.

## TEST REPORT

### 4.0 EQUIPMENT PHOTOGRAPHS

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

### 5.0 PRODUCT LABELLING

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

### 6.0 TECHNICAL SPECIFICATIONS

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

### 7.0 INSTRUCTION MANUAL

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States and Canada.

## TEST REPORT

### 8.0 MISCELLANEOUS INFORMATION

The miscellaneous information includes details of the test procedure and measured bandwidth calculation of factor such as pulse desensitization and averaging factor (calculation and timing diagram).

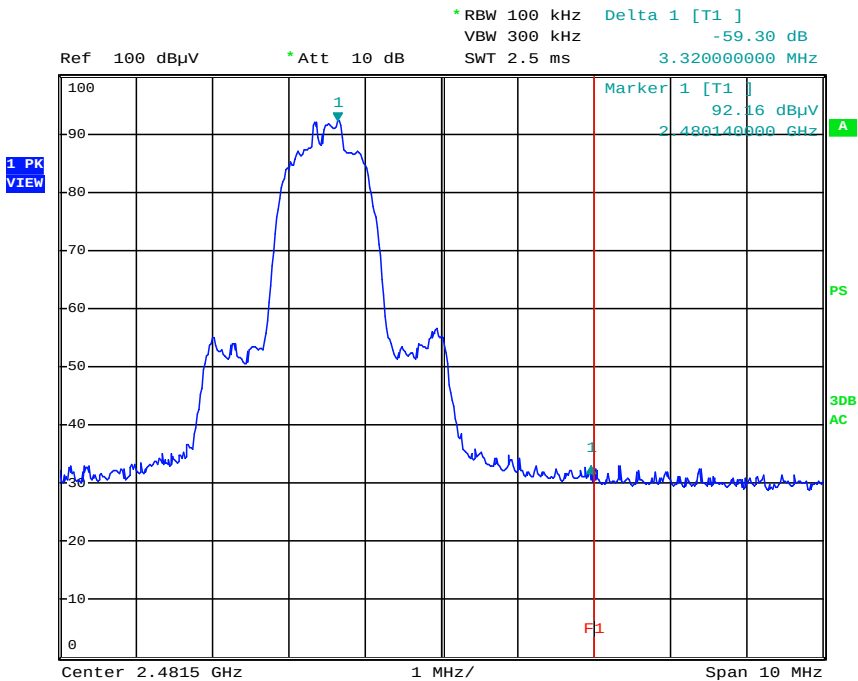
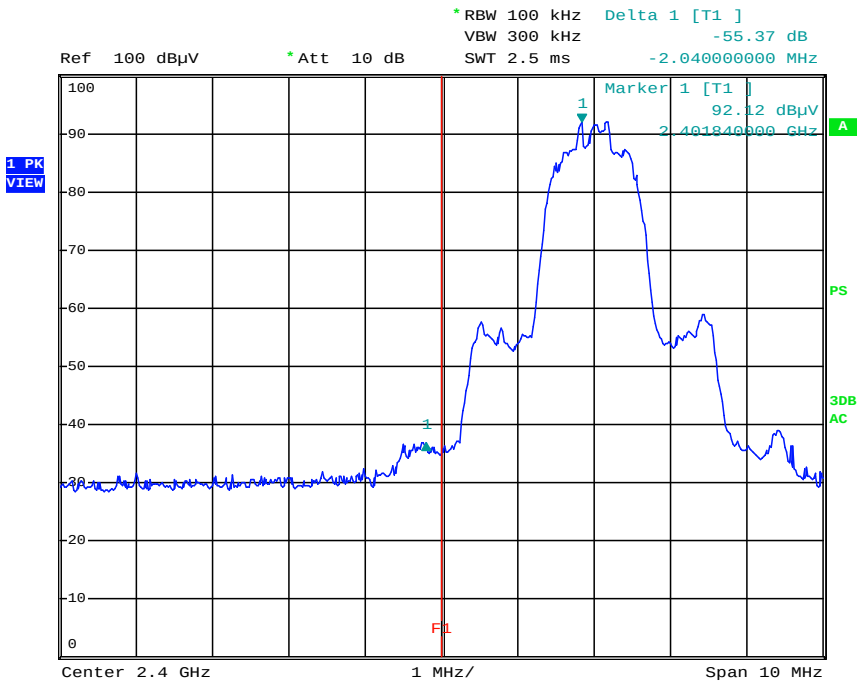
#### 8.1 Measured Bandwidth

From the following plots, they show that the fundamental emissions are confined in the specified band (2400MHz to 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard bandwidth is the bandwidth specified by ANSI C63.10 (2013) for frequency being measured.

