



## RF Exposure Evaluation Declaration

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**FCC ID:** 2ALJ3AP32X

**APPLICANT:** HAN Networks Co., Ltd

**Application Type:** Certification

**Product:** HAN Access Point

**Model No.:** AP321, AP321e

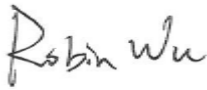
**Brand Name:** HAN NETWORKS; HANNETWORKS

**FCC Classification:** Digital Transmission System (DTS)  
Unlicensed National Information Infrastructure (NII)

**Test Procedure(s):** KDB 447498 D01v06

**Test Date:** September 30 ~ December 16, 2019

Reviewed By:   
( Sunny Sun )

Approved By:   
( Robin Wu )



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

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## Revision History

| Report No.    | Version | Description    | Issue Date | Note  |
|---------------|---------|----------------|------------|-------|
| 1909RSU036-U4 | Rev. 01 | Initial Report | 01-10-2020 | Valid |
|               |         |                |            |       |

## General Information

|                                |                                                                                                                                 |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant:</b>              | HAN Networks Co., Ltd.                                                                                                          |
| <b>Applicant Address:</b>      | 101-A16, 1 <sup>st</sup> Floor, Building 3, No.9 compound, Yongfeng Road, Haidian District, Beijing, P.R. China                 |
| <b>Manufacturer:</b>           | HAN Networks Co., Ltd.                                                                                                          |
| <b>Manufacturer Address:</b>   | 101-A16, 1 <sup>st</sup> Floor, Building 3, No.9 compound, Yongfeng Road, Haidian District, Beijing, P.R. China                 |
| <b>Test Site:</b>              | MRT Technology (Suzhou) Co., Ltd                                                                                                |
| <b>Test Site Address:</b>      | D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China                                              |
| <b>Test Device Serial No.:</b> | N/A <input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering |

## Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is a FCC accredited (MRT Designation No. CN1166) test facility with the site description report on file and has met all the requirements specified in ANSI C63.4-2014.
- MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-20025, G-20034, C-20020, T-20020) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications, Radio and SAR testing.



## 1. PRODUCT INFORMATION

### 1.1. Equipment Description

|                          |                                                                                                    |
|--------------------------|----------------------------------------------------------------------------------------------------|
| Product Name:            | HAN Access Point                                                                                   |
| Model No.:               | AP321, AP321e                                                                                      |
| Brand Name:              | HAN NETWORKS; HANNETWORKS                                                                          |
| Wi-Fi Specification:     | 802.11a/b/g/n/ac/ax                                                                                |
| Bluetooth Specification: | v5.1                                                                                               |
| Operating Temperature:   | 0 ~ 50 °C                                                                                          |
| Power Type:              | PoE input or AC adapter input                                                                      |
| Operating Environment:   | Indoor Use                                                                                         |
| Accessories              |                                                                                                    |
| Adapter 1#:              | Model No.: ADP-30HR B<br>Input Power: 100 - 240V ~ 50/60Hz, 1.0A<br>Output Power: 48VDC/0.66A      |
| Adapter 2#:              | Model No.: PD-9001 25GR/AC<br>Input Power: 100 - 240V ~ 50/60Hz, 1.5A<br>Output Power: 55VDC/0.63A |

Note: The difference between models is that EUT use different Wi-Fi antenna and appearance, other hardware and software are the same.

