



EMI TEST REPORT

Test Report No.: 13806752S-B

Customer	NITTOKU CO., LTD.
Description of EUT	LF-Band RFID READER/WRITER
Model Number of EUT	ITS-LRW210
FCC ID	2A29T-ITSLRW210V11
Test Regulation	FCC Part 15 Subpart B: 2021, Class A
Test Result	Complied (Refer to SECTION 3)
Issue Date	March 18, 2022
Remarks	-

Representative test engineer

Shiro Kobayashi
Engineer

Approved by

Kazuya Noda
Leader



CERTIFICATE 1266.03

- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan, Inc.
☒ There is no testing item of "Non-accreditation".

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- The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan, Inc. has been accredited.
- The information provided from the applicant for this report is identified in Section 1.
- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

REVISION HISTORY

Original Test Report No.: 13806752S-B

Revision	Test report No.	Date	Revised Contents
- (Original)	13806752S-B	March 18, 2022	-

Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	IEEE	Institute of Electrical and Electronics Engineers
AAN	Asymmetric Artificial Network	IF	Intermediate Frequency
AC	Alternating Current	ILAC	International Laboratory Accreditation Conference
AM	Amplitude Modulation	ISED	Innovation, Science and Economic Development Canada
AMN	Artificial Mains Network	ISN	Impedance Stabilization Network
Amp, AMP	Amplifier	ISO	International Organization for Standardization
ANSI	American National Standards Institute	JAB	Japan Accreditation Board
Ant, ANT	Antenna	LAN	Local Area Network
AP	Access Point	LCL	Longitudinal Conversion Loss
ASK	Amplitude Shift Keying	LIMS	Laboratory Information Management System
Atten., ATT	Attenuator	LISN	Line Impedance Stabilization Network
AV	Average	MRA	Mutual Recognition Arrangement
BPSK	Binary Phase-Shift Keying	N/A	Not Applicable
BR	Bluetooth Basic Rate	NIST	National Institute of Standards and Technology
BT	Bluetooth	NS	No signal detect.
BT LE	Bluetooth Low Energy	NSA	Normalized Site Attenuation
BW	BandWidth	OBW	Occupied BandWidth
C.F	Correction Factor	OFDM	Orthogonal Frequency Division Multiplexing
Cal Int	Calibration Interval	PER	Packet Error Rate
CAV	CISPR AV	PK	Peak
CCK	Complementary Code Keying	P _{LT}	long-term flicker severity
CDN	Coupling Decoupling Network	POHC(A)	Partial Odd Harmonic Current
Ch., CH	Channel	Pol., Pola.	Polarization
CISPR	Comite International Special des Perturbations Radioelectriques	PR-ASK	Phase Reversal ASK
Corr.	Correction	P _{ST}	short-term flicker severity
CPE	Customer premise equipment	QAM	Quadrature Amplitude Modulation
CW	Continuous Wave	QP	Quasi-Peak
DBPSK	Differential BPSK	QPSK	Quadrature Phase Shift Keying
DC	Direct Current	r.m.s., RMS	Root Mean Square
DET	Detector	RBW	Resolution BandWidth
D-factor	Distance factor	RE	Radio Equipment
Dmax	maximum absolute voltage change during an observation period	REV	Reverse
DQPSK	Differential QPSK	RF	Radio Frequency
DSSS	Direct Sequence Spread Spectrum	RFID	Radio Frequency Identifier
DUT	Device Under Test	RNSS	Radio Navigation Satellite Service
EDR	Enhanced Data Rate	RSS	Radio Standards Specifications
e.i.r.p., EIRP	Equivalent Isotropically Radiated Power	Rx	Receiving
EM clamp	Electromagnetic clamp	SINAD	Ratio of (Signal + Noise + Distortion) to (Noise + Distortion)
EMC	ElectroMagnetic Compatibility	S/N	Signal to Noise ratio
EMI	ElectroMagnetic Interference	SA, S/A	Spectrum Analyzer
EMS	ElectroMagnetic Susceptibility	SABS	South African Bureau of Standards
EN	European Norm	SANS	South African National Standards
e.r.p., ERP	Effective Radiated Power	SG	Signal Generator
ETSI	European Telecommunications Standards Institute	SVSWR	Site-Voltage Standing Wave Ratio
EU	European Union	THC(A)	Total Harmonic Current
EUT	Equipment Under Test	THD(%)	Total Harmonic Distortion
Fac.	Factor	TR, T/R	Test Receiver
FCC	Federal Communications Commission	Tx	Transmitting
FHSS	Frequency Hopping Spread Spectrum	VBW	Video BandWidth
FM	Frequency Modulation	Vert.	Vertical
Freq.	Frequency	WLAN	Wireless LAN
FSK	Frequency Shift Keying	xDSL	Generic term for all types of DSL technology (DSL: Digital Subscriber Line)
Fund	Fundamental		
FWD	Forward		
GFSK	Gaussian Frequency-Shift Keying		
GNSS	Global Navigation Satellite System		
GPS	Global Positioning System		
Hori.	Horizontal		
ICES	Interference-Causing Equipment Standard		
I/O	Input/Output		
IEC	International Electrotechnical Commission		

