



RF Exposure Evaluation Declaration

FCC ID: 2ALJ3AP32X

APPLICANT: HAN Networks Co., Ltd

Application Type: Certification

Product: HAN Access Point

Model No.: AP321, AP321e

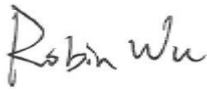
Brand Name: HAN NETWORKS; HANNETWORKS

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.

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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

Applicant:	HAN Networks Co., Ltd.
Applicant Address:	101-A16, 1 st Floor, Building 3, No.9 compound, Yongfeng Road, Haidian District, Beijing, P.R. China
Manufacturer:	HAN Networks Co., Ltd.
Manufacturer Address:	101-A16, 1 st Floor, Building 3, No.9 compound, Yongfeng Road, Haidian District, Beijing, P.R. China
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ 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 Input Power: 100 - 240V ~ 50/60Hz, 1.0A Output Power: 48VDC/0.66A
Adapter 2#:	Model No.: PD-9001 25GR/AC Input Power: 100 - 240V ~ 50/60Hz, 1.5A 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 _x 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 _x 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 ²)	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/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

P_d is the limit of MPE, 1mW/cm². 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 (MHz)	Maximum EIRP (dBm)	Safety Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)		
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/cm² = 0.6992 mW/cm² < 1 mW/cm².

Note 3: The AP321e max Power Density at R (20 cm) = 0.0355 + 0.0990 + 0.7920 + 0.0059 mW/cm² = 0.9324 mW/cm² < 1 mW/cm².

Therefore, the Min Safety Distance is 20cm.

The End

Appendix A – EUT Photograph

Refer to “1909RSU036-UE” file.