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TEST REPORT

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Suwon-si, Gyeonggi-do, 16677, Korea
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1. Client

- Name : SystemBase Co., Ltd.
- Address : Daerung Post Tower-1 16F, 288, Digital-ro, Guro-gu, Seoul, South Korea
- Date of Receipt : 2020-05-11

2. Use of Report : Certification

3. Name of Product and Model : Serial to WiFi Converter / sWiFi/all V1.0

4. Manufacturer and Country of Origin : SystemBase Co., Ltd. / Korea

5. FCC ID : PRO-SWIFIALLV10

6. Date of Test : 2020-06-16 to 2020-06-18

7. Location of Test : ■ Permanent Testing Lab □ On Site Testing (Address: Address of testing location)

8. Test method used : 47 CRF Part 1.1310

9. Test Results : Refer to the test result in the test report

Affirmation	Tested by Name : Minsoo Yoon	(Signature)	Technical Manager Name : Heesu Ahn	(Signature)

2020-06-25

KCTL Inc.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2020-06-25	Originally issued	-

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General remarks for test reports

Nothing significant to report.

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1. General information

Client	:	SystemBase Co., Ltd.
Address	:	Daerung Post Tower-1 16F, 288, Digital-ro, Guro-gu, Seoul, South Korea
Manufacturer	:	SystemBase Co., Ltd.
Address	:	Daerung Post Tower-1 16F, 288, Digital-ro, Guro-gu, Seoul, South Korea
Laboratory	:	KCTL Inc.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132
		VCCI Registration No. : R-20080, G-20078, C-20059, T-20056
		Industry Canada Registration No. : 8035A
		KOLAS No.: KT231

2. Device information

Equipment under test	:	Serial to WiFi Converter
Model	:	sWiFi/all V1.0
Modulation technique	:	WIFI(802.11a/b/g/n_HT20)_DSSS, OFDM
Number of channels	:	802.11b/g/n_HT20 : 11 ch
		UNII-1: 4 ch (20 ㎒)
		UNII-2A: 4 ch (20 ㎒)
		UNII-2C: 12 ch (20 ㎒)
		UNII-3: 5 ch (20 ㎒)
Power source	:	AC 120 ㏈ / 60 ㎐
Antenna specification	:	Dipole Antenna
Antenna gain	:	WIFI(802.11b/g/n_HT20): ANT_6.13 ㏈i
		UNII-1 ANT_6.20 ㏈i
		UNII-2A ANT_6.67 ㏈i
		UNII-2C ANT_6.40 ㏈i
		UNII-3 ANT_6.40 ㏈i
Frequency range	:	2 412 ㎒ ~ 2 462 ㎒ (802.11b/g/n_HT20)
		UNII-1: 5 150 ㎒ ~ 5 250 ㎒ (802.11a/n_HT20)
		UNII-2A: 5 250 ㎒ ~ 5 350 ㎒ (802.11a/n_HT20)
		UNII-2C: 5 470 ㎒ ~ 5 725 ㎒ (802.11a/n_HT20)
		UNII-3: 5 725 ㎒ ~ 5 850 ㎒ (802.11a/n_HT20)
Software version	:	V 1.0.0
Hardware version	:	V 1.0.4
Test device serial No.	:	N/A
Operation temperature	:	-40 ~ 85 ℃

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2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
AC to DC Adapter	Dee Van Electronics(Longchuan) Co.,LTD.	DSA-6PFE-05 FKA 050100	-	INPUT : 100 ~ 240 V / 50/60 Hz / 0.2 A OUTPUT : 5 V, 1.0 A

2.2. Frequency/channel operations

This device contains the following capabilities:
WLAN 2.4 ㎓_802.11b/g/n_HT20, WLAN 5 ㎓_802.11a/n_HT20

Ch.	Frequency (㎒)
01	2 412
. .	. .
06	2 437
. .	. .
11	2 462

Table 2.2.1. 802.11b/g/n(HT20) mode

UNII-1

Ch.	Frequency (㎒)
36	5 180
40	5 200
48	5 240

UNII-2A

Ch.	Frequency (㎒)
52	5 260
56	5 280
64	5 320

UNII-2C

Ch.	Frequency (㎒)
100	5 500
116	5 580
144	5 720

UNII-3

Ch.	Frequency (㎒)
149	5 745
157	5 785
165	5 825

Table 2.2.2. 802.11a/n_HT20 mode

3. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.
All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty (±)
Conducted RF power	1.3 ㏈

4. RF Exposure

Regulation

This document is prepared to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC rules and Regulations.
The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1.
According to FCC §1.1310: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b).

