



RF Exposure Evaluation

For

Hak5 LLC

production sample test1

Test Model: LAN Turtle HUB

Prepared for : Hak5 LLC
Address : 750 N Saint Paul St STE 250 #39371, Dallas, TX 75201, United States

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
Address : 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
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Date of receipt of test sample : March 05, 2025
Number of tested samples : 2
Sample No. : A250303161-1, A250303161-2
Serial number : Prototype
Date of Test : March 05, 2025 ~ March 18, 2025
Date of Report : March 19, 2025



**RF Exposure Evaluation****Report Reference No.** : **LCSA03045118EB****Date of Issue**..... : March 19, 2025**Testing Laboratory Name** : **Shenzhen LCS Compliance Testing Laboratory Ltd.****Address**..... : 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China**Testing Location/ Procedure** : Full application of Harmonised standards ■
Partial application of Harmonised standards □
Other standard testing method □**Applicant's Name**..... : **Hak5 LLC****Address**..... : 750 N Saint Paul St STE 250 #39371, Dallas, TX 75201, United States**Test Specification****Standard** : FCC KDB publication 447498 D01 General RF Exposure Guidance v06

FCC CFR 47 part1 1.1310

FCC CFR 47 part2 2.1093

Test Report Form No. : TRF-4-E-215 A0**TRF Originator** : Shenzhen LCS Compliance Testing Laboratory Ltd.**Master TRF** : Dated 2011-03**Shenzhen LCS Compliance Testing Laboratory Ltd. All rights reserved.**

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EUT Description..... : **production sample test1****Trade Mark**..... : N/A**Test Model** : LAN Turtle HUB**Ratings**..... : Input: DC 5V, 1000mA**Result** : **PASS****Compiled by:***Nadia Zhou*

Nadia Zhou/ Administrator

Supervised by:*Jack Liu*

Jack Liu/ Technique principal

Approved by:*Gavin Liang*

Gavin Liang/ Manager





RF Exposure Evaluation

Test Report No. :	LCSA03045118EB	<u>March 19, 2025</u> Date of issue
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EUT.....	: production sample test1
Test Model.....	: LAN Turtle HUB
Applicant.....	: Hak5 LLC
Address.....	: 750 N Saint Paul St STE 250 #39371, Dallas, TX 75201, United States
Telephone.....	: /
Fax.....	: /
Manufacturer.....	: Shenzhen Gainstrong Technology Co., Ltd.
Address.....	: 4/F, Building B, Hengmingzhu Industrial Park, Qian Jin Road 2, Baoan District
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Test Result	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.





Revision History

Report Version	Issue Date	Revision Content	Revised By
000	March 19, 2025	Initial Issue	--





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**1. Product Information**

Product name	:	production sample test1
Test Model	:	LAN Turtle HUB
Ratings	:	Input: DC 5V, 1000mA
Hardware Version	:	V1.0.0
Software Version	:	V1.0.0
WIFI(2.4G Band)		
Frequency Range	:	2412MHz~2462MHz
Channel Spacing	:	5MHz
Channel Number	:	11 Channels for 20MHz bandwidth (2412~2462MHz) 7 Channels for 40MHz bandwidth (2422~2452MHz)
Modulation Type	:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	:	Ant0: FPC Antenna, -0.66dBi(Max.) Ant1: FPC Antenna, -0.66dBi(Max.)
Exposure category	:	General population/uncontrolled environment
EUT Type	:	Production Unit
Device Type	:	Portable Device

Note: For a more detailed antenna description, please refer to the antenna specifications or the antenna report provided by the customer.





2. Evaluation method and Limit

According to KDB447498 D01 General RF Exposure Guidance v06 Section 4.3.1 Standalone SAR test exclusion considerations: "Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander (see 5) of section 4.1). To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, typically in the SAR measurement or SAR analysis report, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other published RF exposure KDB procedures must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & tablets etc."

$$\left[\frac{\text{max. power of channel, including tune-up tolerance, mW}}{(\text{min. test separation distance, mm})^2} \right] \cdot \left[\frac{1}{f \text{ (GHz)}} \right] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where:}$$

- f (GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to f) in section 4.1 is applied to determine SAR test exclusion.

When one of the following test exclusion conditions is satisfied for all combinations of simultaneous transmission configurations, further equipment approval is not required to incorporate transmitter modules in host devices that operate in the mixed mobile and portable host platform exposure conditions. The grantee is responsible for documenting this according to Class I permissive change requirements. Antennas that qualify for standalone SAR test exclusion must apply the estimated standalone SAR to determine simultaneous transmission test exclusion.

a) The $\left[\sum \text{of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance)} / 1.6 \text{ W/kg} \right] + \left[\sum \text{of MPE ratios} \right]$ is ≤ 1.0 .

b) The SAR to peak location separation ratios of all simultaneously transmitting antenna pairs operating in portable device exposure conditions are all ≤ 0.04 , and the $\left[\sum \text{of MPE ratios} \right]$ is ≤ 1.0 .

