



TEST REPORT

KCTL KCTL Inc. 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.: KR20-SRF0193-A Page (1) of (7)			
1. Client ◦ Name : tuneit ◦ Address : 4-11, Neuti-ro 51beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea ◦ Date of Receipt : 2020-07-07 2. Use of Report : Certification 3. Name of Product / Model : Vehicle IoT Module / tuneitEN01 4. Manufacturer / Country of Origin : tuneit / Korea 5. FCC ID : 2AW4H-TUNEITEN01 6. Date of Test : 2020-07-16 to 2020-07-22 7. Location of Test : <input checked="" type="checkbox"/> Permanent Testing Lab <input type="checkbox"/> On Site Testing (Address: Address of testing location) 8. Test method used : 47 CRF Part 1.1310 9. Test Result : Refer to the test result in the test report				
Affirmation	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;"> Tested by Name : Gyungnam Park (Signature) </td> <td style="width: 50%; padding: 5px;"> Technical Manager Name : Heesu Ahn (Signature) </td> </tr> </table>	Tested by Name : Gyungnam Park (Signature)	Technical Manager Name : Heesu Ahn (Signature)	2020-08-20 <div style="text-align: center; font-size: 1.2em; font-weight: bold;">KCTL Inc.</div> <p style="font-size: 0.8em; margin-top: 10px;">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.</p>
Tested by Name : Gyungnam Park (Signature)	Technical Manager Name : Heesu Ahn (Signature)			

REPORT REVISION HISTORY

Date	Revision	Page No
2020-08-10	Originally issued	-
2020-08-20	Updated	7

This report shall not be reproduced except in full, without the written approval of KCTL Inc. This document may be altered or revised by KCTL Inc. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by KCTL Inc. will constitute fraud and shall nullify the document. This test report is a general report that does not use the KOLAS accreditation mark and is not related to KS Q ISO/IEC 17025 and KOLAS accreditation.

Note. The report No. KR20-SRF0193 is superseded by the report No. KR20-SRF0193-A.

General remarks for test reports

Nothing significant to report.



CONTENTS

1.	General information	4
2.	Device information	4
2.1.	Accessory information	4
2.2.	Frequency/channel operations.....	5
3.	Measurement uncertainty	5
4.	RF Exposure.....	6
4.1.	Test results.....	7



1. General information

Client : tuneit
 Address : 4-11, Neuti-ro 51beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
 Manufacturer : tuneit
 Address : 4-11, Neuti-ro 51beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of 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 : Vehicle IoT Module
 Model : tuneitEN01
 Frequency range : 2 402 MHz ~ 2 480 MHz (Bluetooth Low Energy)
 Modulation technique : GFSK
 Number of channels : 40 ch
 Power source : DC 12 V
 Antenna specification : Chip Antenna
 Antenna gain : 3.3 dBi
 Software version : 1.5
 Hardware version : 1.0
 Test device serial No. : N/A
 Operation temperature : -20 °C ~ 50 °C

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
-	-	-	-	-

2.2. Frequency/channel operations

This device contains the following capabilities:

Bluetooth Low Energy

Ch.	Frequency (MHz)
00	2 402
.	.
20	2 442
.	.
39	2 480

Table 2.2.1. Bluetooth Low Energy

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 or 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 (\pm)
Conducted RF power	1.3 dB

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 (MHz)	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [mW/cm ²]	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 MHz, * = 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 kHz

4.1. Test results

MPE (Maximum Permissible Exposure) Prediction

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

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

S = power density [mW/cm^2]

P = Power input to antenna [mW]

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 [cm]

Calculation Result of RF exposure

Maximum tune-up tolerance

Mode	Frequency [MHz]	Max Tune-up Power [dBm]	Max Tune-up Power [mW]	Ant Gain [dBi]	Ant Gain [mW]	Power density at 20 cm [mW/cm ²]	Limit [mW/cm ²]
BLE/1 Mbps	2 402	-4.00	0.40	3.30	2.14	0.000 17	1.00

Note.

- The power density P_d (5th column) at a distance of 20 cm calculated from the friis transmission Formula is far below the limit of 1 mW/cm^2 .

End of test report