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Section 1: Customer information

Company Name	NITTOKU CO., LTD.
Address	330-0841 2-292-1 Azuma-cho,Omiya-ku,Saitama-city,Saitama-pref,Japan
Telephone Number	+81-048-615-2117
Contact Person	Akitomo Kiriya

The information provided from the customer is as follows:

- Applicant, Type of EUT, Model Number of EUT on the cover page and other relevant pages
 - Operating/Test Mode(s) (Mode(s)) on all the relevant pages
 - Section 1: Customer information
 - Section 2: Equipment under test (EUT) other than the Receipt Date and Test Date
 - Section 4: Operation of EUT during testing
- * The laboratory is exempted from liability of any test results affected from the above information in Section 2 and 4.

Section 2 : Equipment under test (EUT)

2.1 Identification of EUT

Type	LF-Band RFID READER/WRITER
Model Number	ITS-LRW210
Serial Number	Refer to 4.2.
Condition	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab.
Receipt Date	February 20, 2022
Test Date	February 28 and March 1, 2022

2.2 Product description

General Specification

Rating	DC 24 V
Operating temperature	0 deg. C to 40 deg. C
Clock frequency(ies) in the system	48 MHz

Radio Specification

Equipment Type	Transceiver
Frequency of Operation	134.2 kHz
Antenna Type	Loop Antenna

Section 3 : Test specification, procedures and results

3.1 Test specification

Test Specification	FCC Part 15 Subpart B FCC Part 15 final revised on May 3, 2021 and effective July 2, 2021
Title	FCC 47CFR Part15 Radio Frequency Device Subpart B Unintentional Radiators

3.2 Procedures & results

Item	Test procedure	Limits	Worst margin	Result	Remarks
Conducted emission	ANSI C 63.4:2014 +C 63.4a:2017 7. AC powerline conducted emission measurements	Class A	13.6 dB Freq.: 5.75296 MHz Detector: Average Phase: N Mode: Ethernet Communication	Complied a)	-
Radiated emission	ANSI C 63.4:2014 +C 63.4a:2017 8. Radiated emission measurements	Class A	6.4 dB Freq.: 33.194 MHz Detector: Quasi-Peak Polarization: Vertical Mode: Ethernet Communication	Complied b)	*1)
Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591.					
a) Refer to Appendix 2 (data of Conducted emission)					
b) Refer to Appendix 2 (data of Radiated emission)					
Symbols:					
Complied The data of this test item has enough margin, more than the measurement uncertainty.					
Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.					

*1) Measurements have been performed up to 1 GHz since the highest frequency of internal source of the EUT is less than 108 MHz.

3.3 Deviation from standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

Item	Frequency range	No.1 SAC ^{*1} /SR ^{*2} (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)	No.4 SAC/SR (±)
Conducted emission (AC Mains) AMN/LISN	150 kHz to 30 MHz	2.9 dB	2.9 dB	3.0 dB	2.9 dB
Radiated emission (Measurement distance: 10 m)	30 MHz to 200 MHz	4.5 dB	4.5 dB	-	-
	200 MHz to 1 GHz	4.6 dB	4.7 dB	-	-

*1: SAC=Semi-Anechoic Chamber

*2: SR= Shielded Room is applied besides radiated emission

3.5 Test location

UL Japan, Inc. Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone number : +81 463 50 6400

Facsimile number : +81 463 50 6401

A2LA Certificate Number : 1266.03

(FCC Test firm registration number: 839876, ISED lab company number: 2973D / CAB identifier: JP0001)

Test room	Width x Depth x Height (m)	Test room	Width x Depth x Height (m)
No.1 Semi-anechoic chamber	20.6 x 11.3 x 7.65 Maximum measurement distance: 10 m	No.1 Shielded room	6.8 x 4.1 x 2.7
No.2 Semi-anechoic chamber	20.6 x 11.3 x 7.65 Maximum measurement distance: 10 m	No.2 Shielded room	6.8 x 4.1 x 2.7
No.3 Semi-anechoic chamber	12.7 x 7.7 x 5.35 Maximum measurement distance: 5 m	No.3 Shielded room	6.3 x 4.7 x 2.7
No.4 Semi-anechoic chamber	8.1 x 5.1 x 3.55	No.4 Shielded room	4.4 x 4.7 x 2.7
		No.5 Shielded room	7.8 x 6.4 x 2.7
		No.6 Shielded room	7.8 x 6.4 x 2.7
		No.7 Shielded room	2.76 x 3.76 x 2.4
		No.8 Shielded room	3.45 x 5.5 x 2.4
		No.1 Measurement room	2.55 x 4.1 x 2.5

3.6 Test setup, test data & test instruments

Refer to Appendix 1 to 3.

