

RADIO PERFORMANCE TEST REPORT (CLASS I Permissive Change)

Test Report No. : OT-24O-RWD-050
Reception No. : 2409003267
Applicant : gninth Co., Ltd.
Address : 2120, 122, Jomaru-ro 385beon-gil, Wonmi-gu, Bucheon-si, Gyeonggi-do, South Korea
Manufacturer : gninth Co., Ltd.
Address : 2120, 122, Jomaru-ro 385beon-gil, Wonmi-gu, Bucheon-si, Gyeonggi-do, South Korea
Type of Equipment : SMART DOORLOCK REMOCON
FCC ID : 2BLBY-DELKEY-R
Model No. : DELKEY-R
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 18 pages (including this page)
Date of Incoming : October 14, 2024
Date of issuing : October 28, 2024

SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.209 and Section 15.231**

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.

한동연




Tested by
Dong-Yeon, Han / Prj. 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	5
2. TEST SUMMARY	6
2.1 TEST ITEMS AND RESULTS	6
2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....	6
2.3 RELATED SUBMITTAL(S) / GRANT(S)	6
2.4 PURPOSE OF THE TEST	7
2.5 TEST METHODOLOGY.....	7
2.6 TEST FACILITY.....	7
3. GENERAL INFORMATION.....	8
3.1 PRODUCT DESCRIPTION.....	8
3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	8
4. EUT MODIFICATIONS.....	8
5. SYSTEM TEST CONFIGURATION	8
5.1 JUSTIFICATION.....	8
5.2 PERIPHERAL EQUIPMENT	8
5.3 MODE OF OPERATION DURING THE TEST	9
5.4 CONFIGURATION OF TEST SYSTEM.....	10
5.5 ANTENNA REQUIREMENT	10
6. PRELIMINARY TEST	10
6.1 AC POWER LINE CONDUCTED EMISSIONS TESTS.....	10
6.2 GENERAL RADIATED EMISSIONS TESTS	10
7. BANDWIDTH MEASUREMENT	11
7.1 OPERATING ENVIRONMENT	11
7.2 TEST SET-UP	11
7.3 TEST DATE	11
7.4 TEST DATA.....	11
8. TRANSMISSION TIME	12
8.1 OPERATING ENVIRONMENT	12
8.2 TEST SET-UP	12
8.3 TEST DATE	12
8.4 TEST DATA.....	12
9. RADIATED EMISSION TEST	13

9.1 REGULATION	13
9.2 TEST SET-UP	13
9.3 TEST DATE	14
9.4 TEST DATA.....	14
9.4.1 Field Strength of Fundamental.....	14
9.4.2 Spurious Emission Test & Restricted Band Test	14
10. LIST OF TEST EQUIPMENT	18

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-24O-RWD-029	October 18, 2024	Initial Release	All
1	OT-24O-RWD-050	October 28, 2024	The company name, model name, and FCC ID have been changed. (Class I Permissive Change)	All

1. VERIFICATION OF COMPLIANCE

Applicant : gninth Co., Ltd.

Address : 2120, 122, Jomaru-ro 385beon-gil, Wonmi-gu, Bucheon-si, Gyeonggi-do, South Korea

Contact Person : Lee Ho Sub / Manager

Telephone No. : +82-10-2325-9990

FCC ID : 2BLBY-DELKEY-R

Model Name : DELKEY-R

Brand Name : -

Serial Number : N/A

Date : October 28, 2024

EQUIPMENT CLASS	DSC - Part 15, Security/Remote Control Transmitter
E.U.T. DESCRIPTION	SMART DOORLOCK REMOCON
THIS REPORT CONCERNS	Class I Permissive Change
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.209 and Section 15.231
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None
FINAL TEST WAS CONDUCTED ON	3 m, Semi Anechoic Chamber

-. 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. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.231(c)	Bandwidth Measurement	Met the Limit / PASS
15.231(a)	Transmission Time	Met the Limit / PASS
15.231(b) 15.209(a)	Field Strength of Fundamental and Spurious Emission	Met the Limit / PASS
15.205	Restricted Band	Met the Limit / PASS
15.207	AC Conducted Emissions	N/A (See Note)

Note: This test is not performed because the EUT is operated by DC battery.