3. Refer Evaluation Method

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB publication 447498 D01 General RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1093](#): Radiofrequency radiation exposure evaluation: portable devices



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4. Conducted Power Results

[2.4G WIFI]

Mode	Channel	Frequency (MHz)	Ant1 Max Conducted Power(dBm)	Ant2 Max Conducted Power(dBm)
11B	1	2412	6.32	6.27
	6	2437	6.33	6.08
	11	2462	6.43	5.72
11G	1	2412	5.6	5.93
	6	2437	5.64	6.25
	11	2462	5.77	5.99
11N20 SISO	1	2412	5.5	5.39
	6	2437	5.7	5.91
	11	2462	5.91	5.47
11N40 SISO	3	2422	4.05	4.35
	6	2437	4.11	4.97
	9	2452	4.18	4.86

5. Manufacturing Tolerance

[2.4G WIFI Ant0]

11B (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	6.0	6.0	6.0
Tolerance ±(dB)	1.0	1.0	1.0
11G (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	5.0	5.0	5.0
Tolerance ±(dB)	1.0	1.0	1.0
11N20(Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	5.0	5.0	5.0
Tolerance ±(dB)	1.0	1.0	1.0
11N40(Peak)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	4.0	4.0	4.0
Tolerance ±(dB)	1.0	1.0	1.0



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[2.4G WIFI Ant1]

11B (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	6.0	6.0	5.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11G (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	5.0	6.0	5.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N20(Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	5.0	5.0	5.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
11N40(Peak)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	4.0	4.0	4.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

6. Evaluation Results

6.1 Standalone Evaluation

[2.4G WIFI Ant0]

Band/Mode	Frequency (GHz)	Antenna Distance (mm)	RF output power		SAR Test Exclusion Threshold	SAR Test Exclusion
			dBm	mW		
IEEE 802.11b	2.462	5	7.0	5.0119	1.5728< 3.0	Yes
IEEE 802.11g	2.462	5	6.0	3.9811	1.2493< 3.0	Yes
IEEE 802.11n HT20	2.462	5	6.0	3.9811	1.2493< 3.0	Yes
IEEE 802.11n HT40	2.452	5	5.0	3.1623	0.9904< 3.0	Yes

[2.4G WIFI Ant1]

Band/Mode	Frequency (GHz)	Antenna Distance (mm)	RF output power		SAR Test Exclusion Threshold	SAR Test Exclusion
			dBm	mW		
IEEE 802.11b	2.437	5	7.0	5.0119	1.5648< 3.0	Yes
IEEE 802.11g	2.437	5	7.0	5.0119	1.5648< 3.0	Yes
IEEE 802.11n HT20	2.462	5	6.0	3.9811	1.2493< 3.0	Yes
IEEE 802.11n HT40	2.452	5	5.0	3.1623	0.9904< 3.0	Yes

Remark:

- Output power including tune up tolerance;
- When the minimum test separation distance is < 5 mm, a distance of 5 mm according to f) in section 4.1 is applied to determine SAR test exclusion.





6.2 Simultaneous Transmission for SAR Exclusion

The sample support one modular and supports two antennas, need consider simultaneous transmission; standalone SAR value $=[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) + \sqrt{f \text{ (GHz)}/x}]$; where $X=7.5$ for 1-g SAR and $x=18.75$ for 10-g SAR

$$\text{SAR}_{\text{ANT0}} = 3.9811 \text{ mW}/5 \text{ mm} \times [\sqrt{f \text{ (2.462 GHz)}/7.5}] = 0.1666$$

$$\text{SAR}_{\text{ANT1}} = 3.9811 \text{ mW}/5 \text{ mm} \times [\sqrt{f \text{ (2.462 GHz)}/7.5}] = 0.1666$$

Antennas that qualify for standalone SAR test exclusion must apply the estimated standalone SAR to determine simultaneous transmission test exclusion:

The Σ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg + Σ of MPE ratios + is ≤ 1.0 .

Result: Σ of (the highest measured or estimated $\text{SAR}_{\text{ANT0}} + \text{SAR}_{\text{ANT1}}) / 1.6 = (0.1666 + 0.1666) / 1.6 = 0.208 < 1.0$;

7. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v06.

8. Description of Test Facility

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

Test Firm Registration Number: 254912.

9. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Output power	:	1GHz-40GHz	$\pm 0.57 \text{ dB}$	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

.....THE END OF REPORT.....



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