TEST REPORT

Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR23-SRF0077 Page (1) of (9)	eurofins | KCTL

1. Client

- Name : bitsensing Inc.
- Address : 4, 5F, 4, Godeung-ro, Sujeong-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
- Date of Receipt : 2023-02-01

2. Use of Report : Certification

3. Name of Product / Model : ITS Radar / ATM220-UHD

4. Manufacturer / Country of Origin : bitsensing Inc. / Korea

5. FCC ID : 2AVBK-ATM220-UHD

6. IC : 25840-ATM220UHD

7. Date of Test : 2023-02-16 to 2023-02-22

8. Location of Test : ■ Permanent Testing Lab ☐ On Site Testing
(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

9. Test method used : Part 1.1310
RSS-102 Issue 5 February 2021

10. Test Result : Refer to the test result in the test report

	Tested by	Technical Manager
Affirmation	Name : Taeung Um (Signature)	Name : Seungyong Kim (Signature)

2023-03-07

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2023-03-07	Originally issued	-

General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ **Statement not required by the standard or client used for type testing**

CONTENTS

1. General information

Client	:	bitsensing Inc.
Address	:	4, 5F, 4, Godeung-ro, Sujeong-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Manufacturer	:	bitsensing Inc.
Address	:	4, 5F, 4, Godeung-ro, Sujeong-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Laboratory	:	Eurofins KCTL Co.,Ltd.
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 CAB Identifier: KR0040 ISED Number: 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	ITS Radar
Model	:	ATM220-UHD
Frequency range	:	24 050 ㎓ ~ 24.250 ㎓ (Radar)
Modulation technique	:	FMCW(Radar)
Number of channels	:	1 ch
Power source	:	DC 24 V
Antenna specification	:	PCB Array antenna
Antenna gain	:	11.06 ㏈i
Software version	:	1.1.0
Hardware version	:	1.0.0
Operation temperature	:	-40 ℃ ~ 80 ℃
Test device serial No.	:	A04A400051

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
AC/DC Adapter	ChenZhen Smart Power Technology Co.,Ltd.	SW60-24002500-W	SW60-24002500-WH8	In put : 100-240V / 50/60Hz 1.5A Out put : 24.0V/2.5A

2.2. Frequency/channel operations

This device contains the following capabilities:
24 ㎓ radar

Ch.	Frequency (㎓)
-	24.15

Table 2.2.1. 24 ㎓ radar sensor

3. Antenna requirement

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	0.9 ㏈

4. RF Exposure

FCC

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/f²	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/f²	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 ㎑

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 [㎝]

IC

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

According to RSS-102 Issue 5, Paragraph “4. Exposure Limits”, Industry of Canada has adopted the RF field strength limits stablished in Healths Canada’s RF exposure guideline, Safety code 6:

Frequency Range (㎒)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10[21]	83	90	-	Instantaneous*
0.1-10	-	0.73/ f	-	6**
1.1-10	87/ $f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ $f^{0.25}$	0.1540/ $f^{0.25}$	8.944/ $f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 f 0.3417	0.008335 f 0.3417	0.02619$f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ $f^{1.2}$
150000-300000	0.158 $f^{0.5}$	4.21 x 10^{-4} $f^{0.5}$	6.67 x 10^{-5} f	616000/ $f^{1.2}$

Note: f is frequency in ㎒.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

Exemption Limits for Routine Evaluation – RF Exposure Evaluation

According to RSS-102 Issue 5 section 2.5.2, RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 ㎝, except when the device operates as follows:

- Below 20 ㎒ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1W (adjusted for tune-up tolerance);
- At or above 20 ㎒ and below 48 ㎒ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 4.49/ $f^{0.5}$ W (adjusted for tune-up tolerance), where f is in ㎒;
- At or above 48 ㎒ and below 300 ㎒ and the source-bands, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- At or above 300 ㎒ and below 6 ㎓ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10^{-2} $f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in ㎒;
- At or above 6 ㎓ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance.)

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

4.1. Test results

FCC

Calculation Result of RF exposure

Mode	Frequency [㎒]	EIRP Max Tune-up Power [dBm]	EIRP Max Tune-up Power [㎽]	Power density at 20 ㎝ [㎽/㎠]	Limit [㎽/㎠]
24 ㎓ radar sensor	24 150	16.00	39.81	0.007 92	1.000

Note.

1. The power density P_d at a distance of 20 ㎝ calculated from the friis transmission Formula is far below the limit of 1 ㎽/㎠.

Simultaneous transmission

Note: Calculation of MPE ratio with simultaneous transmission for RF exposure test exemption.

24 ㎓ radar sensor: the ratio is 0.007 92 / 1.000 00

Confirm the sum result of individual MPEs ratio is ≤ 1.0;

IC

Calculation Results of RF exposure

Mode	Frequency [㎒]	Max Tune-up Power [dBm]	E.I.R.P		Limit [㎽]
			[dBm]	[㎽]	
24 ㎓ radar sensor	24 150	16.00	16.00	39.81	5 000.00

End of test report