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

-. CLASS I Permissive Change:

The EUT was granted on October 24, 2024 but only following modifications and/or changed items are implemented into the device.

Company name	Before	gninth Co. Ltd.
	After	gninth Co., Ltd.
Model name	Before	DELEY-R
	After	DELKEY-R
FCC ID	Before	2BLBY-DELEY-R
	After	2BLBY-DELKEY-R

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in section 2.1.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The gninth Co., Ltd., Model DELKEY-R (referred to as the EUT in this report) is a SMART DOORLOCK REMOCON. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	SMART DOORLOCK REMOCON
TX FREQUENCY	447.275 MHz
RX FREQUENCY	-
MODULATION	FSK
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>= 1 MHz)	26 MHz
DUTY CYCLE FACTOR	7.68 dB (Duty Cycle: 41.32 %)
ANTENNA TYPE	Helical Antenna
ANTEENA GAIN	1.30 dBi
RATED SUPPLY VOLTAGE	DC 3.0 V

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

-. None

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
MAIN BOARD	gninth Co., Ltd.	HYR260-RC	-

5.2 Peripheral equipment

-. None

5.3 Mode of operation during the test

Software was programmed into the EUT to maintain continuous transfer mode. The EUT was set at 447.275 MHz. To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis. So, the worst data was recorded in this test report.

