



# RF Exposure Evaluation Declaration

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**FCC ID:** 2ALJ3AP45X

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

**Product:** HAN Access Point

**Model No.:** AP451

**Brand Name:** HANNETWORKS; HAN NETWORKS

**FCC Classification:** Digital Transmission System (DTS)  
Unlicensed National Information Infrastructure (NII)  
6GHz Low Power Indoor Access Point (6ID)

**FCC Rule Part(s):** FCC Part 2.1091

**Test Procedure(s):** KDB 447498 D04v01

**Result:** Complies

**Reviewed By:** \_\_\_\_\_

**Approved By:** \_\_\_\_\_



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
2203RSU065-U6	Rev. 01	Initial Report	2022-09-20	Valid

Note: This report is a copy report of original report 2203RSU064-U6. Only applicant information and Product information (name & model No. & brand name) has changed.

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## CONTENTS

Description	Page
<b>1. General Information.....</b>	<b>4</b>
1.1. Applicant .....	4
1.2. Manufacturer .....	4
1.3. Testing Facility .....	4
1.4. Product Information.....	5
1.5. Antenna Details.....	6
1.6. Applied Standards.....	6
<b>2. RF Exposure Evaluation .....</b>	<b>7</b>
2.1. Test Limits .....	7
2.2. MPE Exemptions .....	8
2.3. Test Result .....	11

## 1. General Information

### 1.1. Applicant

HAN Networks Co., Ltd.

101-A16, 1st Floor, Building 3, No.9 compound, Yongfeng Road, Haidian District, Beijing, P.R. China

### 1.2. Manufacturer

HAN Networks Co., Ltd.

101-A16, 1st Floor, Building 3, No.9 compound, Yongfeng Road, Haidian District, Beijing, P.R. China

### 1.3. Testing Facility

<input checked="" type="checkbox"/>	<p><b>Test Site – MRT Suzhou Laboratory</b></p> <p><b>Laboratory Location (Suzhou - Wuzhong)</b> D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China</p> <p><b>Laboratory Location (Suzhou - SIP)</b> 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China</p> <p><b>Laboratory Accreditations</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">A2LA: 3628.01</td> <td style="width: 50%;">CNAS: L10551</td> </tr> <tr> <td>FCC: CN1166</td> <td>ISED: CN0001</td> </tr> <tr> <td>VCCI:</td> <td> <input type="checkbox"/>R-20025      <input type="checkbox"/>G-20034      <input type="checkbox"/>C-20020      <input type="checkbox"/>T-20020  <input type="checkbox"/>R-20141      <input type="checkbox"/>G-20134      <input type="checkbox"/>C-20103      <input type="checkbox"/>T-20104                 </td> </tr> </table>	A2LA: 3628.01	CNAS: L10551	FCC: CN1166	ISED: CN0001	VCCI:	<input type="checkbox"/> R-20025 <input type="checkbox"/> G-20034 <input type="checkbox"/> C-20020 <input type="checkbox"/> T-20020 <input type="checkbox"/> R-20141 <input type="checkbox"/> G-20134 <input type="checkbox"/> C-20103 <input type="checkbox"/> T-20104
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<input type="checkbox"/>	<p><b>Test Site – MRT Shenzhen Laboratory</b></p> <p><b>Laboratory Location (Shenzhen)</b> 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China</p> <p><b>Laboratory Accreditations</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">A2LA: 3628.02</td> <td style="width: 50%;">CNAS: L10551</td> </tr> <tr> <td>FCC: CN1284</td> <td>ISED: CN0105</td> </tr> </table>	A2LA: 3628.02	CNAS: L10551	FCC: CN1284	ISED: CN0105		
A2LA: 3628.02	CNAS: L10551						
FCC: CN1284	ISED: CN0105						
<input type="checkbox"/>	<p><b>Test Site – MRT Taiwan Laboratory</b></p> <p><b>Laboratory Location (Taiwan)</b> No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)</p> <p><b>Laboratory Accreditations</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">TAF: L3261-190725</td> <td style="width: 50%;"></td> </tr> <tr> <td>FCC: 291082, TW3261</td> <td>ISED: TW3261</td> </tr> </table>	TAF: L3261-190725		FCC: 291082, TW3261	ISED: TW3261		
TAF: L3261-190725							
FCC: 291082, TW3261	ISED: TW3261						

