



TEST REPORT

KCTL Inc.

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Report No.:
KR20-SRF0028-A

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1. Client

- Name : POWEROS.CO.,LTD
- Address : Bizdong-B117, SKN TECHNOPARK, 124, Sagimakgol-ro,
Jungwon-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
- Date of Receipt : 2019-11-28

2. Use of Report : Certification

3. Name of Product and Model : Fault Detector / PIA-1010

4. Manufacturer and Country of Origin : POWEROS.CO.,LTD / Korea

5. FCC ID : 2AVA6-PIA-1010

6. Date of Test : 2020-01-15 to 2020-01-17

7. Test Standards : 47 CFR Part 1.1310

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

Affirmation	Tested by	Technical Manager
	Name : Euijung Kim  (Signature)	Name : Bobae Lee  (Signature)

2020-02-11

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
2020-01-31	Initial report	-
2020-02-11	Updated	4

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Note. The report No. KR20-SRF0028 is superseded by the report No. KR20-SRF0028-A.

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1. General information

Client : POWEROS.CO.,LTD
 Address : Bizdong-B117, SKN TECHNOPARK, 124, Sagimakgol-ro, Jungwon-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
 Manufacturer : POWEROS.CO.,LTD
 Address : Bizdong-B117, SKN TECHNOPARK, 124, Sagimakgol-ro, Jungwon-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 : Fault Detector
 Model : PIA-1010
 Frequency range : 904 MHz ~ 925 MHz
 Modulation technique : LoRa (DTS)
 Number of channels : 43 ch
 Power source : DC 3.6 V
 Antenna specification : Patch Antenna
 Antenna gain : 1.05 dBi
 Software version : V1.0
 Hardware version : V1.0
 Test device serial No. : 1903-0096
 Operation temperature : 23 °C

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
N/A	-	-	-	-

2.2. Frequency/channel operations

This device contains the following capabilities: LORA

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	904.0 MHz	23	915.0 MHz
2	904.5 MHz	24	915.5 MHz
3	905.0 MHz	25	916.0 MHz
4	905.5 MHz	26	916.5 MHz
5	906.0 MHz	27	917.0 MHz
6	906.5 MHz	28	917.5 MHz
7	907.0 MHz	29	918.0 MHz
8	907.5 MHz	30	918.5 MHz
9	908.0 MHz	31	919.0 MHz
10	908.5 MHz	32	919.5 MHz
11	909.0 MHz	33	920.0 MHz
12	909.5 MHz	34	920.5 MHz
13	910.0 MHz	35	921.0 MHz
14	910.5 MHz	36	921.5 MHz
15	911.0 MHz	37	922.0 MHz
16	911.5 MHz	38	922.5 MHz
17	912.0 MHz	39	923.0 MHz
18	912.5 MHz	40	923.5 MHz
19	913.0 MHz	41	924.0 MHz
20	913.5 MHz	42	924.5 MHz
21	914.0 MHz	43	925.0 MHz
22	914.5 MHz		

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	1.76 dB

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 (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

FCC

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]

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 cm must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

Calculation Result of RF exposure (FCC)

- SF 9

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]
Lowest	904	19.50	89.13	1.05	1.27	0.022 58	1.000 0

5. Measurement Equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV40	100988	21.01.03
Wideband Power Sensor	R&S	NRP-Z81	102398	21.01.21
ATTENUATOR	R&S	DNF Dämpfungsglied 10 dB in N-50 Ohm	31212	20.05.13

End of test report

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