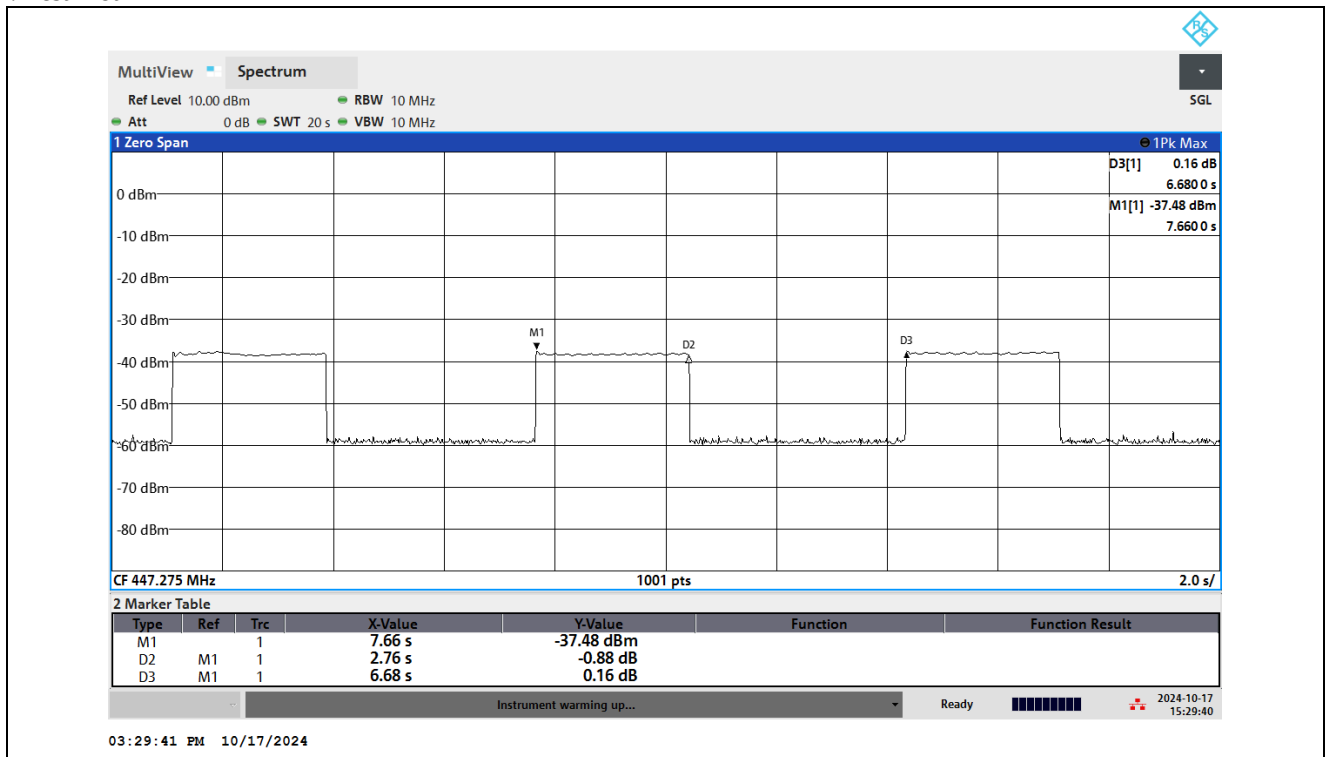
-. Duty Cycle

Frequency (MHz)	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Duty Cycle Factor [dB]
447.275	2760	6680	41.32	7.68

Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) * 100

Duty Cycle Factor : 20 * Log(1 / (Duty Cycle / 100))

-. Test Plot



The average field strength may be found by measuring the peak pulse amplitude (in log equivalent units) and determining the duty cycle correction factor (in dB) associated with the pulse modulation as shown in Equation. (ANSI C63.10: 2013)

5.4 Configuration of Test System

Line Conducted Test: It is not need to test this requirement, because the EUT shall be operated by DC battery.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m Semi Anechoic Chamber
The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

5.5 Antenna Requirement

For intentional device, according to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction:

The antenna of the EUT is Helical Antenna on the main board, so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
It is not need to test this requirement, because the power of the EUT is supplied by battery.	

6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

7. Bandwidth Measurement

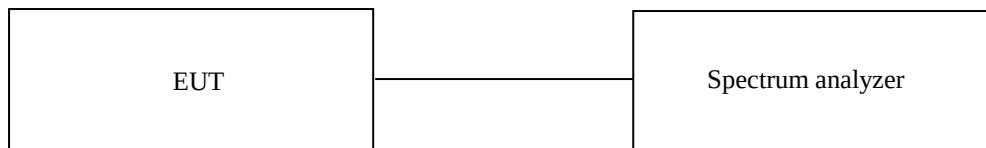
7.1 Operating environment

Temperature : 21 °C

Relative humidity : 52 % R.H.

7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 10 kHz, and peak detection was used. The bandwidth of fundamental frequency was measured and recorded.