Section 4 : Operation of EUT during testing

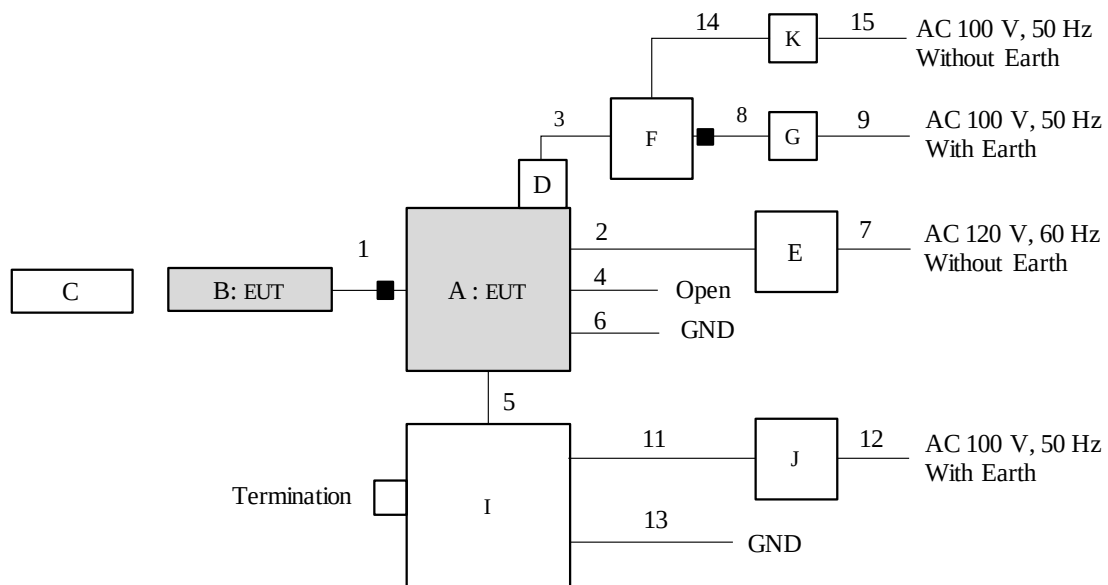
4.1 Operating modes

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

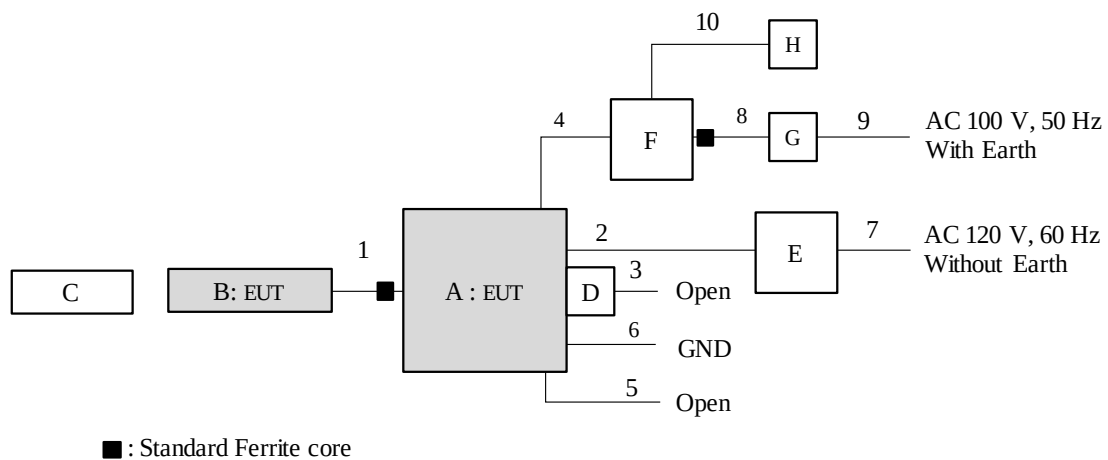
Operation mode(s)	1. Serial Communication mode 2. Ethernet Communication mode
Software	ITS-LRW210 Test Tool Version: 1.0.0.0 (for Serial Communication mode) Chrome ver99.0.4844.74 (for Ethernet Communication mode)
Justification	The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals

<Serial Communication mode>



<Ethernet Communication mode>



*Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

*Pre-check has been performed all antenna and with/without Tag, and measurement was conducted with the worst combination of two types of antennas and with/without Tag.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	LF-Band RFID READER/WRITER	ITS-LRW210	11000001	NITTOKU CO., LTD.	EUT
B	Antenna	ITS-LANT30S-1	2220001	NITTOKU CO., LTD.	EUT *1)
		ITS-LANT30S-3	2226001	NITTOKU CO., LTD.	EUT *1)
		ITS-LANT30S-2U	2229001	NITTOKU CO., LTD.	EUT *2)
		ITS-LANT30S-3U	2223001	NITTOKU CO., LTD.	EUT *2)
C	Tag	RI-TRP-DR2B	00000999	NITTOKU CO., LTD.	-
D	RS232C-USB Converter	CBL-USB(NR)232	-	Yukioka Manufactory Co.Ltd.	-
E	DC Power Supply	STEP-PS/1AC/24DC/2.5	2868651032037P5959	Phoenix Contact	-
F	Laptop PC	CF-SZ5PDYVS	8EKSA83295	Panasonic	-
G	AC Adapter	CF-AA64L2C M1	64L2CM118418742A	Panasonic	-
H	Portable HDD	TS250GST25P	238677-0449	Transcend	-
I	LF-Band RFID READER/WRITER	ITS-LRW210	11000002	NITTOKU CO., LTD.	-
J	Power Supply(DC)	PAN35-10A	DE001677	KIKUSUI	-
K	Switching HUB	EHC-G05MN-HJW	6AL829502975A	ELECOM	-