Emissions radiated outside of the specified frequency bands, except harmonics, are attenuated by 50dB below the level of the fundamental or to the general radiated emissions limits in part 15.209 / RSS-Gen 8.9 whichever is the lesser attenuation, which meet the requirement of part 15.249(d) / RSS-210 B.10.

TEST REPORT

PEAK MEASUREMENT





## TEST REPORT

### PEAK MEASUREMENT

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=107.4 dB $\mu$ V/m – 55.37 dB

=52.03 dB $\mu$ V/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=82.8 dB $\mu$ V/m – 55.37 dB

=27.43 dB $\mu$ V/m

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=105.1 dB $\mu$ V/m – 59.3 dB

=45.8 dB $\mu$ V/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=80.5 dB $\mu$ V/m – 59.3 dB

=21.2 dB $\mu$ V/m

The resultant field strength meets the general radiated emission limit in Section 15.209 / RSS-Gen 8.9 which does not exceed 74 dB $\mu$ V/m (Peak Limit) and 54 dB $\mu$ V/m (Average Limit).

## TEST REPORT

### 8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (Teff) is approximately 2950µs for a digital "1" bit which illustrated on technical specification, with a resolution bandwidth (3dB) of 3MHz, so the pulse desensitivity factor is 0dB.

### 8.3 Calculation of Average Factor

The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 100 ms

Effective period of the cycle = 2.95ms x 2

DC = 0.059

Therefore, the averaging factor is found by  $20\log 0.059 = -24.6\text{dB}$ .

For the worst case calculation, there are two transmissions might occur in 100ms. Therefore,

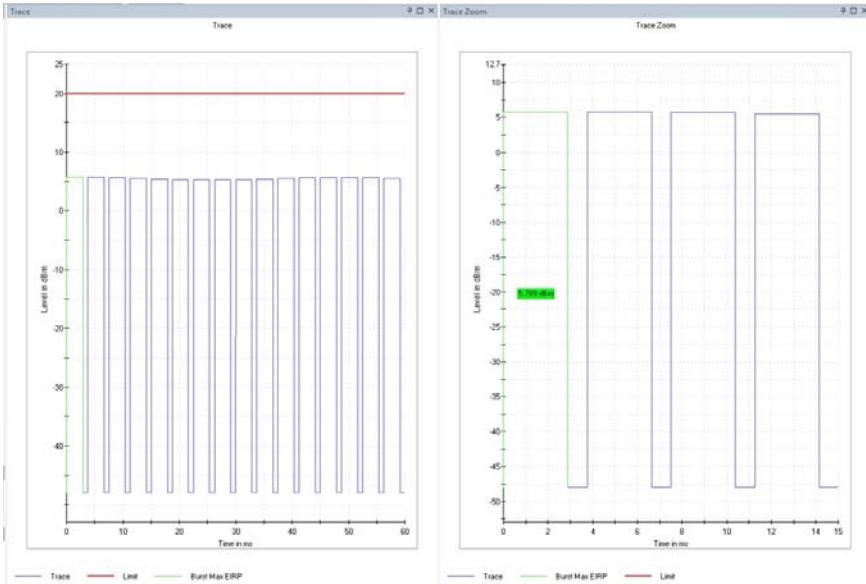
Duty Cycle (DC) = Maximum On time in 100ms/100ms  
= 2.95ms x 2/100ms  
= 0.059

Average Factor (AF) in dB =  $20 \log_{10} (0.059)$   
= -24.6 dB

The duty cycle has been shown as below;

TEST REPORT

|                         |          |    |
|-------------------------|----------|----|
| Hopping mode duty cycle | 77%      |    |
| hopping channel         | 20       |    |
| evaluation time         | 1000     | ms |
| On Time                 | 2.95     | ms |
| Off Time                | 0.881169 | ms |
| per cycle               | 76.62    | ms |
| on Time per 100 ms Max  | 5.9      |    |
| Duty                    | 5.9%     |    |



## TEST REPORT

### 8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately 0.8m in height above the ground plane for emission measurement at or below 1GHz and 1.5m in height above the ground plane for emission measurement above 1GHz. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.10 (2013).

