



RF EXPOSURE EVALUATION REPORT

APPLICANT : SamKnows Limited
PRODUCT NAME : SamKnows Whitebox 8.0+
MODEL NAME : SK-WB8+
BRAND NAME : SamKnows
FCC ID : 2AGPP-SKWB8V4
STANDARD(S) : FCC 47CFR Part 2(2.1091)
RECEIPT DATE : 2020-11-11
TEST DATE : 2020-11-29 to 2021-01-26
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Change History		
Version	Date	Reason for Change
1.0	2022-06-13	First edition



1. Technical Information

Note: Provide by applicant.

1.1 Applicant and Manufacturer Information

Applicant:	SamKnows Limited
Applicant Address:	94 New Bond Street, London W1S 1SJ, United Kingdom
Manufacturer:	Taicang T & W Electronics Co., Ltd
Manufacturer Address:	No. 89, Jiangnan Road, Loudong Street, Taicang, Jiangsu Province 215412, P. R. China

1.2 Equipment under Test (EUT) Description

Product Name:	SamKnows Whitebox 8.0+	
Sample No.:	4#	
Hardware Version:	3	
Software Version:	20160115	
Frequency Bands:	WLAN 2.4GHz	2412MHz-2472MHz
	WLAN 5GHz	5180MHz-5240MHz
		5260MHz-5320MHz
		5500MHz-5720MHz
		5745MHz-5825MHz
Modulation Mode:	WLAN 2.4GHz	DSSS, OFDM
	WLAN 5GHz	OFDM
Antenna Information:	WLAN 2.4GHz, WLAN 5GHz	
	Antenna Type:	External Antenna
	Antenna Gain:	ANT0: 5.00dBi
ANT1: 5.00dBi		

Note 1: This test report is variant from the original report (Report No.: SZ20110143S01, FCC ID: 2AGPP-SKWB8V3), based on the similarity between before, o a second Wi-Fi(2.4G) chip needs to be added. The Wi-Fi(2.4G) chip is Pin-to-Pin and the supplier is the same to the before. New Wi-Fi(2.4G) chip's basic function is the same with old chip and no any change in radio parameters has occurred. Except for the above differences, their electrical circuit design, layout, components used and internal wiring are identical. The changes do not affect the results in this report.



1.3 Applied Reference Documents

Leading reference documents for testing:

Identity	Document Title	Method determination /Remark
FCC 47CFR Part 2(2.1091)	Radio Frequency Radiation Exposure Assessment: mobile devices	No deviation
KDB 447498 D01v06	General RF Exposure Guidance	No deviation

Note 1: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

Note 2: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.



2. Device Category and RF Exposure Limit

Per user manual, Based on 47CFR 2.1091, this device belongs to mobile device category with General Population/Uncontrolled exposure.

Mobile Devices:

47CFR 2.1091(b)

For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

General Population/Uncontrolled Exposure:

The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

Table 1 Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

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



3. RF Output Power

2.4GHz WLAN, ANT0					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11b	CH 1	2412	20.63	21.00	87.70
	CH 7	2442	19.90	20.50	
	CH 13	2472	19.85	20.50	
802.11g	CH 1	2412	19.65	20.50	87.80
	CH 7	2442	19.02	20.50	
	CH 13	2472	19.25	20.50	

2.4GHz WLAN, ANT1					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11b	CH 1	2412	18.54	19.00	87.70
	CH 7	2442	17.39	18.00	
	CH 13	2472	16.42	17.00	
802.11g	CH 1	2412	17.78	18.50	87.80
	CH 7	2442	16.91	17.50	
	CH 13	2472	15.95	16.50	

2.4GHz WLAN, ANT0+ANT1					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11n (HT20)	CH 1	2412	21.34	22.00	86.54
	CH 7	2442	20.83	21.50	
	CH 13	2472	20.64	21.50	
802.11n (HT40)	CH 3	2422	21.14	21.50	76.55
	CH 7	2442	20.72	21.50	
	CH 11	2462	20.61	20.50	



5GHz WLAN, ANT0					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11a	CH 36	5180	15.65	16.50	87.54
	CH 44	5220	16.06	16.50	
	CH 48	5240	16.16	16.50	
	CH 52	5260	16.18	16.50	
	CH 60	5300	17.05	17.50	
	CH 64	5320	17.16	17.50	
	CH 100	5500	18.09	18.50	
	CH 120	5600	17.97	18.50	
	CH 144	5720	17.67	18.50	
	CH 149	5745	18.47	19.00	
	CH 157	5785	18.17	18.50	
	CH 165	5825	19.16	19.50	

5GHz WLAN, ANT1					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11a	CH 36	5180	14.90	15.50	87.54
	CH 44	5220	14.22	15.00	
	CH 48	5240	14.30	15.00	
	CH 52	5260	15.35	16.00	
	CH 60	5300	15.70	16.50	
	CH 64	5320	15.95	16.50	
	CH 100	5500	16.46	17.00	
	CH 120	5600	17.53	18.50	
	CH 144	5720	16.98	17.50	
	CH 149	5745	18.25	18.50	
	CH 157	5785	18.50	19.00	
	CH 165	5825	18.41	19.00	



5GHz WLAN, ANT0+ANT1					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11n (HT20)	CH 36	5180	17.78	18.50	86.86
	CH 44	5220	18.20	18.50	
	CH 48	5240	18.33	18.50	
	CH 52	5260	18.92	19.50	
	CH 60	5300	19.14	19.50	
	CH 64	5320	19.40	20.00	
	CH 100	5500	20.29	20.50	
	CH 120	5600	20.61	21.00	
	CH 144	5720	20.45	19.00	
	CH 149	5745	21.30	21.50	
	CH 157	5785	21.73	22.50	
CH 165	5825	22.07	22.50		