*1) With magnetic sheet

*2) Without magnetic sheet

List of cables used

No.	Cable	Length (m)	Shield-Cable	Shield-Connector	Remarks
1	RF	1.0	Shielded	Shielded	ITS-LANT30S-1
		2.0	Shielded	Shielded	ITS-LANT30S-2U
		3.0	Shielded	Shielded	ITS-LANT30S-3/ ITS-LANT30S-3U
2	DC	1.2	Unshielded	Unshielded	-
3	USB	0.9	Shielded	Shielded	-
4	LAN	1.1	Shielded	Shielded	-
5	RS485	1.2	Unshielded	Unshielded	-
6	GND	1.2	Unshielded	Unshielded	-
7	AC	2.0	Unshielded	Unshielded	-
8	DC	0.9	Unshielded	Unshielded	-
9	AC	0.8	Unshielded	Unshielded	-
10	USB	2.0	Shielded	Shielded	-
11	DC	1.2	Unshielded	Unshielded	-
12	AC	2.0	Unshielded	Unshielded	-
13	GND	1.2	Unshielded	Unshielded	-
14	LAN	2.0	Unshielded	Unshielded	-
15	AC	1.8	Unshielded	Unshielded	-

Section 5 : Conducted emission

5.1 Test conditions

Frequency range	0.15 MHz to 30 MHz
EUT position	Table top

5.2 Test configuration

The EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals was aligned and was flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. The EUT was located 0.8 m from Line Impedance Stabilization Network (LISN) and excess AC Cable was bundled in center. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane.

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment.

Photographs of the set up are shown in Appendix 1.

5.4 Test procedure

The emission had been measured with the EUT in the shielded room. An overview sweep with peak detection has been performed. The measurements had been performed with a quasi-peak detector and if required, with a CISPR average detector (CAV).

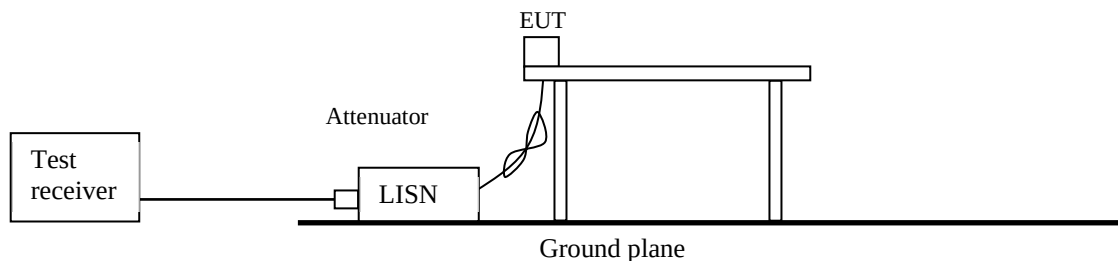
The conducted emission measurements were made with the following detector function of the test receiver.

Detector Type	QP / CAV
IF Bandwidth	9 kHz / 9 kHz

5.5 Results

Summary of the test results : Pass

Figure 1. Test Setup



Section 6 : Radiated emission

6.1 Test conditions

Frequency range	30 MHz to 1000 MHz
EUT position	Table top

6.2 Test configuration

The EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity. The rear of EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. Photographs of the set up are shown in Appendix 1.

6.3 Test procedure

The Radiated Electric Field Strength intensity has been measured on a Semi-Anechoic Chamber with a ground plane at a distance of 10 m*.

* Measuring distance

The boundary of the EUT is defined by an imaginary circular periphery.

The measuring antenna height was varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detector function.

	30 MHz to 1000 MHz (Test receiver)
Detector Type	QP
IF Bandwidth	120 kHz

The noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

6.4 Results

Summary of the test results : Pass

Figure 2. Antenna angle

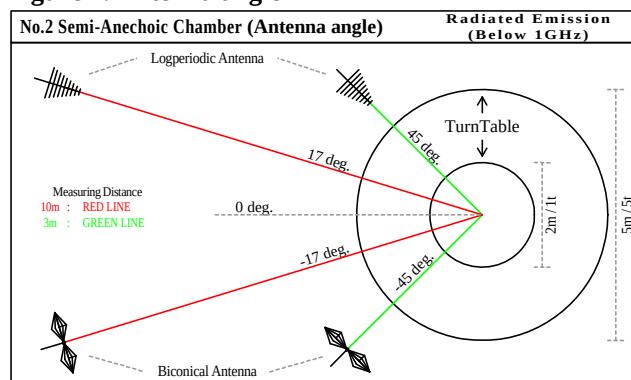
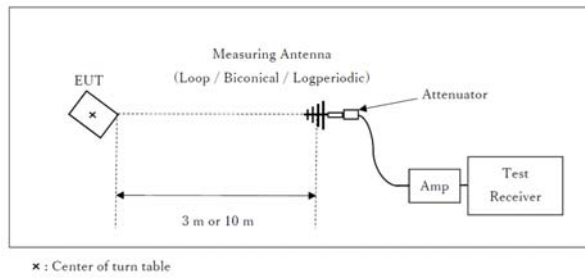