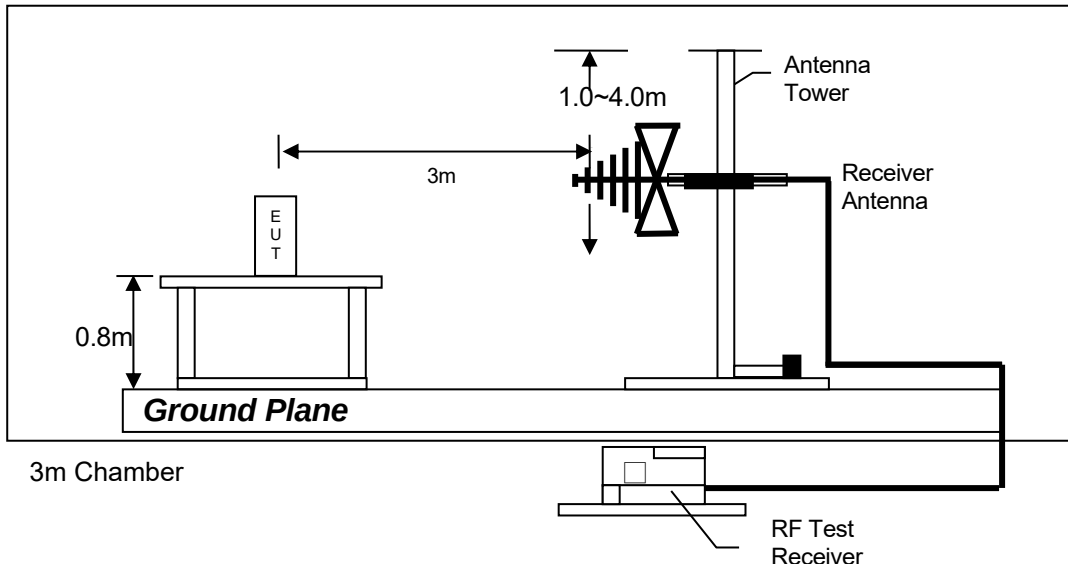
The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 3 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