5GHz WLAN, ANT0+ANT1					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11n (HT40)	CH 38	5190	16.23	16.50	75.52
	CH 46	5230	17.71	18.00	
	CH 54	5270	18.45	19.00	
	CH 62	5310	18.86	19.00	
	CH 102	5510	19.68	20.00	
	CH 126	5630	20.64	21.00	
	CH 142	5710	19.96	20.50	
	CH 151	5755	21.00	21.50	
	CH 159	5795	21.24	21.50	



5GHz WLAN, ANT0+ANT1					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11ac (VHT20)	CH 36	5180	18.20	18.50	86.69
	CH 44	5220	18.39	18.50	
	CH 48	5240	18.45	19.00	
	CH 52	5260	19.08	19.50	
	CH 60	5300	19.34	19.50	
	CH 64	5320	20.21	20.50	
	CH 100	5500	21.00	21.50	
	CH 120	5600	21.04	21.50	
	CH 144	5720	19.87	20.50	
	CH 149	5745	21.55	22.00	
	CH 157	5785	21.73	22.00	
CH 165	5825	21.88	22.50		

5GHz WLAN, ANT0+ANT1					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11ac (VHT40)	CH 38	5190	18.26	18.50	76.45
	CH 46	5230	18.45	19.00	
	CH 54	5270	19.29	19.50	
	CH 62	5310	21.00	21.50	
	CH 102	5510	21.21	21.50	
	CH 126	5630	21.00	21.50	
	CH 142	5710	20.93	21.50	
	CH 151	5755	21.88	22.20	
	CH 159	5795	22.12	22.50	



5GHz WLAN, ANT0+ANT1					
Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-up Power	Duty Cycle %
802.11ac (VHT80)	CH 42	5210	18.20	18.50	48.48
	CH 58	5290	18.75	18.50	
	CH 106	5530	19.54	20.00	
	CH 122	5610	19.24	19.50	
	CH 138	5690	18.20	18.50	
	CH 155	5775	18.20	18.50	

Note 1: According to KDB 447498 Section 4.3, MPE assessment is based on source-based time-averaged maximum conducted output power of the RF channel requiring assessment, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

Note 2: The output power refers to report (Report No.: SZ21110175W01/W02).

4. RF Exposure Assessment

➤ Standalone Transmission Assessment:

Bands	Frequency (MHz)	Tune-up Power(dBm)	Antenna Gain(dBi)	E.I.R.P. (mW)	Power Density (mW/cm ²)	Limit for MPE (mW/cm ²)
WLAN 2.4GHz ANT0	2412	21.00	5.00	398.11	0.079	1.0
WLAN 2.4GHz ANT1	2412	19.00	5.00	251.19	0.050	1.0
WLAN 5GHz ANT0	5825	19.50	5.00	281.84	0.056	1.0
WLAN 5GHz ANT1	5785	19.00	5.00	251.19	0.050	1.0

➤ MIMO Transmission Assessment

Bands	Frequency (MHz)	Tune-up Power(dBm)	Antenna Gain(dBi)	E.I.R.P. (mW)	Power Density (mW/cm ²)	Limit for MPE (mW/cm ²)
WLAN 2.4GHz	2412	22.00	5.00	501.19	0.100	1.0
WLAN 5GHz	5825	22.50	5.00	562.34	0.112	1.0

Note 1: For 2.4G/5G WLAN, only the worst case will be used for calculating the power density.

Note 2: MPE calculate method

$$\text{Power Density} = \text{E.I.R.P.}/4\pi R^2$$

Where: E.I.R.P. = P+G

P = Output Power (dBm)

G = Antenna Gain (dBi)

R = Separation Distance (20cm)



➤ **Simultaneous Transmission Assessment:**

Multi-Band Simultaneous Transmission Consideration

Simultaneous Transmission Consideration	Position	Applicable Combination
	Hand/Body	WLAN 2.4GHz(ANT0) + WLAN 2.4GHz(ANT1)
		WLAN 5GHz(ANT0) + WLAN 5GHz(ANT1)
WLAN 2.4GHz(MIMO)+ WLAN 5GHz(MIMO)		

Note 1: This device contains transmitters that may operate simultaneously, therefore simultaneous transmission analysis is required as below.

Applicable Combination	Transmission Bands	Power Density (mW/cm ²)	Limit (mW/cm ²)	Simultaneous Transmission Result
WLAN 2.4GHz(ANT0)+ WLAN 2.4GHz(ANT1)	WLAN 2.4GHz (ANT0)	0.079	1.0	0.129
	WLAN 2.4GHz (ANT1)	0.050	1.0	
WLAN 5GHz(ANT0)+ WLAN 5GHz(ANT1)	WLAN 5GHz (ANT0)	0.056	1.0	0.106
	WLAN 5GHz (ANT1)	0.050	1.0	
WLAN 2.4GHz(MIMO)+ WLAN 5GHz(MIMO)	WLAN 2.4GHz (MIMO)	0.100	1.0	0.212
	WLAN 5GHz (MIMO)	0.112	1.0	
Note 1: Formula for result=Power density ₁ / limit ₁ + Power density ₂ / limit ₂ ≤ 1.				
Note 2: The black bold applicable combination was the worst condition.				

➤ **Conclusion:**

According to 47 CFR §2.1091, this device complies with human exposure basic restrictions.



Annex A Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.

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