Figure 3. Test Setup

Below 1 GHz



Test Distance: 10 m

DATA OF CONDUCTED EMISSION TEST

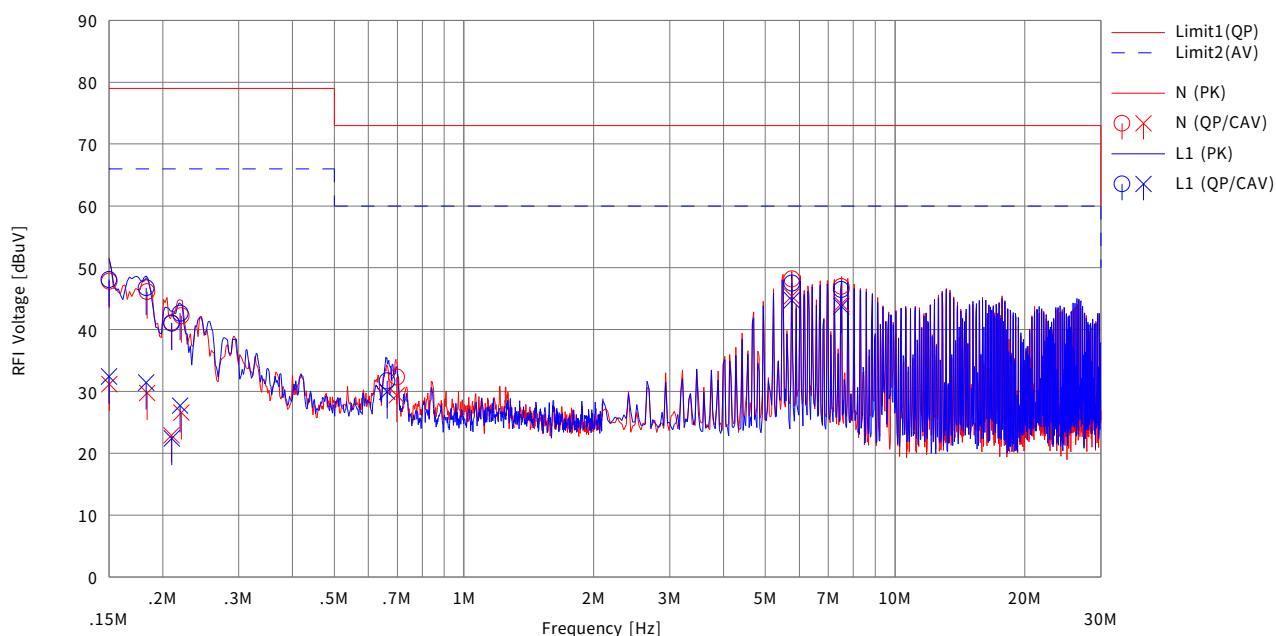
UL Japan,Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2022/03/01

Company : NITTOKU CO., LTD.
Kind of EUT : LF-Band RFID READER/WRITER
Model No. : ITS-LRW210
Serial No. : Refer to Section 4.2
Remarks : Antenna : ITS-LANT30S-1, with Tag

Mode : Serial Communication
Order No. : 13806752
Power : AC 120 V, 60 Hz (DC Power Supply)
Temp./Humi. : 23 deg.C / 32 %RH

Limit : FCC_Part 15 Subpart B(15.107)_Class A

Engineer : Shiro Kobayashi



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP>	<CAV>		<QP>	<CAV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15049	35.37	18.76	12.45	47.82	31.21	79.00	66.00	31.1	34.7	N	
2	0.18394	33.68	17.28	12.46	46.14	29.74	79.00	66.00	32.8	36.2	N	
3	0.20950	28.65	10.44	12.46	41.11	22.90	79.00	66.00	37.8	43.1	N	
4	0.22098	29.77	14.15	12.46	42.23	26.61	79.00	66.00	36.7	39.3	N	
5	0.69848	19.79	16.88	12.52	32.31	29.40	73.00	60.00	40.6	30.6	N	
6	5.76176	35.30	32.51	12.88	48.18	45.39	73.00	60.00	24.8	14.6	N	
7	7.50476	33.98	31.21	12.97	46.95	44.18	73.00	60.00	26.0	15.8	N	
8	0.15000	35.62	19.95	12.47	48.09	32.42	79.00	66.00	30.9	33.5	L1	
9	0.18325	34.31	18.98	12.46	46.77	31.44	79.00	66.00	32.2	34.5	L1	
10	0.20978	28.56	9.94	12.48	41.04	22.42	79.00	66.00	37.9	43.5	L1	
11	0.21955	30.17	15.26	12.48	42.65	27.74	79.00	66.00	36.3	38.2	L1	
12	0.66340	19.20	17.46	12.51	31.71	29.97	73.00	60.00	41.2	30.0	L1	
13	5.76250	34.68	31.91	12.84	47.52	44.75	73.00	60.00	25.4	15.2	L1	
14	7.50436	33.56	30.86	12.92	46.48	43.78	73.00	60.00	26.5	16.2	L1	