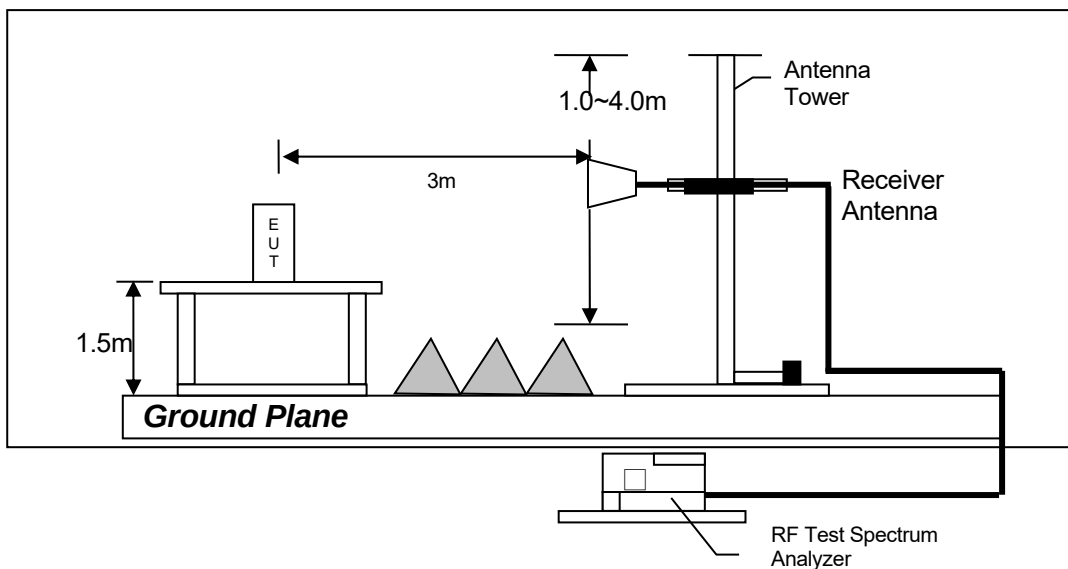
## TEST REPORT

### 8.4.1 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



Test setup of radiated emissions up to 1GHz



Test setup of radiated emissions above 1GHz

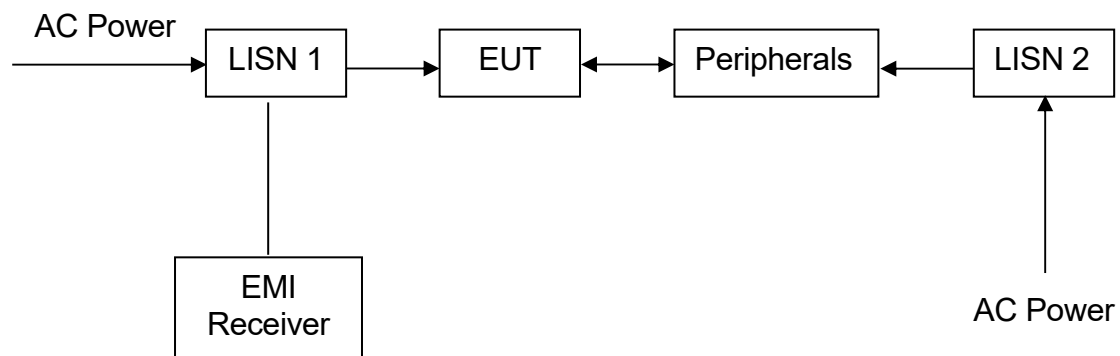
## TEST REPORT

### 8.4.2 Conducted Emission Test Procedures

For tabletop equipment, the EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table. For floor-standing equipment, the EUT and all cables were insulated, if required, from the ground plane by up to 12 mm of insulating material. The EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were moved to find the maximum emission.

### 8.4.3 Conducted Emission Test Setup



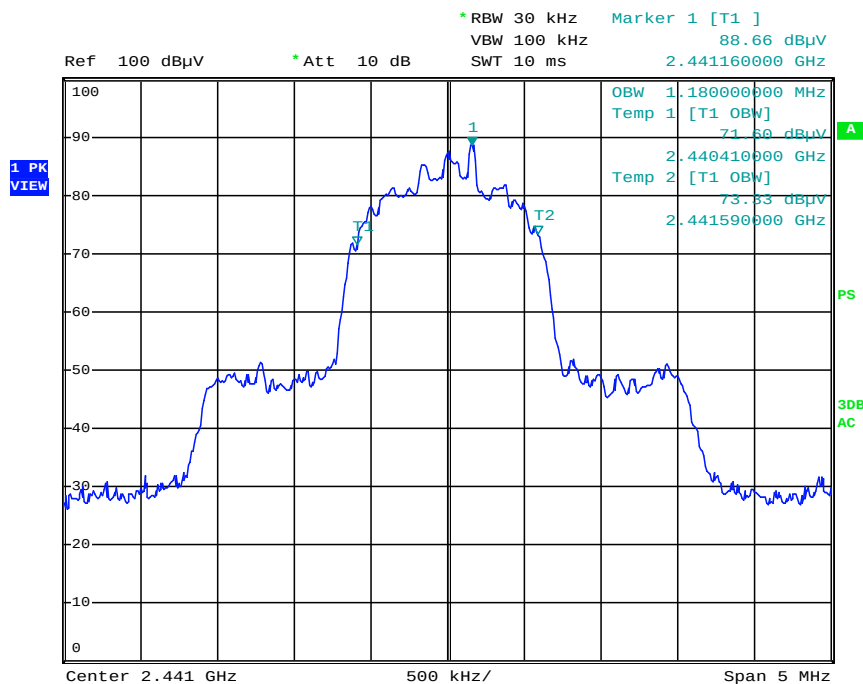
## TEST REPORT

### 8.5 Occupied Bandwidth

Occupied Bandwidth Results:

| Occupied Bandwidth (kHz) |      |
|--------------------------|------|
| Low Channel: 2402        | 1170 |
| Middle Channel: 2440     | 1180 |
| High Channel: 2480       | 1170 |

