

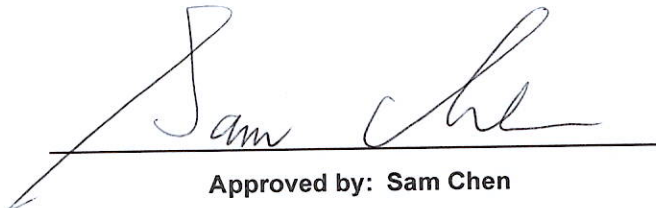


# RADIO EXPOSURE TEST REPORT

**FCC ID** : NKR-SWA54  
**Equipment** : Wireless Audio Module  
**Brand Name** : WNC  
**Model Name** : SWA54  
**Applicant** : Wistron NeWeb Corporation  
20 Park Avenue II, Hsinchu Science Park, Hsinchu  
308 Taiwan  
**Manufacturer** : Wistron NeWeb Corporation  
20 Park Avenue II, Hsinchu Science Park, Hsinchu  
308 Taiwan  
**Standard** : 47 CFR Part 2.1091

The product was received on Sep. 08, 2022, and testing was started from Sep. 15, 2022 and completed on Oct. 20, 2022. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR Part 2.1091 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.



Approved by: Sam Chen

**Sporton International Inc. Hsinchu Laboratory**  
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## Table of Contents

|   |           |
|---|-----------|
| History of this test report.....                | 3         |
| Summary of Test Result.....                     | 4         |
| <b>1 General Description .....</b>              | <b>5</b>  |
| 1.1 EUT General Information .....               | 5         |
| 1.2 Channel List.....                           | 6         |
| 1.3 Antenna Information .....                   | 10        |
| 1.4 Table for EUT type information .....        | 11        |
| 1.5 Accessories .....                           | 11        |
| 1.6 Applicable Standards .....                  | 11        |
| 1.7 Testing Location .....                      | 11        |
| <b>2 Maximum Permissible Exposure .....</b>     | <b>12</b> |
| 2.1 Limit of Maximum Permissible Exposure ..... | 12        |
| 2.2 MPE Calculation Method.....                 | 12        |
| 2.3 MPE Exemption.....                          | 13        |
| 2.4 Calculated Result and Limit.....            | 14        |

### Photographs of EUT v01





## Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items          | Result (PASS/FAIL) | Remark |
|---------------|-----------------|---------------------|--------------------|--------|
| 2             | -               | Exposure evaluation | PASS               | -      |

**Declaration of Conformity:**

1. The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to report "Measurement Uncertainty".

**Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: **Sam Chen**

Report Producer: **Jessie Wei**



# 1 General Description

## 1.1 EUT General Information

| Frequency Range (MHz) | Mode       | Bandwidth | Frequency Spacing (MHz) | Ch. Frequency (MHz) | Channel Number |
|-----------------------|------------|-----------|-------------------------|---------------------|----------------|
| 5150-5250             | pi/4-DQPSK | 2MHz      | 2                       | 5157.35-5247.35     | 3-48 [46]      |
|                       |            | 4MHz      |                         | 5160.35-5246.35     | 4-47 [44]      |
| 2MHz                  |            | 2         | 5726.35-5848.35         | 0-61 [62]           |                |
| 4MHz                  |            |           | 5727.35-5847.35         | 0-60 [61]           |                |
| 5725-5895             |            | 2MHz      | 2                       | 5850.35-5874.35     | 62-74 [13]     |
|                       |            | 4MHz      |                         | 5849.35-5875.35     | 61-74 [14]     |