DATA OF CONDUCTED EMISSION TEST

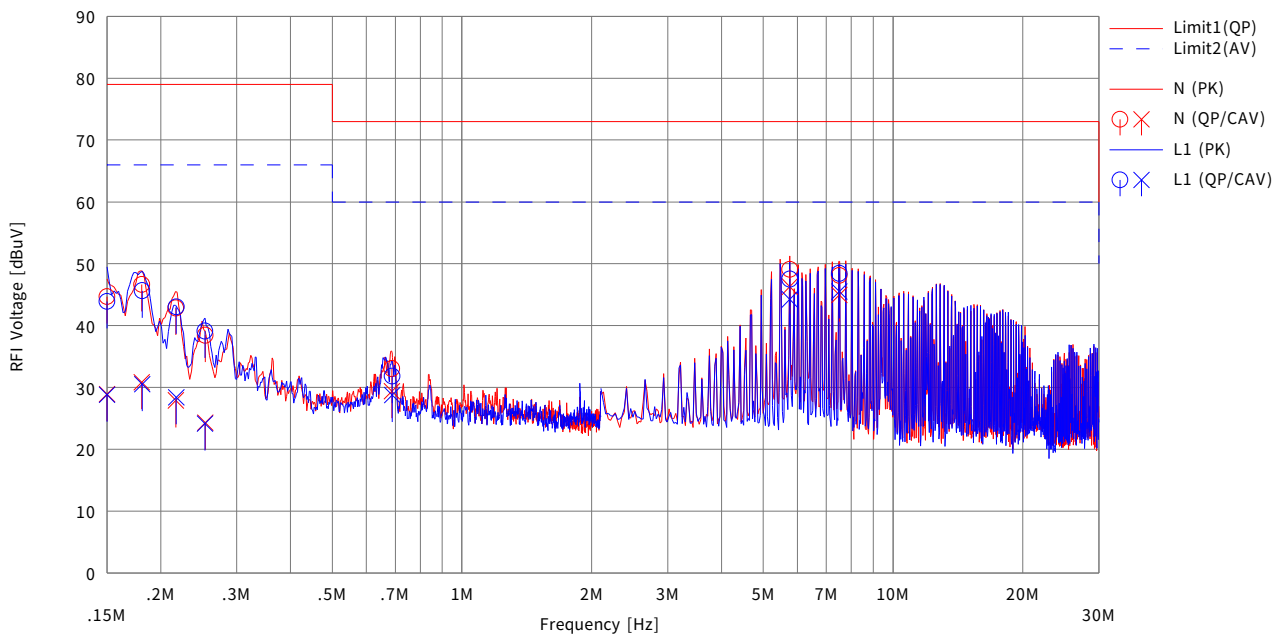
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2022/03/01

Company : NITTOKU CO., LTD.
Kind of EUT : LF-Band RFID READER/WRITER
Model No. : ITS-LRW210
Serial No. : Refer to Section 4.2
Remarks : Antenna : ITS-LANT30S-2U, with Tag

Mode : Serial Communication
Order No. : 13806752
Power : AC 120 V, 60 Hz (DC Power Supply)
Temp./Humi. : 23 deg.C / 32 %RH

Limit : FCC_Part 15 Subpart B(15.107)_Class A

Engineer : Shiro Kobayashi



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP>	<CAV>		<QP>	<CAV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	32.25	16.49	12.45	44.70	28.94	79.00	66.00	34.3	37.0	N	
2	0.18106	34.20	18.38	12.46	46.66	30.84	79.00	66.00	32.3	35.1	N	
3	0.21695	30.38	15.46	12.46	42.84	27.92	79.00	66.00	36.1	38.0	N	
4	0.25385	25.98	11.84	12.47	38.45	24.31	79.00	66.00	40.5	41.6	N	
5	0.68801	20.54	16.87	12.52	33.06	29.39	73.00	60.00	39.9	30.6	N	
6	5.76200	36.21	33.42	12.88	49.09	46.30	73.00	60.00	23.9	13.7	N	
7	7.50422	35.15	32.00	12.97	48.12	44.97	73.00	60.00	24.8	15.0	N	
8	0.15000	31.44	16.36	12.47	43.91	28.83	79.00	66.00	35.0	37.1	L1	
9	0.18109	33.18	18.09	12.46	45.64	30.55	79.00	66.00	33.3	35.4	L1	
10	0.21738	30.54	15.91	12.48	43.02	28.39	79.00	66.00	35.9	37.6	L1	
11	0.25320	26.66	11.67	12.47	39.13	24.14	79.00	66.00	39.8	41.8	L1	
12	0.68890	19.32	16.27	12.51	31.83	28.78	73.00	60.00	41.1	31.2	L1	
13	5.76193	34.68	31.39	12.84	47.52	44.23	73.00	60.00	25.4	15.7	L1	
14	7.50458	35.51	32.60	12.92	48.43	45.52	73.00	60.00	24.5	14.4	L1	