The worst case is shown as below



## TEST REPORT

### 9.0 EQUIPMENT LIST

#### 1) Radiated Emissions Test

| Equipment            | Signal and Spectrum Analyzer (10Hz to 40GHz) | EMI Test Receiver 7GHz | Biconical Antenna (20MHz to 200MHz) |
|----------------------|----------------------------------------------|------------------------|-------------------------------------|
| Registration No.     | EW-3016                                      | EW-3481                | EW-3061                             |
| Manufacturer         | ROHDESCHWARZ                                 | ROHDESCHWARZ           | EMCO                                |
| Model No.            | FSV40                                        | ESR7                   | 3142E                               |
| Calibration Date     | October 29, 2021                             | December 21, 2021      | February 02, 2021                   |
| Calibration Due Date | October 29, 2022                             | December 21, 2022      | August 02, 2022                     |

| Equipment            | Log Periodic Antenna | Double Ridged Guide Antenna | Active Loop H-field (9kHz to 30MHz) |
|----------------------|----------------------|-----------------------------|-------------------------------------|
| Registration No.     | EW-3243              | EW-1133                     | EW-3302                             |
| Manufacturer         | EMCO                 | EMCO                        | EMCO                                |
| Model No.            | 3148B                | 3115                        | 6502                                |
| Calibration Date     | June 30, 2021        | June 03, 2021               | December 13, 2021                   |
| Calibration Due Date | December 30, 2022    | June 03, 2022               | June 13, 2023                       |

| Equipment            | RF Preamplifier (9kHz to 6000MHz) | 2.4GHz Notch Filter | 14m Double Shield RF Cable (20MHz to 6GHz) |
|----------------------|-----------------------------------|---------------------|--------------------------------------------|
| Registration No.     | EW-3006b                          | EW-3435             | EW-2074                                    |
| Manufacturer         | SCHWARZBECK                       | MICROWAVE           | RADIAL                                     |
| Model No.            | BBV9718                           | N0324413            | N(m)-RG142-BNC(m)<br>L=14M                 |
| Calibration Date     | November 25, 2019                 | November 16, 2019   | November 14, 2019                          |
| Calibration Due Date | June 25, 2022                     | June 16, 2022       | August 14, 2022                            |

| Equipment            | Pyramidal Horn Antenna |
|----------------------|------------------------|
| Registration No.     | EW-0905                |
| Manufacturer         | EMCO                   |
| Model No.            | 3160-09                |
| Calibration Date     | July 23, 2019          |
| Calibration Due Date | June 23, 2022          |



## TEST REPORT

### 2) Conducted Emissions Test

| Equipment            | RF Cable 240cm<br>(RG142)<br>(9kHz to 30MHz) | Artificial Mains<br>Network | (EMI Test Receiver) |
|----------------------|----------------------------------------------|-----------------------------|---------------------|
| Registration No.     | EW-2454                                      | EW-2501                     | EW-2500             |
| Manufacturer         | RADIAL                                       | ROHDESCHWARZ                | ROHDESCHWARZ        |
| Model No.            | Bnc m st / 142 / bnc<br>mra 240cm            | ENV-216                     | ESCI                |
| Calibration Date     | January 26, 2022                             | November 09, 2021           | March 29, 2021      |
| Calibration Due Date | January 26, 2023                             | November 09, 2022           | March 29, 2022      |

### 3) Bandedge Measurement & Duty Cycle

| Equipment            | Spectrum Analyzer | Open Switch and<br>Control Unit (OSP120<br>Serial 101258) |
|----------------------|-------------------|-----------------------------------------------------------|
| Registration No.     | EW-2466           | EW-3064                                                   |
| Manufacturer         | ROHDESCHWARZ      | ROHDESCHWARZ                                              |
| Model No.            | FSP30             | OSP120 Incl. B157                                         |
| Calibration Date     | November 18, 2019 | April 19, 2021                                            |
| Calibration Due Date | August 18, 2022   | April 19, 2022                                            |

### 4) Control Software for Radiated emission.

| Software Information |                     |
|----------------------|---------------------|
| Software Name        | EMC32               |
| Manufacturer         | ROHDESCHWARZ        |
| Software version     | 10.50.40 & 10.40.10 |

**END OF TEST REPORT**