#### 1.4. Product Information

Product Name	HAN Access Point
Model No.	AP451
Wi-Fi Specification	802.11a/b/g/n/ac/ax
Bluetooth Specification	V5.1 Single Mode
Antenna Information	Refer to Section 1.5
Power Type	AC Adapter Input or PoE Input
Operating Environment	Indoor Use
Accessories	
AC Adapter	Model: ADP-50GR B Input: 100-240V ~ 50/60Hz, 1.3A Output: 48.0V, 1.042A, 50.1W MAX
PoE Injector	Model: POE60U-1BT-X Input: 100-240V ~ 1.5A, 50/60Hz Output: 56.0V, 0.535A, 30W PIN 3, 6+ PIN 1, 2 Return Output: 56.0V, 0.535A, 30W PIN 4, 5+ PIN 7, 8 Return
Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

### 1.5. Antenna Details

Antenna Type	Frequency Band (MHz)	Tx Paths	Max Antenna Gain (dBi)	Directional Gain (dBi)		Beamforming Directional Gain (dBi)
				For Power	For PSD	
<b>Wi-Fi Antennas</b>						
PIFA	2400 ~ 2483.5	4	3.9	3.9	9.92	9.92
PIFA & Dipole	5150 ~ 5850	8	3.9	BW ≥ 40M, 3.9 BW=20M, 6.9	12.93	12.93
Dipole	5925 ~ 7125	4	3.8	3.8	9.82	9.82
<b>Scan Antenna</b>						
Dipole	2400 ~ 2483.5	1	3.5	3.5	3.5	--
Dipole	5150 ~ 5250 & 5725 ~ 5850	1	3.9	3.9	3.9	--
<b>Bluetooth Antenna</b>						
Dipole	2400 ~ 2483.5	1	3.5	3.5	3.5	--
Remark: <ol style="list-style-type: none"> <li>The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated. For CDD transmissions, directional gain is calculated as follows. Directional gain = <math>G_{ANT\ Max} + \text{Array Gain}</math>, where Array Gain is as follows.                             <ul style="list-style-type: none"> <li>For power spectral density (PSD) measurements on all devices, Array Gain = <math>10 \log (N_{ANT} / N_{SS})</math> dB;</li> <li>For power measurements on IEEE 802.11 devices, Array Gain = 0 dB for <math>N_{ANT} \leq 4</math>; Array Gain = 0 dB for channel widths <math>\geq 40</math> MHz for any <math>N_{ANT}</math>; Array Gain = <math>5 \log(N_{ANT} / N_{SS})</math> dB or 3 dB, whichever is less, for 20MHz channel widths with <math>N_{ANT} \geq 5</math>.</li> </ul> </li> <li>The EUT also supports Beam Forming mode, and the Beam Forming support 802.11n/ac/ax, not include 802.11a/b/g. Beamforming Directional gain = <math>G_{ANT\ Max} + 10 \log (N_{ANT} / N_{SS})</math>.</li> </ol>						

### 1.6. Applied Standards

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

- FCC Part 2.1091 & KDB 447498 D04 Interim General RF Exposure Guidance v01

## 2. RF Exposure Evaluation

### 2.1. Test Limits

According to §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				
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
300-1,500	--	--	f/300	<6
1,500-100,000	--	--	5	<6
(B) Limits for General Population/ Uncontrolled Exposures				
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
300-1,500	--	--	f/1500	<30
1,500-100,000	--	--	1.0	<30

f= frequency in MHz. \* = Plane-wave equivalent power density.

