

TEST REPORT

FCC Rules Part 15.231

Report Reference No......: **MTWG2207145-H**

FCC ID..... : **2A33F-OPA-1**

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Date of issue.....: **Aug.11, 2022**

Representative Laboratory Name ..: **Shenzhen Most Technology Service Co., Ltd.**

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Applicant's name.....: **TrolMaster Agro Instruments Co., Ltd**

Address: Room 02-03, 25/F, Well Tech Centre, 9 Pat Tat Street,
San Po Kong, Kowloon, Hong Kong.

Test specification/ Standard: **47 CFR Part 1.1307**

47 CFR Part 2.1093

TRF Originator.....: Shenzhen Most Technology Service Co., Ltd.

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Test item description: Smart Junction Box / Smart Junction Box (480V version)

Trade Mark: **TrolMaster**

Model/Type reference.....: OPA-1

Listed Models: OPB-1

Modulation Type.....: LORA

Operation Frequency.....: 915MHz

Hardware version: V1.0

Software version: V0.5

Rating: AC100~480V,50/60Hz

Result.....: **PASS**

TEST REPORT

Equipment under Test : Smart Junction Box / Smart Junction Box (480V version)

Model /Type : OPA-1

Listed Models : OPB-1

Remark: The internal circuit is the same, only the output voltage is different.

Applicant : TrolMaster Agro Instruments Co., Ltd

Address : Room 02-03, 25/F, Well Tech Centre, 9 Pat Tat Street,
San Po Kong, Kowloon, Hong Kong

Manufacturer : TrolMaster Agro Instruments Co., Ltd

Address : Room 02-03, 25/F, Well Tech Centre, 9 Pat Tat Street,
San Po Kong, Kowloon, Hong Kong

Factory 1 : TOPE (XIAMEN) ELECTRONICS CO.,LTD
No.98-2, North Xinglin 2nd Road, Jimer District, XIAMEN, Fujian
361022

Factory 2 : Alder Optomechanical Corp.
No. 171 Tianjin Street, Pingzhen Dist. Taoyuan 32458, Taiwan

Factory 3 : Amber Horticultural Technology Ltd.
No.39, Daji Rende Dist, Tainan City, 717007, Taiwan

Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents**1. Revision History**

Revision	Issue Date	Revisions	Revised By
00	2022.08.11	Initial Issue	Alisa Luo

2. SAR Evaluation

2.1 RF Exposure Compliance Requirement

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(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 (minutes)
(A) Limits for Occupational/Controlled Exposures				
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
300–1500			f/300	6
1500–100,000			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
300–1500			f/1500	30
1500–100,000			1.0	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$ Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

2.1.3 EUT RF Exposure

$$\text{EIRP} = \text{PT} * \text{GT} = (\text{E} \times \text{D})^2 / 30$$

where:

PT = transmitter output power in watts,

GT = numeric gain of the transmitting antenna (unitless),

E = electric field strength in V/m, $10^{(\text{dB}\mu\text{V}/\text{m})/20} / 10^6$,

D = measurement distance in meters (m)---3m,

$$\text{So PT} = (\text{E} \times \text{D})^2 / 30 / \text{GT}$$

The worst case (refer to report MTWG2207120s below:

Antenna polarization: Horizontal		
Frequency (MHz)	Level (dBuV/m)	Polarization
915.0	77.85	Peak
915.0	65.84	Average

Antenna polarization: Vertical		
Frequency (MHz)	Level (dBuV/m)	Polarization
915.0	78.46	Peak
915.0	66.13	Average

For 915.0MHz wireless:

Field strength=66.13 dBuV/m

Ant gain:3dBi;so Ant numeric gain=2

$$\text{EIRP} = \text{PT} * \text{GT} = (\text{E} \times \text{D})^2 / 30 = (10^{(\text{dB}\mu\text{V}/\text{m})/20} / 10^6 * 3)^2 / 30 = 0.0000012$$

$$\text{So PT} = \text{EIRP} / \text{GT} = 0.0000006\text{W} = 0.0006\text{mW}$$

$$\text{So Pd} = (\text{Pout} * \text{G}) / (4 * \text{Pi} * \text{R}^2) = (0.0006 * 2) / (4 * 3.1416 * 20^2) = 0.0000002$$

$$\text{exclusion} = 0.0000002 < 0.61$$

So the SAR report is not required.