Table 1 – Limits for Maximum Permissible Exposure (MPE)

Frequency Range (㎒)	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [㎽/㎠]	Averaging Time [minute]
(A) Limits for Occupational / Controlled Exposure				
0.3 ~ 3.0	614	1.63	*100	6
3.0 ~ 30	1842/f	4.89/f	*900/f^2	6
30 ~ 300	61.4	0.163	1.0	6
300 ~ 1 500	/	/	f/300	6
1 500 ~ 15 000	/	/	5	6
(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 ~ 1 500	/	/	f/1 500	30
1 500 ~ 15 000	/	/	1.0	30

*f=frequency in ㎒, *= plane-wave equivalent power density*

Per the guidance of KDB 680106, the E-field and H-field limits shown in the table above are extended down to 100 ㎑

4.1. Test results

MPE (Maximum Permissive Exposure) Prediction

Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2 \quad \left(\Rightarrow R = \sqrt{PG/4\pi S}\right)$$

S = power density [㎽/㎠]
P = Power input to antenna [㎽]
G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna [㎝]

RF Exposure Compliance Issue

The information should be included in the user's manual:
This appliance and its antenna must not be co-located or operation is conjunction with any other antenna or transmitter. A minimum separation distance of 20 ㎝ must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

Antenna gain

Band	Ant Gain [dBi]
2.4 ㎓	6.13
5 ㎓_U-NII-1	6.20
5 ㎓_U-NII-2A	6.67
5 ㎓_U-NII-2C	6.40
5 ㎓_U-NII-3	6.40

Calculation Result of RF exposure

-WLAN (2.4 GHz)

Mode	Frequency [㎒]	Max Tune-up Power [dBm]	Max Tune-up Power [㎽]	Ant Gain [dBi]	Ant Gain [㎽]	Power density at 20 ㎝ [㎽/㎠]	Limit [㎽/㎠]
802.11n_HT20	2 412	20.00	100.00	6.13	4.10	0.081 61	1.00

-WLAN (5 GHz)

UNII-1

Mode	Frequency [㎒]	Max Tune-up Power [dBm]	Max Tune-up Power [㎽]	Ant Gain [dBi]	Ant Gain [㎽]	Power density at 20 ㎝ [㎽/㎠]	Limit [㎽/㎠]
802.11a	5 240	11.00	12.59	6.20	4.17	0.010 44	1.00

UNII-2A

Mode	Frequency [㎒]	Max Tune-up Power [dBm]	Max Tune-up Power [㎽]	Ant Gain [dBi]	Ant Gain [㎽]	Power density at 20 ㎝ [㎽/㎠]	Limit [㎽/㎠]
802.11a	5 320	12.00	15.85	6.67	4.65	0.014 65	1.00

UNII-2C

Mode	Frequency [㎒]	Max Tune-up Power [dBm]	Max Tune-up Power [㎽]	Ant Gain [dBi]	Ant Gain [㎽]	Power density at 20 ㎝ [㎽/㎠]	Limit [㎽/㎠]
802.11a	5 500	11.00	12.59	6.40	4.37	0.010 93	1.00

UNII-3

Mode	Frequency [㎒]	Max Tune-up Power [dBm]	Max Tune-up Power [㎽]	Ant Gain [dBi]	Ant Gain [㎽]	Power density at 20 ㎝ [㎽/㎠]	Limit [㎽/㎠]
802.11n_HT20	5 745	9.00	7.94	6.40	4.37	0.006 90	1.00

Note.

1. The power density P_d (5th column) at a distance of 20 ㎝ calculated from the friis transmission Formula is far below the limit of 1 ㎽/㎠.
2. Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, …, GN ㏈i (i) If transmit signals are correlated, then

Directional gain = 10 log[(10G 1 /20 + 10G 2 /20 + … + 10G N /20)2/NANT] ㏈ i [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

5. Measurement Equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Signal Generator	R&S	SMB100A	176206	2021.01.21
Spectrum Analyzer	R&S	FSV30	100732	2021.01.21
DC Power Supply	AGILENT	E3632A	MY40007371	2021.05.11
Attenuator	API Inmet	40AH2W-10	15	2021.05.12
Pulse Power Meter	ANRITSU	ML2495A	1608009	2020.07.31
Pulse Power Sensor	ANRITSU	MA2411B	1726174	2020.07.31

End of test report

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