

RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-245-RWD-035

Reception No. : 2308002605

Applicant : LANDROAD Inc.

Address : B-107, 109, Ballyong-ro, Deokjin-gu, jeonju-si, Jeollabuk-do, South Korea

Manufacturer : LANDROAD Inc.

Address : B-107, 109, Ballyong-ro, Deokjin-gu, jeonju-si, Jeollabuk-do, South Korea

Type of Equipment : LTE CatM1 based Sensor node

FCC ID : 2BGJWROADRAINLTEN

Model Name : RoaDrain LTEN

Multiple Model Name : N/A

Serial number : N/A

Total page of Report : 6 pages (including this page)

Date of Incoming : January 15, 2024

Date of Issuing : May 29, 2024

SUMMARY

The equipment complies with the regulation; *FCC CFR 47 § 1.1307*

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

This report is not correlated with the "KS Q ISO/IEC 17025 and KOLAS accreditation" of Korean Laboratory Accreditation Scheme.



Tested by
Ju-Yun, Park / Sr. Engineer
ONETECH Corp.



Reviewed by
Tae-Ho, Kim / Chief Engineer
ONETECH Corp.



Approved by
Jae-Ho, Lee / Chief Engineer
ONETECH Corp.

CONTENTS

PAGE

1. VERIFICATION OF COMPLIANCE	4
2. GENERAL INFORMATION	5
2.1 PRODUCT DESCRIPTION.....	5
2.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	5
3. EUT MODIFICATIONS.....	5
4. MAXIMUM PERMISSIBLE EXPOSURE	6
4.1 RF EXPOSURE CALCULATION	6
4.2 EUT DESCRIPTION.....	6
5. CALCULATED MPE SAFE DISTANCE	6

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-245-RWD-035	May 29, 2024	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : LANDROAD Inc.
Address : B-107, 109, Ballyong-ro, Deokjin-gu, jeonju-si, Jeollabuk-do, South Korea
Contact Person : Juhwan Lee
Telephone No. : +82-10-6319-4565
FCC ID : 2BGJWROADRAINLTEN
Model Name : RoaDrain LTEN
Serial Number : N/A
Date : May 29, 2024

DEVICE TYPE	PCB-PCS Licensed Transmitter
E.U.T. DESCRIPTION	LTE CatM1 based Sensor node
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	KDB 447498 D01 Interim General RF Exposure Guidance v06
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The LANDROAD Inc., Model RoaDrain LTEN (referred to as the EUT in this report) is a LTE CatM1 based Sensor node.

Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	LTE CatM1 based Sensor node		
OPERATING FREQUENCY	LTE Band 2	TX	1 850 MHz ~ 1 910 MHz
		RX	1 930 MHz ~ 1 990 MHz
	LTE Band 12	TX	699 MHz ~ 716 MHz
		RX	729 MHz ~ 746 MHz
LTE Channel Bandwidth	LTE Band 2	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz	
	LTE Band 12	1.4 MHz, 3 MHz, 5 MHz, 10 MHz	
Modulation Type	QPSK, 16QAM		
Maximum EIRP Power	LTE Band 2	22.45 dBm	
	LTE Band 12	22.91 dBm	
ANTENNA TYPE	Dipole Antenna		
ANTENNA GAIN	LTE Band 2	3.5 dBi	
	LTE Band 12	2.5 dBi	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32.768 kHz, 8.0 MHz		

2.2 Alternative type(s)/model(s); also covered by this test report.

-. None

3. EUT MODIFICATIONS

-. None

4. MAXIMUM PERMISSIBLE EXPOSURE

4.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment are $f/1500$ mW/cm² for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm² for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm² exposure is calculated as follows:

$$E = \sqrt{(30 * P * G)} / d, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

Where

S = Power density in mW/cm², Z = Impedance of free space, 377 Ω

E = Electric field strength in V/m, G = Numeric antenna gain, and d = distance in meter

Combining equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30 * P * G) / (377 * 10 S)}$$

Changing to units of mW and cm, using P (mW) = P (W) / 1 000, d (cm) = 0.01 * d (m)

$$d = 0.282 * \sqrt{(P * G) / S}$$

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

4.2 EUT Description

Kind of EUT	LTE CatM1 based Sensor node	
MAX. RF OUTPUT POWER	LTE Band 2	22.45 dBm
	LTE Band 12	22.91 dBm
Device Category	<input type="checkbox"/> Portable (< 20 cm separation) <input checked="" type="checkbox"/> Mobile (> 20 cm separation) <input type="checkbox"/> Others	
Exposure Evaluation Applied	<input checked="" type="checkbox"/> MPE <input type="checkbox"/> SAR <input type="checkbox"/> N/A	

5. Calculated MPE Safe Distance

Operating Mode	Operating Frequency (MHz)	Average Power E.I.R.P		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
		(dBm)	(mW)			
LTE Band 2	1 852.5	27.50	393.55	20.00	0.111 9	1.00
LTE Band 12	701.5	26.50	347.54	20.00	0.088 9	0.47