### 1.2 Channel List

| Frequency Band           | Bandwidth | Channel No. | Frequency | Channel No. | Frequency |
|--------------------------|-----------|-------------|-----------|-------------|-----------|
| 5.15-5.25GHz<br>(UNII 1) | 2 MHz     | 3           | 5157.35   | 26          | 5203.35   |
|                          |           | 4           | 5159.35   | 27          | 5205.35   |
|                          |           | 5           | 5161.35   | 28          | 5207.35   |
|                          |           | 6           | 5163.35   | 29          | 5209.35   |
|                          |           | 7           | 5165.35   | 30          | 5211.35   |
|                          |           | 8           | 5167.35   | 31          | 5213.35   |
|                          |           | 9           | 5169.35   | 32          | 5215.35   |
|                          |           | 10          | 5171.35   | 33          | 5217.35   |
|                          |           | 11          | 5173.35   | 34          | 5219.35   |
|                          |           | 12          | 5175.35   | 35          | 5221.35   |
|                          |           | 13          | 5177.35   | 36          | 5223.35   |
|                          |           | 14          | 5179.35   | 37          | 5225.35   |
|                          |           | 15          | 5181.35   | 38          | 5227.35   |
|                          |           | 16          | 5183.35   | 39          | 5229.35   |
|                          |           | 17          | 5185.35   | 40          | 5231.35   |
|                          |           | 18          | 5187.35   | 41          | 5233.35   |
|                          |           | 19          | 5189.35   | 42          | 5235.35   |
|                          |           | 20          | 5191.35   | 43          | 5237.35   |
|                          |           | 21          | 5193.35   | 44          | 5239.35   |
|                          |           | 22          | 5195.35   | 45          | 5241.35   |
|                          |           | 23          | 5197.35   | 46          | 5243.35   |
|                          |           | 24          | 5199.35   | 47          | 5245.35   |
|                          |           | 25          | 5201.35   | 48          | 5247.35   |



| Frequency Band           | Bandwidth | Channel No. | Frequency | Channel No. | Frequency |
|--------------------------|-----------|-------------|-----------|-------------|-----------|
| 5.15-5.25GHz<br>(UNII 1) | 4 MHz     | 4           | 5160.35   | 26          | 5204.35   |
|                          |           | 5           | 5162.35   | 27          | 5206.35   |
|                          |           | 6           | 5164.35   | 28          | 5208.35   |
|                          |           | 7           | 5166.35   | 29          | 5210.35   |
|                          |           | 8           | 5168.35   | 30          | 5212.35   |
|                          |           | 9           | 5170.35   | 31          | 5214.35   |
|                          |           | 10          | 5172.35   | 32          | 5216.35   |
|                          |           | 11          | 5174.35   | 33          | 5218.35   |
|                          |           | 12          | 5176.35   | 34          | 5220.35   |
|                          |           | 13          | 5178.35   | 35          | 5222.35   |
|                          |           | 14          | 5180.35   | 36          | 5224.35   |
|                          |           | 15          | 5182.35   | 37          | 5226.35   |
|                          |           | 16          | 5184.35   | 38          | 5228.35   |
|                          |           | 17          | 5186.35   | 39          | 5230.35   |
|                          |           | 18          | 5188.35   | 40          | 5232.35   |
|                          |           | 19          | 5190.35   | 41          | 5234.35   |
|                          |           | 20          | 5192.35   | 42          | 5236.35   |
|                          |           | 21          | 5194.35   | 43          | 5238.35   |
|                          |           | 22          | 5196.35   | 44          | 5240.35   |
|                          |           | 23          | 5198.35   | 45          | 5242.35   |
|                          |           | 24          | 5200.35   | 46          | 5244.35   |
|                          |           | 25          | 5202.35   | 47          | 5246.35   |



| Frequency Band            | Bandwidth | Channel No. | Frequency | Channel No. | Frequency |
|---------------------------|-----------|-------------|-----------|-------------|-----------|
| 5.725-5.85GHz<br>(UNII 3) | 2 MHz     | 0           | 5726.35   | 31          | 5788.35   |
|                           |           | 1           | 5728.35   | 32          | 5790.35   |
|                           |           | 2           | 5730.35   | 33          | 5792.35   |
|                           |           | 3           | 5732.35   | 34          | 5794.35   |
|                           |           | 4           | 5734.35   | 35          | 5796.35   |
|                           |           | 5           | 5736.35   | 36          | 5798.35   |
|                           |           | 6           | 5738.35   | 37          | 5800.35   |
|                           |           | 7           | 5740.35   | 38          | 5802.35   |
|                           |           | 8           | 5742.35   | 39          | 5804.35   |
|                           |           | 9           | 5744.35   | 40          | 5806.35   |
|                           |           | 10          | 5746.35   | 41          | 5808.35   |
|                           |           | 11          | 5748.35   | 42          | 5810.35   |
|                           |           | 12          | 5750.35   | 43          | 5812.35   |
|                           |           | 13          | 5752.35   | 44          | 5814.35   |
|                           |           | 14          | 5754.35   | 45          | 5816.35   |
|                           |           | 15          | 5756.35   | 46          | 5818.35   |
|                           |           | 16          | 5758.35   | 47          | 5820.35   |
|                           |           | 17          | 5760.35   | 48          | 5822.35   |
|                           |           | 18          | 5762.35   | 49          | 5824.35   |
|                           |           | 19          | 5764.35   | 50          | 5826.35   |
|                           |           | 20          | 5766.35   | 51          | 5828.35   |
|                           |           | 21          | 5768.35   | 52          | 5830.35   |
|                           |           | 22          | 5770.35   | 53          | 5832.35   |
|                           |           | 23          | 5772.35   | 54          | 5834.35   |
|                           |           | 24          | 5774.35   | 55          | 5836.35   |
|                           |           | 25          | 5776.35   | 56          | 5838.35   |
|                           |           | 26          | 5778.35   | 57          | 5840.35   |
|                           |           | 27          | 5780.35   | 58          | 5842.35   |
|                           |           | 28          | 5782.35   | 59          | 5844.35   |
|                           |           | 29          | 5784.35   | 60          | 5846.35   |
|                           |           | 30          | 5786.35   | 61          | 5848.35   |