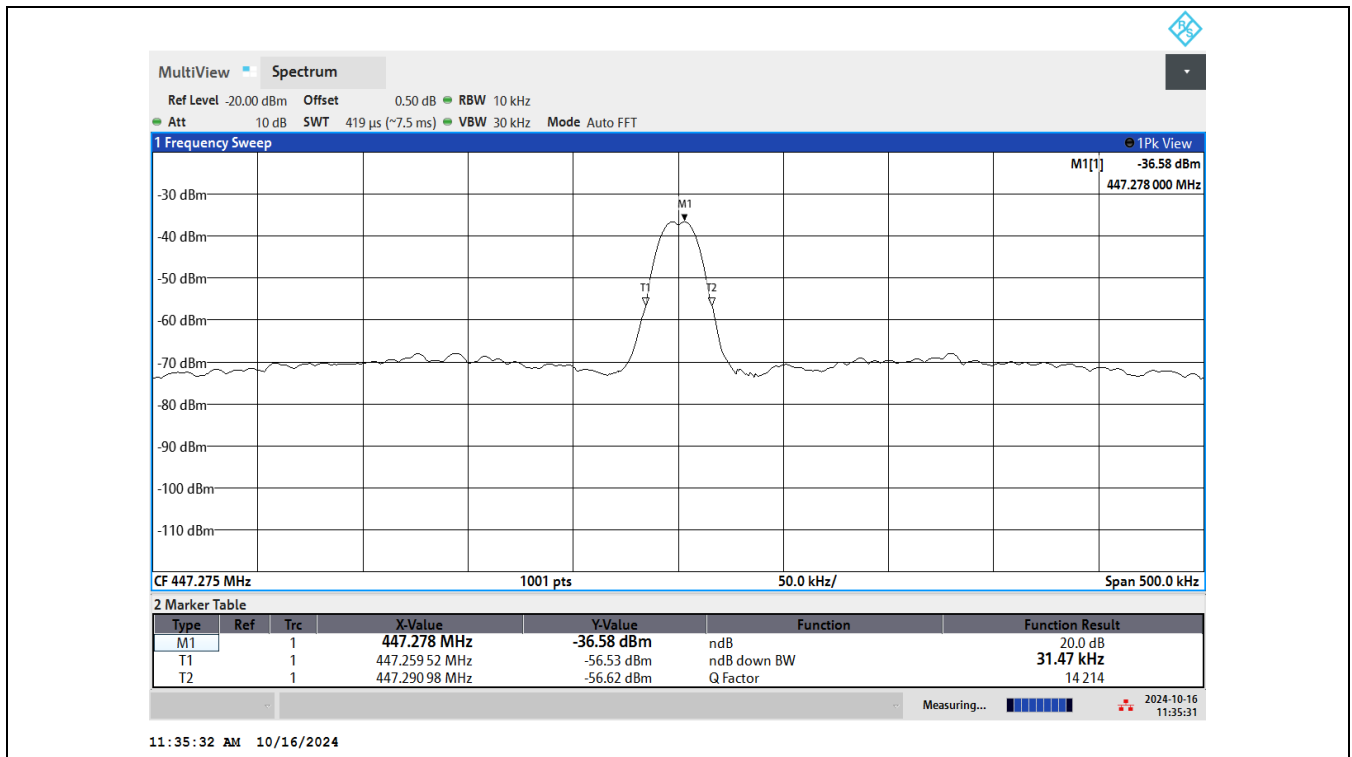
7.3 Test date

October 15, 2024 ~ October 16, 2024

7.4 Test data

-. Test Result : Pass

Frequency (MHz)	20 dB Bandwidth (MHz)	Limit (MHz)
447.28	0.031	1.118



8. Transmission Time

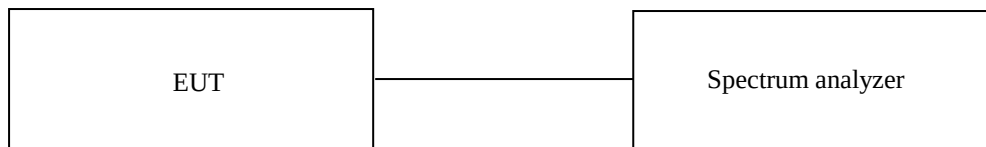
8.1 Operating environment

Temperature : 21 °C

Relative humidity : 52 % R.H.

8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The bandwidth of fundamental frequency was measured and recorded.