DATA OF CONDUCTED EMISSION TEST

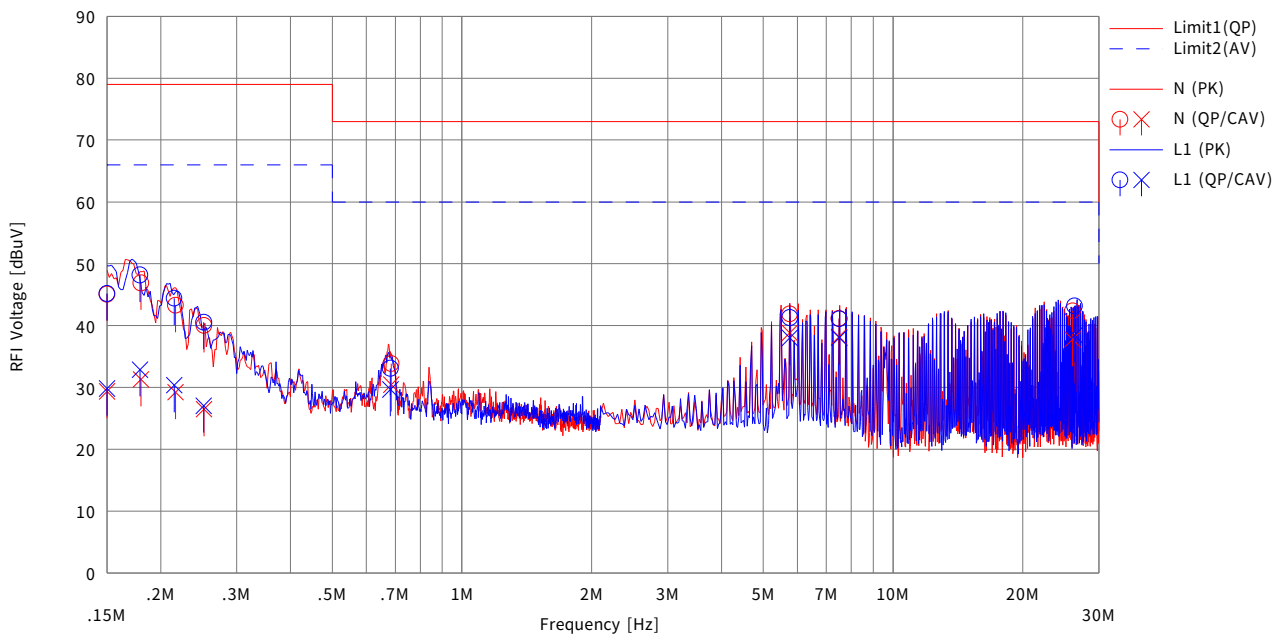
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2022/02/28

Company : NITTOKU CO., LTD.
Kind of EUT : LF-Band RFID READER/WRITER
Model No. : ITS-LRW210
Serial No. : Refer to Section 4.2
Remarks : Antenna : ITS-LANT30S-1, with Tag

Mode : Ethernet Communication
Order No. : 13806752
Power : AC 120 V, 60 Hz (DC Power Supply)
Temp./Humi. : 23 deg.C / 32 %RH

Limit : FCC_Part 15 Subpart B(15.107)_Class A

Engineer : Shiro Kobayashi



No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP>	<CAV>		<QP>	<CAV>	<QP>	<AV>	<QP>	<AV>		
	[MHz]	[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	32.64	16.93	12.45	45.09	29.38	79.00	66.00	33.9	36.6	N	
2	0.18001	34.43	18.84	12.46	46.89	31.30	79.00	66.00	32.1	34.7	N	
3	0.21638	30.83	16.78	12.46	43.29	29.24	79.00	66.00	35.7	36.7	N	
4	0.25206	27.55	14.03	12.47	40.02	26.50	79.00	66.00	38.9	39.5	N	
5	0.68476	21.33	17.93	12.52	33.85	30.45	73.00	60.00	39.1	29.5	N	
6	5.75500	29.01	25.97	12.88	41.89	38.85	73.00	60.00	31.1	21.1	N	
7	7.49487	28.22	25.25	12.96	41.18	38.21	73.00	60.00	31.8	21.7	N	
8	26.09467	28.65	24.04	13.76	42.41	37.80	73.00	60.00	30.5	22.2	N	
9	0.15000	32.71	17.35	12.47	45.18	29.82	79.00	66.00	33.8	36.1	L1	
10	0.17901	35.72	20.44	12.46	48.18	32.90	79.00	66.00	30.8	33.1	L1	
11	0.21505	31.95	17.89	12.48	44.43	30.37	79.00	66.00	34.5	35.6	L1	
12	0.25185	28.07	14.57	12.47	40.54	27.04	79.00	66.00	38.4	38.9	L1	
13	0.68223	20.58	17.17	12.51	33.09	29.68	73.00	60.00	39.9	30.3	L1	
14	5.76145	28.45	25.18	12.84	41.29	38.02	73.00	60.00	31.7	21.9	L1	
15	7.50164	28.19	25.14	12.92	41.11	38.06	73.00	60.00	31.8	21.9	L1	
16	26.37466	29.84	25.09	13.36	43.20	38.45	73.00	60.00	29.8	21.5	L1	