## 1.2. Description of Available Antennas

Model No.: AP321

| Antenna Type                                                 | Frequency Band (GHz) | T <sub>x</sub> Paths | Bandwidth (MHz)      | Max Peak Gain (dBi) |       |       |                     | Directional Gain (dBi) |             |
|--------------------------------------------------------------|----------------------|----------------------|----------------------|---------------------|-------|-------|---------------------|------------------------|-------------|
|                                                              |                      |                      |                      | Ant 0               | Ant 1 | Ant 2 | Ant 3               | CDD                    | Beamforming |
| Wi-Fi Internal Antenna List (2.4GHz 2*2 MIMO, 5GHz 4*4 MIMO) |                      |                      |                      |                     |       |       |                     |                        |             |
| Omni Antenna                                                 | 2400 ~ 2483.5        | 2                    | 20, 40               | 3.5                 | 3.5   | --    | --                  | 3.5                    | 6.51        |
|                                                              | 5150 ~ 5850          | 4                    | 20                   | 3.2                 | 3.6   | 3.7   | 3.5                 | 3.7                    | 9.52        |
|                                                              |                      |                      | 40                   |                     |       |       |                     |                        |             |
|                                                              |                      |                      | 80                   |                     |       |       |                     |                        |             |
| Bluetooth Internal Antenna                                   |                      |                      |                      |                     |       |       |                     |                        |             |
| Antenna Type                                                 |                      |                      | Frequency Band (GHz) |                     |       |       | Max Peak Gain (dBi) |                        |             |
| Omni Antenna                                                 |                      |                      | 2400 ~ 2483.5        |                     |       |       | 3.2                 |                        |             |
| Scan Internal Antenna                                        |                      |                      |                      |                     |       |       |                     |                        |             |
| Antenna Type                                                 |                      |                      | Frequency Band (GHz) |                     |       |       | Max Peak Gain (dBi) |                        |             |
| Omni Antenna                                                 |                      |                      | 2400 ~ 2483.5        |                     |       |       | 3.5                 |                        |             |
|                                                              |                      |                      | 5150 ~ 5850          |                     |       |       | 3.5                 |                        |             |

Model No.: AP321e

| Antenna Type                                                 | Frequency Band (GHz) | T <sub>x</sub> Paths | Bandwidth (MHz) | Max Peak Gain (dBi) | Directional Gain (dBi) |             |
|--------------------------------------------------------------|----------------------|----------------------|-----------------|---------------------|------------------------|-------------|
|                                                              |                      |                      |                 |                     | CDD                    | Beamforming |
| Wi-Fi Internal Antenna List (2.4GHz 2*2 MIMO, 5GHz 4*4 MIMO) |                      |                      |                 |                     |                        |             |
| Dipole                                                       | 2400 ~ 2483.5        | 2                    | 20, 40          | 3.5                 | 3.5                    | 6.51        |
|                                                              | 5150 ~ 5850          | 4                    | 20              | 6                   | 6                      | 12.02       |
|                                                              |                      |                      | 40              |                     |                        |             |
|                                                              |                      |                      | 80              |                     |                        |             |
| Bluetooth Internal Antenna                                   |                      |                      |                 |                     |                        |             |
| Antenna Type                                                 |                      | Frequency Band (GHz) |                 |                     | Max Peak Gain (dBi)    |             |
| Omni Antenna                                                 |                      | 2400 ~ 2483.5        |                 |                     | 3.2                    |             |
| Scan Internal Antenna                                        |                      |                      |                 |                     |                        |             |
| Antenna Type                                                 |                      | Frequency Band (GHz) |                 |                     | Max Peak Gain (dBi)    |             |
| Omni Antenna                                                 |                      | 2400 ~ 2483.5        |                 |                     | 3.5                    |             |
|                                                              |                      | 5150 ~ 5850          |                 |                     | 3.5                    |             |

Note 1: The EUT supports Cyclic Delay Diversity (CDD) technology for 802.11a/b/g/n/ac/ax mode.

Note 2: The EUT also supports Beam Forming technology for 802.11n/ac/ax.

Note 3: The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.

If all antennas have the same gain,  $G_{ANT}$ , Directional gain =  $G_{ANT}$  + Array Gain, where Array Gain is as follows.

- For power spectral density (PSD) measurements on all devices,  
Array Gain =  $10 \log (N_{ANT} / N_{SS})$  dB = 3.01;
- For power measurements on IEEE 802.11 devices,  
Array Gain = 0 dB for  $N_{ANT} \leq 4$ ;

If antenna gains are not equal, Directional gain may be calculated by using the formulas applicable to equal gain antennas with  $G_{ANT}$  set equal to the gain of the antenna having the highest gain.

Note 4: The EUT also supports Beam Forming mode, and the Beam Forming support 802.11n/ac/ax, not include 802.11a/b/g. The directional gain =  $10 \cdot \log [(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$  dBi.