| Frequency Band            | Bandwidth | Channel No. | Frequency | Channel No. | Frequency |
|---------------------------|-----------|-------------|-----------|-------------|-----------|
| 5.725-5.85GHz<br>(UNII 3) | 4 MHz     | 0           | 5727.35   | 31          | 5789.35   |
|                           |           | 1           | 5729.35   | 32          | 5791.35   |
|                           |           | 2           | 5731.35   | 33          | 5793.35   |
|                           |           | 3           | 5733.35   | 34          | 5795.35   |
|                           |           | 4           | 5735.35   | 35          | 5797.35   |
|                           |           | 5           | 5737.35   | 36          | 5799.35   |
|                           |           | 6           | 5739.35   | 37          | 5801.35   |
|                           |           | 7           | 5741.35   | 38          | 5803.35   |
|                           |           | 8           | 5743.35   | 39          | 5805.35   |
|                           |           | 9           | 5745.35   | 40          | 5807.35   |
|                           |           | 10          | 5747.35   | 41          | 5809.35   |
|                           |           | 11          | 5749.35   | 42          | 5811.35   |
|                           |           | 12          | 5751.35   | 43          | 5813.35   |
|                           |           | 13          | 5753.35   | 44          | 5815.35   |
|                           |           | 14          | 5755.35   | 45          | 5817.35   |
|                           |           | 15          | 5757.35   | 46          | 5819.35   |
|                           |           | 16          | 5759.35   | 47          | 5821.35   |
|                           |           | 17          | 5761.35   | 48          | 5823.35   |
|                           |           | 18          | 5763.35   | 49          | 5825.35   |
|                           |           | 19          | 5765.35   | 50          | 5827.35   |
|                           |           | 20          | 5767.35   | 51          | 5829.35   |
|                           |           | 21          | 5769.35   | 52          | 5831.35   |
|                           |           | 22          | 5771.35   | 53          | 5833.35   |
|                           |           | 23          | 5773.35   | 54          | 5835.35   |
|                           |           | 24          | 5775.35   | 55          | 5837.35   |
|                           |           | 25          | 5777.35   | 56          | 5839.35   |
|                           |           | 26          | 5779.35   | 57          | 5841.35   |
|                           |           | 27          | 5781.35   | 58          | 5843.35   |
|                           |           | 28          | 5783.35   | 59          | 5845.35   |
|                           |           | 29          | 5785.35   | 60          | 5847.35   |
|                           |           | 30          | 5787.35   | -           | -         |



| Frequency Band             | Bandwidth | Channel No. | Frequency | Channel No. | Frequency |
|----------------------------|-----------|-------------|-----------|-------------|-----------|
| 5.725-5.895GHz<br>(UNII 4) | 2 MHz     | 62          | 5850.35   | 69          | 5864.35   |
|                            |           | 63          | 5852.35   | 70          | 5866.35   |
|                            |           | 64          | 5854.35   | 71          | 5868.35   |
|                            |           | 65          | 5856.35   | 72          | 5870.35   |
|                            |           | 66          | 5858.35   | 73          | 5872.35   |
|                            |           | 67          | 5860.35   | 74          | 5874.35   |
|                            |           | 68          | 5862.35   | -           | -         |