8.3 Test date

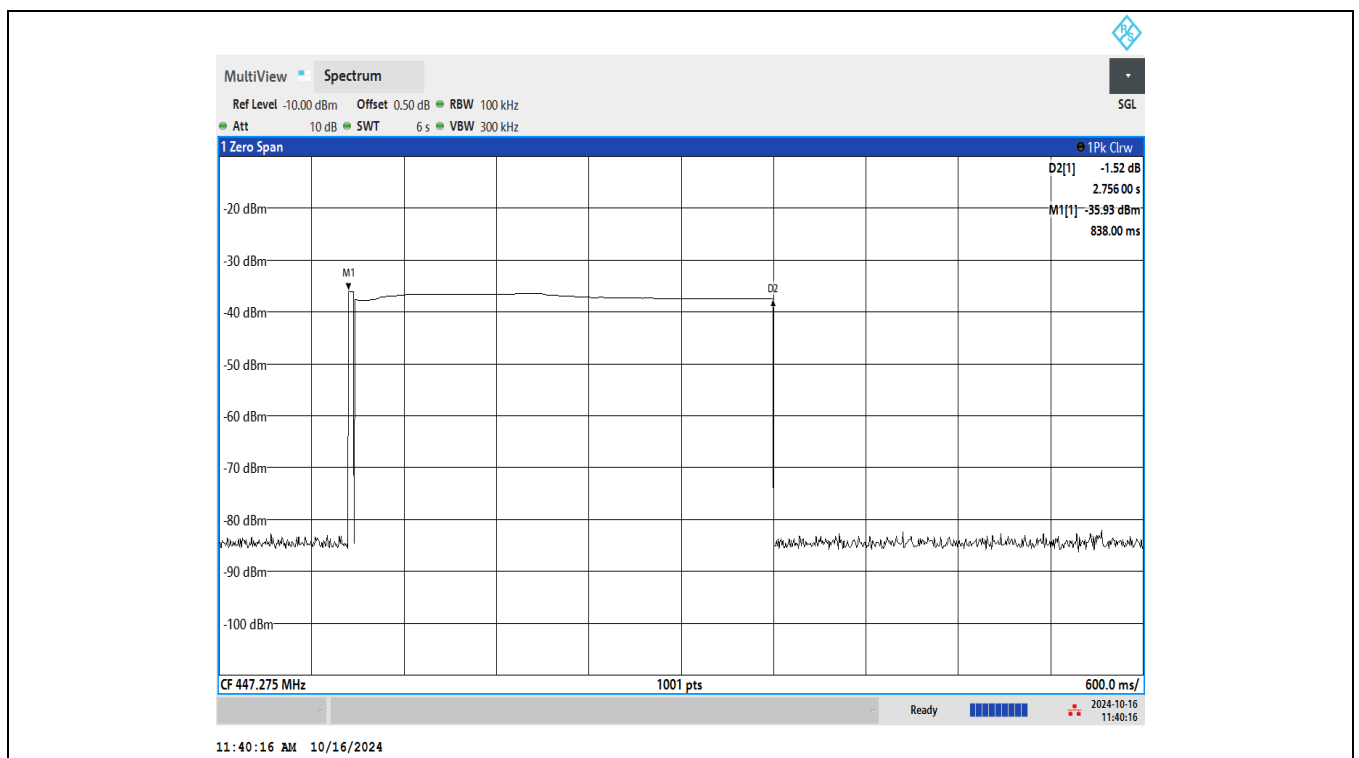
October 15, 2024 ~ October 16, 2024

8.4 Test data

-. Test Result : Pass

-. Test Applies : 15.231 (a) (1)

Frequency (MHz)	Transmission Time (s)	Limit (s)	Result
447.28	2.76	5.000	Pass



9. Radiated Emission Test

9.1 Regulation

According to §15.209(a), for an intentional device, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency [MHz]	Field strength [μ V/m]	Field strength [dB μ V/m]	Measurement distance [m]
0.009 ~ 0.490	2 400 / F (kHz)	-	300
0.490 ~ 1.705	24 000 / F (kHz)	-	30
1.705 ~ 30	30	29.50	30
30 ~ 88	*100	40.00	3
88 ~ 216	*150	43.52	3
216 ~ 960	*200	46.02	3
Above 960	500	53.98	3

*Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 ~ 72 MHz, 76 ~ 88 MHz, 174 ~ 216 MHz or 470 ~ 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