## 2. RF Exposure Evaluation

### 2.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

#### LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency Range (MHz)                                     | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Average Time (Minutes) |
|-----------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|------------------------|
| (A) Limits for Occupational/ Control Exposures            |                               |                               |                                     |                        |
| 300-1500                                                  | --                            | --                            | f/300                               | 6                      |
| 1500-100,000                                              | --                            | --                            | 5                                   | 6                      |
| (B) Limits for General Population/ Uncontrolled Exposures |                               |                               |                                     |                        |
| 300-1500                                                  | --                            | --                            | f/1500                              | 6                      |
| 1500-100,000                                              | --                            | --                            | 1                                   | 30                     |

f= Frequency in MHz

Calculation Formula:  $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

$r$  = distance between observation point and center of the radiator in cm

$P_d$  is the limit of MPE, 1mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance  $r$  where the MPE limit is reached.

## 2.2. Test Result of RF Exposure Evaluation

|           |                        |
|-----------|------------------------|
| Product   | HAN Access Point       |
| Test Item | RF Exposure Evaluation |

| Test Mode   | Frequency Band<br>(MHz) | Maximum EIRP<br>(dBm) | Safety Distance<br>(cm) | Power Density<br>(mW/cm <sup>2</sup> ) | Limit<br>(mW/cm <sup>2</sup> ) |        |   |
|-------------|-------------------------|-----------------------|-------------------------|----------------------------------------|--------------------------------|--------|---|
| AP321       |                         |                       |                         |                                        |                                |        |   |
| Bluetooth   | 2402 ~ 2480             | 22.51                 | 20                      | 0.0355                                 | 1                              |        |   |
| Wi-Fi       | 2412 ~ 2462             | 27.80                 |                         | 0.1199                                 |                                |        |   |
|             | 5180 ~ 5240             | 33.67                 |                         | 0.4632                                 |                                |        |   |
|             | 5745 ~ 5825             | 34.32                 |                         | 0.5379                                 |                                |        |   |
|             | Scan Wi-Fi              | 2412 ~ 2462           |                         | 14.75                                  |                                | 0.0059 |   |
| 5180 ~ 5240 |                         | 14.00                 |                         | 0.0050                                 |                                |        |   |
| 5745 ~ 5825 |                         | 14.30                 |                         | 0.0054                                 |                                |        |   |
| AP321e      |                         |                       |                         |                                        |                                |        |   |
| Bluetooth   | 2402 ~ 2480             | 22.51                 |                         | 20                                     |                                | 0.0355 | 1 |
| Wi-Fi       | 2412 ~ 2462             | 26.97                 | 0.0990                  |                                        |                                |        |   |
|             | 5180 ~ 5240             | 36.00                 | 0.7920                  |                                        |                                |        |   |
|             | 5745 ~ 5825             | 34.75                 | 0.5939                  |                                        |                                |        |   |
|             | Scan Wi-Fi              | 2412 ~ 2462           | 14.75                   |                                        | 0.0059                         |        |   |
| 5180 ~ 5240 |                         | 14.00                 | 0.0050                  |                                        |                                |        |   |
| 5745 ~ 5825 |                         | 14.30                 | 0.0054                  |                                        |                                |        |   |

### CONCLUSION:

Note 1: The 2.4G & 5G can't work simultaneously of Scan Wi-Fi.

Note 2: The AP321 max Power Density at R (20 cm) = 0.0355 + 0.1199 + 0.5379 + 0.0059 mW/cm<sup>2</sup> = 0.6992 mW/cm<sup>2</sup> < 1 mW/cm<sup>2</sup>.

Note 3: The AP321e max Power Density at R (20 cm) = 0.0355 + 0.0990 + 0.7920 + 0.0059 mW/cm<sup>2</sup> = 0.9324 mW/cm<sup>2</sup> < 1 mW/cm<sup>2</sup>.

Therefore, the Min Safety Distance is 20cm.

The End



## **Appendix A – EUT Photograph**

Refer to “1909RSU036-UE” file.