| Frequency Band             | Bandwidth | Channel No. | Frequency | Channel No. | Frequency |
|----------------------------|-----------|-------------|-----------|-------------|-----------|
| 5.725-5.895GHz<br>(UNII 4) | 4 MHz     | 61          | 5849.35   | 68          | 5863.35   |
|                            |           | 62          | 5851.35   | 69          | 5865.35   |
|                            |           | 63          | 5853.35   | 70          | 5867.35   |
|                            |           | 64          | 5855.35   | 71          | 5869.35   |
|                            |           | 65          | 5857.35   | 72          | 5871.35   |
|                            |           | 66          | 5859.35   | 73          | 5873.35   |
|                            |           | 67          | 5861.35   | 74          | 5875.35   |

### 1.3 Antenna Information

| Ant. | Port | Brand  | Model Name     | Antenna Type    | Connector | Gain (dBi) |        |        | Remark   |
|------|------|--------|----------------|-----------------|-----------|------------|--------|--------|----------|
|      |      |        |                |                 |           | UNII 1     | UNII 3 | UNII 4 |          |
| 1    | 1    | WNC    | SWA54          | Printed Antenna | N/A       | 4.32       | 4.90   | 4.50   | Internal |
| 2    | 2    | WNC    | SWA54          | Printed Antenna | N/A       | 2.40       | 3.50   | 2.96   |          |
| 3    | 1    | KINGRF | IA.0355.LA.2FI | PCB Antenna     | I-PEX     | 3.03       | 4.23   | 3.01   | External |

Note: The above information was declared by manufacturer.

#### For EUT 1:

The EUT supports the antenna with TX and RX diversity functions.

Both Ant. 1(Port 1) and Ant. 2(Port 2) support transmit and receive functions, but only one of them will be used at one time.

The Ant. 1(Port 1) generated the worst case, so it was selected to test and record in the report.

#### For EUT 2:

Ant. 3(Port 1) can be used as transmitting/receiving antenna.



### 1.4 Table for EUT type information

| EUT Type            | Module | Firmware | Description                                     |
|---------------------|--------|----------|---|
| EUT 1<br>(Internal) | TX     | 72.1.15  | The variation of EUT is for different firmware. |
|                     | RX     | 72.1.1   |   |
| EUT 2<br>(External) | TX     | 72.1.15  |   |
|                     | RX     | 72.1.1   |   |

Note: The above information was declared by manufacturer.

### 1.5 Accessories

N/A

### 1.6 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 2.1091
  - ♦ KDB 447498 D04 Interim General RF Exposure Guidance v01
- The following reference test guidance is not within the scope of accreditation of TAF.
- ♦ 47 CFR Part 1.1307
  - ♦ 47 CFR Part 1.1310

### 1.7 Testing Location

| Testing Location Information                              |  |
|---|--|
| Test Lab. : Sporton International Inc. Hsinchu Laboratory |  |
| Hsinchu<br>(TAF: 3787)                                    | ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)<br>TEL: 886-3-656-9065 FAX: 886-3-656-9085<br>Test site Designation No. TW3787 with FCC.<br>Conformity Assessment Body Identifier (CABID) TW3787 with ISED. |



## 2 Maximum Permissible Exposure

### 2.1 Limit of Maximum Permissible Exposure

(A) Limits for Occupational / Controlled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|--|--|
| 0.3-3.0               | 614                               | 1.63                              | *(100)                                   | <6   |
| 3.0-30                | 1842/f                            | 4.89/f                            | *(900/f <sup>2</sup> )                   | <6   |
| 30-300                | 61.4                              | 0.163                             | 1.0                                      | <6   |
| 300-1500              | -                                 | -                                 | f/300                                    | <6   |
| 1500-100,000          | -                                 | -                                 | 5  | <6   |

(B) Limits for General Population / Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|--|--|
| 0.3-1.34              | 614                               | 1.63                              | *(100)                                   | <30  |
| 1.34-30               | 824/f                             | 2.19/f                            | *(180/f <sup>2</sup> )                   | <30  |
| 30-300                | 27.5                              | 0.073                             | 0.2                                      | <30  |
| 300-1500              | -                                 | -                                 | f/1500                                   | <30  |
| 1500-100,000          | -                                 | -                                 | 1.0                                      | <30  |