According to §15.231(b), for an intentional device, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency [MHz]	Field strength of Fundamental [μ V/m]	Field strength of Spurious Emissions [μ V/m]
40.66 ~ 40.70	2 250	225
70 ~ 130	1 250	125
130 ~ 174	1 250 ~ 3 750 **	125 ~ 375 **
174 ~ 260	3 750	375
260 ~ 470	3 750 ~ 12 500 **	375 ~ 1 250 **
Above 470	12 500	1 250

** Linear interpolations

9.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 kHz to 1 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

It should not be reproduced except in full, without the written approval of ONETECH.

OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

9.3 Test date

October 15, 2024 ~ October 16, 2024

9.4 Test data

9.4.1 Field Strength of Fundamental

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 52 % R.H.

Temperature: 21 °C

Limits apply to : FCC CFG 47, PART 15, SUBPART C, SECTION 15.231(b)

Result : PASSED

EUT : SMART DOORLOCK REMOCON

Operating Condition : TX mode

Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Duty Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
447.28	85.45	Peak	H	22.80	5.89	32.00	-	82.14	101.25	19.11
	-	Average	H	22.80	5.89	32.00	7.68	74.46	81.25	6.79
	76.62	Peak	V	22.80	5.89	32.00	-	73.31	101.25	27.94
	-	Average	V	22.80	5.89	32.00	7.68	65.63	81.25	15.62

Remark: "H": Horizontal, "V": Vertical

Total (dBμV/m) = Reading (dBμV) + Ant Factor (dB) + Cable Loss (dB) – Amp Gain (dB) – Duty Factor (dB)

Margin (dB) = Limits (dBμV/m) - Total (dBμV/m)

9.4.2 Spurious Emission Test & Restricted Band Test

9.4.2.1 Test data for 9 kHz to 30 MHz

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

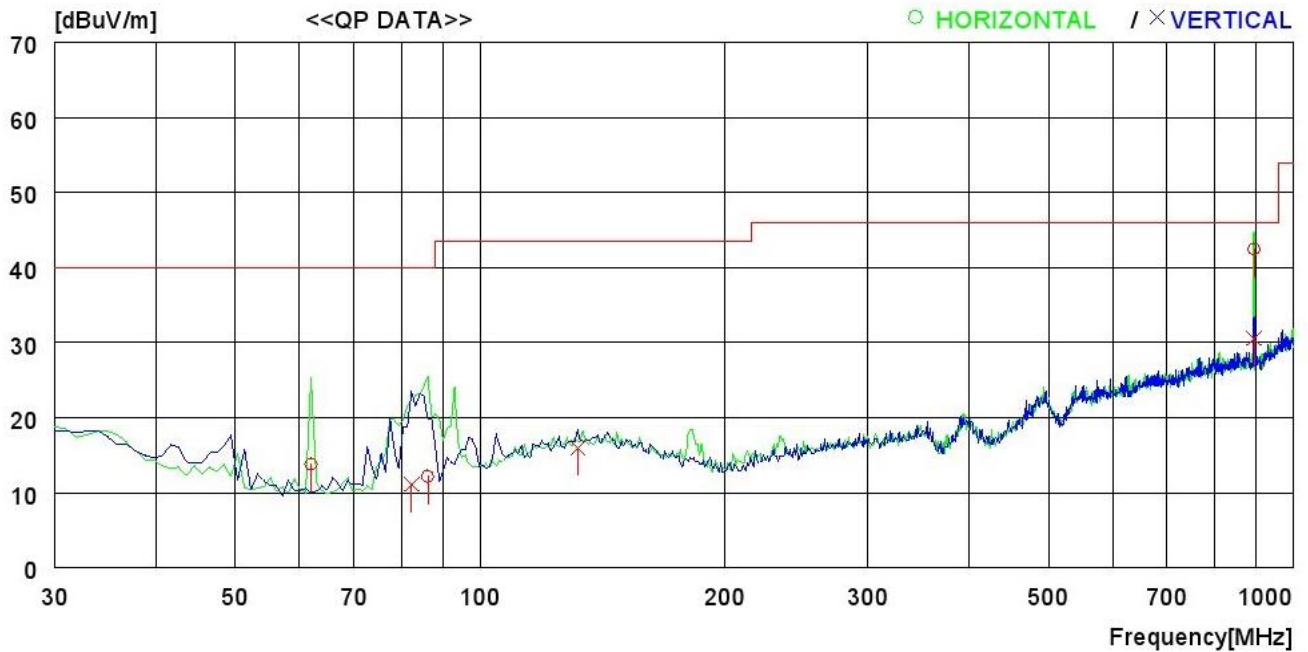
-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
All emissions observed were 20 dB below the limit.									