## 2.2. MPE Exemptions

**For single RF sources** (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph §1.1307(b)(2) of this section): A single RF source is exempt if:

**(Option A)** The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph §1.1307(b)(3)(ii)(A) of this section.

Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(ii)(A);

**(Option B)** Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P is given by:

$$P_{th}(mW) = \{ERP_{20cm} (d / 20cm)^x \quad d \leq 20cm$$

$$P_{th}(mW) = \{ERP_{20cm} \quad 20cm < d \leq 40cm$$

Where

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

and

$$ERP_{20cm}(mW) = \{2040f \quad 0.3GHz \leq f < 1.5GHz$$

$$ERP_{20cm}(mW) = \{3060 \quad 1.5GHz \leq f \leq 6GHz$$

**(Option C)** Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of  $\lambda/4$  or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).



Table 1 to §1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1920R <sup>2</sup>
1.34-30	3450R <sup>2</sup> /f <sup>2</sup>
30-300	3.83R <sup>2</sup>
300-1,500	0.0128R <sup>2</sup> /f
1,500-100,000	19.2R <sup>2</sup>

**For multiple RF sources:** Multiple RF sources are exempt if:

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those in paragraph §1.1307(b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(i)(A).

(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

Where:

**a** = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(B) of this section for  $P_{th}$ , including existing exempt transmitters and those being added.

**b** = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

**c** = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

$P_i$  = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source  $i$  at a distance between 0.5 cm and 40 cm (inclusive).

$P_{th,i}$  = the exemption threshold power ( $P_{th}$ ) according to paragraph §1.1307(b)(3)(i)(B) of this section for fixed, mobile, or portable RF source  $i$ .

$ERP_j$  = the ERP of fixed, mobile, or portable RF source  $j$ .

$ERP_{th,j}$  = exemption threshold ERP for fixed, mobile, or portable RF source  $j$ , at a distance of at least  $\lambda/2\pi$

according to the applicable formula of paragraph §1.1307(b)(3)(i)(C) of this section.

***Evaluated<sub>k</sub>*** = the maximum reported SAR or MPE of fixed, mobile, or portable RF source *k* either in the device or at the transmitter site from an existing evaluation at the location of exposure.

***Exposure Limit<sub>k</sub>*** = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source *k*, as applicable from §1.1310 of this chapter.

### 2.3. Test Result

Product	HAN Access Point
Test Item	RF Exposure Evaluation

Test Mode	Frequency Band (MHz)	Max. Conducted Power (dBm)	Antenna Gain (dBi)	Max EIRP (dBm)	Max ERP (dBm)	Max. Tune-up ERP (dBm)
802.11b/g/n/ax (CDD Mode)	2412 ~ 2462	23.85	3.90	27.75	25.6	26
802.11a/n/ac/ax (CDD Mode)	5180 ~ 5825	27.60	3.9	31.5	29.35	30
802.11ax (CDD Mode)	5955 ~ 7095	--	--	22.14	19.99	20
Bluetooth	2402 ~ 2480	18.04	3.5	21.54	19.39	20

Note:

1. The level of max power was from RF report 2105TW0102-U1, 2105TW0102-U2, 2105TW0102-U3, 2203RSU064-U3 and 2203RSU064-U5.
2. Tune-up power was declared by manufacturer.
3. Max ERP (dBm) = Max EIRP (dBm) - 2.15 (dB).
4. The ERP of beamforming mode is lower than CDD mode, so only CDD mode showed in this report.

#### For single RF source, Option C

Frequency (MHz)	Max ERP (Watts)	$\lambda / 2 \pi$ (cm)	R (cm)	Threshold ERP (Watts)
2412 ~ 2462	0.398	1.98	30	1.728
5180 ~ 5825	1.000	0.92	30	1.728
5955 ~ 7095	0.100	0.80	30	1.728
2402 ~ 2480	0.100	1.99	30	1.728

#### For multiple RF sources

The EUT supports Wi-Fi 2.4GHz + Wi-Fi 5GHz + Wi-Fi 6GHz + BLE simultaneous transmissions.

The Max Simultaneous Transmission =  $0.398 / 1.728 + 1.000 / 1.728 + 0.100 / 1.728 + 0.100 / 1.728 = 0.925 < 1$

Therefore, the device qualifies for RF exposure test exemption.

\_\_\_\_\_ The End \_\_\_\_\_