Note: f = frequency in MHz ; \*Plane-wave equivalent power density

### 2.2 MPE Calculation Method

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

**E** = Electric field (V/m)

**P** = RF output power (W)

**G** = EUT Antenna numeric gain (numeric)

**d** = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$



### 2.3 MPE Exemption

Option (A): 1.1307(b)(3)(i)(A): Available maximum time-averaged power is < 1 mW

Option (B): 1.1307(b)(3)(i)(B): Device operates between 300 MHz and 6 GHz and the maximum time-averaged power or effective radiated power (ERP), whichever is greater, <= Pth.

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left( \frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Option (C): 1.1307(b)(3)(i)(C): ERP is below a threshold calculated based on the distance

R between the person and the antenna / radiating structure, where  $R > \lambda / 2 \pi$ .

| Single RF Sources Subject to Routine Environmental Evaluation |  |
|---|--|
| RF Source frequency (MHz)                                     | Threshold ERP (watts)                  |
| 0.3-1.34  | 1,920 R <sup>2</sup> .                 |
| 1.34-30   | 3,450 R <sup>2</sup> /f <sup>2</sup> . |
| 30-300  | 3.83 R <sup>2</sup> .                  |
| 300-1,500   | 0.0128 R <sup>2</sup> f.               |
| 1,500-100,000   | 19.2R <sup>2</sup> .                   |

Note: R is in meters, f is in MHz.



## 2.4 Calculated Result and Limit

**Exposure Environment: General Population / Uncontrolled Exposure**

**For EUT 1**

| Mode      | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up EIRP (dBm) | Distance (cm) | S (mW/cm <sup>2</sup> ) | S Limit (mW/cm <sup>2</sup> ) | Option *1 | TL EIRP (dBm) *2 | TL Ratio *3 |
|-----------|----------|-------------|------------|----------------|--------------------|---------------|-------------------------|-------------------------------|-----------|------------------|-------------|
| 5.2G;G7D  | 4.32     | 15.89       | 20.21      | 0.50           | 20.71              | 20            | 0.02343                 | 1.00000                       | B         | 37.006           | 0.0235      |
| 5.8G;G7D  | 4.90     | 15.89       | 20.79      | 0.50           | 21.29              | 20            | 0.02678                 | 1.00000                       | B         | 37.006           | 0.0268      |
| 5.87G;G7D | 4.50     | 14.41       | 18.91      | 0.50           | 19.41              | 20            | 0.01737                 | 1.00000                       | B         | 37.006           | 0.0174      |

Note 1: Option A, B and C refer as clause 2.3

Note 2: For option B, Pth(mW) convert to TL EIRP(dBm); For option C, ERP(W) convert to TL EIRP(dBm)

Note 3: TL Ratio=Tune-up EIRP(mW)/TL EIRP(mW)

**For EUT 2**

| Mode      | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up EIRP (dBm) | Distance (cm) | S (mW/cm <sup>2</sup> ) | S Limit (mW/cm <sup>2</sup> ) | Option *1 | TL EIRP (dBm) *2 | TL Ratio *3 |
|-----------|----------|-------------|------------|----------------|--------------------|---------------|-------------------------|-------------------------------|-----------|------------------|-------------|
| 5.2G;G7D  | 3.03     | 15.89       | 18.92      | 0.50           | 19.42              | 20            | 0.01741                 | 1.00000                       | B         | 37.006           | 0.0174      |
| 5.8G;G7D  | 4.23     | 15.89       | 20.12      | 0.50           | 20.62              | 20            | 0.02295                 | 1.00000                       | B         | 37.006           | 0.0230      |
| 5.87G;G7D | 3.01     | 14.41       | 17.42      | 0.50           | 17.92              | 20            | 0.01232                 | 1.00000                       | B         | 37.006           | 0.0123      |

Note 1: Option A, B and C refer as clause 2.3

Note 2: For option B, Pth(mW) convert to TL EIRP(dBm); For option C, ERP(W) convert to TL EIRP(dBm)

Note 3: TL Ratio=Tune-up EIRP(mW)/TL EIRP(mW)

—————THE END—————