9.4.2.2 Test data for 30 MHz to 1 000 MHz

- . Resolution bandwidth : 120 kHz
- . Frequency range : 30 MHz ~ 1 000 MHz
- . Measurement distance : 3 m



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	62.010	33.5	12.3	1.0	33.0	13.8	40.0	26.2	200	359
2	86.260	30.6	13.4	1.2	33.0	12.2	40.0	27.8	200	2
3	895.229	43.6	27.5	3.9	32.5	42.5	46.0	3.5	100	0
----- Vertical -----										
4	82.380	29.7	13.2	1.2	33.0	11.1	40.0	28.9	100	359
5	131.850	28.3	19.2	1.5	33.0	16.0	43.5	27.5	100	340
6	895.229	31.7	27.5	3.9	32.5	30.6	46.0	15.4	100	359

9.4.2.3 Test data for above 1 GHz

- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 5 GHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Duty Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1 341.72 ^{1), 2)}	51.27	Peak	H	25.80	2.26	42.01	-	37.32	74.00	36.68
1 341.27 ^{1), 2)}		Average	H	25.80	2.26	42.01	7.68	29.64	54.00	24.36
1 341.88 ^{1), 2)}	51.33	Peak	V	25.80	2.26	42.01	-	37.38	74.00	36.62
1 341.88 ^{1), 2)}		Average	V	25.80	2.26	42.01	7.68	29.70	54.00	24.30
1 788.98 ^{1), 2)}	49.86	Peak	H	25.10	2.55	41.84	-	35.67	81.25	45.58
1 788.98 ^{1), 2)}		Average	H	25.10	2.55	41.84	7.68	27.99	61.25	33.26
1 814.96 ^{1), 2)}	55.6	Peak	V	25.10	2.55	41.84	-	41.41	81.25	39.84
1 814.96 ^{1), 2)}		Average	V	25.10	2.55	41.84	7.68	33.73	61.25	27.52
2 237.16 ^{1), 2)}	50.38	Peak	H	28.10	2.84	41.75	-	39.57	74.00	34.43
2 237.16 ^{1), 2)}		Average	H	28.10	2.84	41.75	7.68	31.89	54.00	22.11
2 233.92 ^{1), 2)}	59.96	Peak	V	28.10	2.84	41.75	-	49.15	74.00	24.85
2 233.92 ^{1), 2)}		Average	V	28.10	2.84	41.75	7.68	41.47	54.00	12.53
2 686.46 ^{1), 2)}	49.66	Peak	H	27.70	3.05	41.72	-	38.69	81.25	42.56
2 686.46 ^{1), 2)}		Average	H	27.70	3.05	41.72	7.68	31.01	61.25	30.24
2 683.29 ^{1), 2)}	50.06	Peak	V	27.70	3.05	41.72	-	39.09	81.25	42.16
2 683.29 ^{1), 2)}		Average	V	27.70	3.05	41.72	7.68	31.41	61.25	29.84
3 131.13 ^{1), 2)}	48.66	Peak	H	29.00	3.33	41.60	-	39.39	81.25	41.86
3 131.13 ^{1), 2)}		Average	H	29.00	3.33	41.60	7.68	31.71	61.25	29.54
3 128.94 ^{1), 2)}	49.11	Peak	V	29.00	3.33	41.60	-	39.84	81.25	41.41
3 128.94 ^{1), 2)}		Average	V	29.00	3.33	41.60	7.68	32.16	61.25	29.09

