



TEST REPORT

FCC MPE Test for LORU
Certification

APPLICANT
Mueller Systems, LLC

REPORT NO.
HCT-RF-2312-FI013

DATE OF ISSUE
December 27, 2023

Tested by
Kyung Jun Woo



Technical Manager
Jong Seok Lee

Accredited by KOLAS, Republic of KOREA

HCT CO., LTD.
BongJai Huh
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Additional Model

-

Applicant

Mueller Systems, LLC

1200 Abernathy Road, NE, Suite 1200. Atlanta, GA, USA, 30328

Eut Type Model Name

Water Meter Universal Node (LoRa)
LORU

FCC ID

SM6-LORU

Frequency range

2 402 MHz – 2 480 MHz (BT LE)
902.3 MHz – 914.9 MHz(LoRa 125k)
903.0 MHz – 915.7 MHz(LoRa 500k)

Test Location

☒ Permanent Testing Lab

(Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si,
Gyeonggi-do, Republic of Korea)

☐ On Site Testing

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

This test results were applied only to the test methods required by the standard.

This laboratory is not accredited for the test results marked *.

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	December 27, 2023	Initial Release

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance

Test Report Statement:

KOLAS Statement:

The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (KOLAS Accreditation No. KT197)

If this report is required to confirmation of authenticity, please contact to www.hct.co.kr

RF Exposure Statement

1. Limit

According to § 1.1310, § 2.1091 RF exposure is calculated.

(B) Limits for General Population/Uncontrolled Exposures

Frequency range (MHz)	Electric field Strength (V/m)	Magnetic field Strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
0.3 - 1.34.....	614	1.63	^(a) (100)	30
1.34 - 30.....	824/f	2.19/f	^(a) (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

^(a) = Plane-wave equivalent power density

2. Maximum Permissible Exposure Prediction

Prediction of MPE limit at a given distance

$$S = PG/4\pi R^2$$

S = Power density

P = Power input to antenna

G = Power gain to the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

3. RESULTS

3-1. BT LE

Average output Power at antenna input terminal	4.500	dBm
Average output Power at antenna input terminal	2.818	mW
Prediction distance	20.000	cm
Prediction frequency	2 402 ~ 2 480	MHz
Antenna Gain(typical)	0.880	dBi
Antenna Gain(numeric)	1.225	-
Power density at prediction frequency(S)	0.0007	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm ²

2.1091

EIRP	5.38	(dBm)
ERP	3.23	(dBm)
ERP	0.002	(W)
ERP Limit	3.00	(W)
MARGIN	31.54	(dB)

3-2. LoRa 125k FHSS

Average output Power at antenna input terminal	30.000	dBm
Average output Power at antenna input terminal	1000.000	mW
Prediction distance	20.000	cm
Prediction frequency	902.3 – 914.9	MHz
Antenna Gain(typical)	0.950	dBi
Antenna Gain(numeric)	1.245	-
Power density at prediction frequency(S)	0.2476	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.6015	mW/cm ²

2.1091

EIRP	30.95	(dBm)
ERP	28.80	(dBm)
ERP	0.759	(W)
ERP Limit	1.50	(W)
MARGIN	2.96	(dB)

3-3. LoRa 125k Hybrid

Average output Power at antenna input terminal	10.000	dBm
Average output Power at antenna input terminal	10.000	mW
Prediction distance	20.000	cm
Prediction frequency	902.3 – 914.9	MHz
Antenna Gain(typical)	0.950	dBi
Antenna Gain(numeric)	1.245	-
Power density at prediction frequency(S)	0.0025	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.6015	mW/cm ²

2.1091

EIRP	10.95	(dBm)
ERP	8.80	(dBm)
ERP	0.008	(W)
ERP Limit	1.50	(W)
MARGIN	22.96	(dB)

3-4. LoRa 500k

Average output Power at antenna input terminal	30.000	dBm
Average output Power at antenna input terminal	1000.000	mW
Prediction distance	20.000	cm
Prediction frequency	903.0 – 915.7	MHz
Antenna Gain(typical)	0.950	dBi
Antenna Gain(numeric)	1.245	-
Power density at prediction frequency(S)	0.2476	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.6020	mW/cm ²

2.1091

EIRP	30.95	(dBm)
ERP	28.80	(dBm)
ERP	0.759	(W)
ERP Limit	1.50	(W)
MARGIN	2.96	(dB)