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Duty Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
3 577.65 ^{1), 2)}	48.94	Peak	H	29.00	3.47	41.46	-	39.95	81.25	41.30
3 577.65 ^{1), 2)}		Average	H	29.00	3.47	41.46	7.68	32.27	61.25	28.98
3 581.04 ^{1), 2)}	49.51	Peak	V	29.00	3.47	41.46	-	40.52	81.25	40.73
3 581.04 ^{1), 2)}		Average	V	29.00	3.47	41.46	7.68	32.84	61.25	28.41
4 026.04 ^{1), 2)}	50.2	Peak	H	29.60	3.65	41.45	-	42.00	74.00	32.00
4 026.04 ^{1), 2)}		Average	H	29.60	3.65	41.45	7.68	34.32	54.00	19.68
4 028.12 ^{1), 2)}	47.49	Peak	V	29.60	3.65	41.45	-	39.29	74.00	34.71
4 028.12 ^{1), 2)}		Average	V	29.60	3.65	41.45	7.68	31.61	54.00	22.39
4 470.94 ^{1), 2)}	49.22	Peak	H	30.60	3.86	41.37	-	42.31	81.25	38.94
4 470.94 ^{1), 2)}		Average	H	30.60	3.86	41.37	7.68	34.63	61.25	26.62
4 470.08 ^{1), 2)}	49.87	Peak	V	30.60	3.86	41.37	-	42.96	81.25	38.29
4 470.08 ^{1), 2)}		Average	V	30.60	3.86	41.37	7.68	35.28	61.25	25.97
4 921.45 ^{1), 2)}	49.6	Peak	H	31.50	4.03	41.25	-	43.88	74.00	30.12
4 921.45 ^{1), 2)}		Average	H	31.50	4.03	41.25	7.68	36.20	54.00	17.80
4 921.63 ^{1), 2)}	49.65	Peak	V	31.50	4.03	41.25	-	43.93	74.00	30.07
4 921.63 ^{1), 2)}		Average	V	31.50	4.03	41.25	7.68	36.25	54.00	17.75

Remark : “H”: Horizontal, “V”: Vertical

¹⁾ : Harmonic

²⁾ : Restricted band

Total (dBμV/m) = Reading (dBμV) + Ant Factor (dB) + Cable Loss (dB) – Amp Gain (dB) – Duty Factor (dB)

Margin (dB) = Limits (dBμV/m) - Total (dBμV/m)

10. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
FSV40-N	Rohde & Schwarz	Signal Analyzer	101651	Jan. 15, 2024 (1Y)
ESR	Rohde & Schwarz	EMI Test Receiver	101470	Jnu. 13, 2024 (1Y)
HLP-2008	TDK RF Solutions	Hybrid Antenna	131313	Apr. 05, 2023 (2Y)
310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 11, 2024 (1Y)
BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1349	Jul. 02, 2024 (1Y)
N/A	PHELCOM.CO	Band Reject Filter	N/A	Jan. 15, 2024 (1Y)
F-20-1000-N	RLC Electronis	High Pass Filter (1 GHz)	0426	Jan. 15, 2024 (1Y)
SCU18	R/S	SIGNAL CONDITIONING UNIT	18040081	Jul. 04, 2024 (1Y)
CO3000	Innco Systems GmbH	Controller	N/A	N/A
DT5000	Innco Systems GmbH	Turn Table	N/A	N/A
MA-4000XPET	Innco Systems GmbH	Antenna Master	MA4000/509/ 37211215/L	N/A