Calculation: Result[dBuV] = Reading[dBuV] + C.Fac(LISN(AMN) + Cable + ATT)[dB]
LISN(AMN): SLS-03

DATA OF CONDUCTED EMISSION TEST

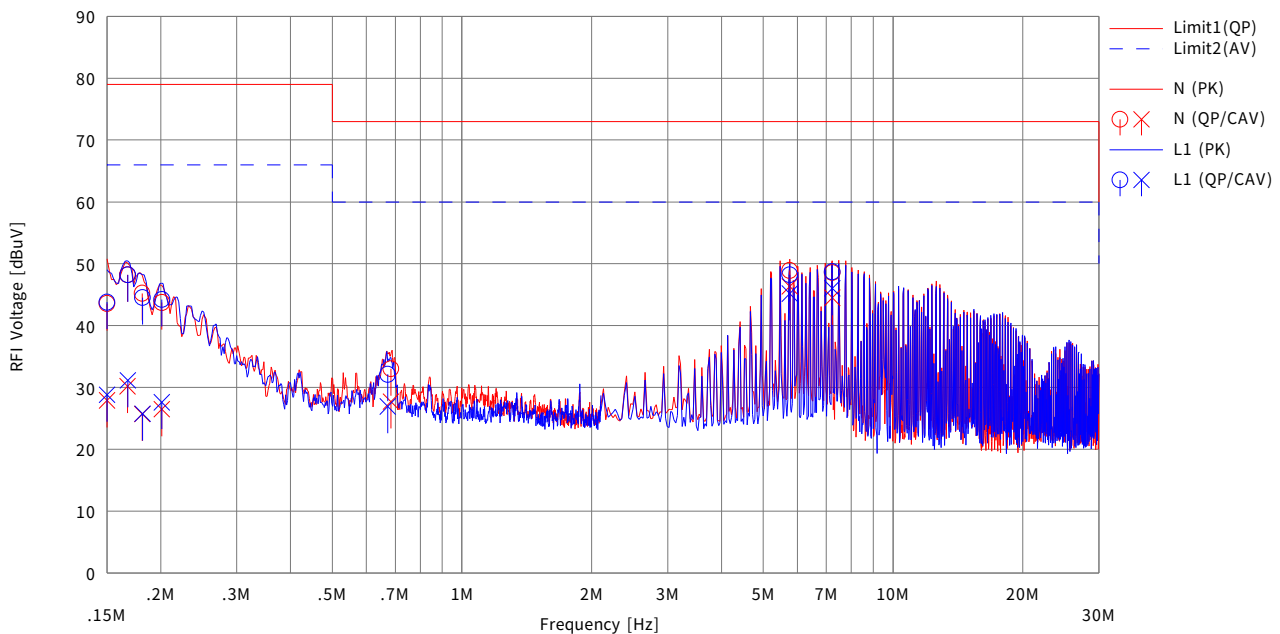
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2022/03/01

Company : NITTOKU CO., LTD.
Kind of EUT : LF-Band RFID READER/WRITER
Model No. : ITS-LRW210
Serial No. : Refer to Section 4.2
Remarks : Antenna : ITS-LANT30S-2U, with Tag

Mode : Ethernet Communication
Order No. : 13806752
Power : AC 120 V, 60 Hz (DC Power Supply)
Temp./Humi. : 23 deg.C / 32 %RH

Limit : FCC_Part 15 Subpart B(15.107)_Class A

Engineer : Shiro Kobayashi



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP>	<CAV>		<QP>	<CAV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	31.11	15.46	12.45	43.56	27.91	79.00	66.00	35.4	38.0	N	
2	0.16752	35.76	17.75	12.46	48.22	30.21	79.00	66.00	30.7	35.7	N	
3	0.18131	32.75	13.26	12.46	45.21	25.72	79.00	66.00	33.7	40.2	N	
4	0.20124	31.27	14.03	12.46	43.73	26.49	79.00	66.00	35.2	39.5	N	
5	0.68430	20.50	15.19	12.52	33.02	27.71	73.00	60.00	39.9	32.2	N	
6	5.75296	36.04	33.44	12.88	48.92	46.32	73.00	60.00	24.0	13.6	N	
7	7.22420	35.62	31.56	12.95	48.57	44.51	73.00	60.00	24.4	15.4	N	
8	0.15000	31.31	16.35	12.47	43.78	28.82	79.00	66.00	35.2	37.1	L1	
9	0.16771	35.73	18.69	12.46	48.19	31.15	79.00	66.00	30.8	34.8	L1	
10	0.18154	32.07	13.29	12.46	44.53	25.75	79.00	66.00	34.4	40.2	L1	
11	0.20129	31.74	15.13	12.48	44.22	27.61	79.00	66.00	34.7	38.3	L1	
12	0.67227	19.60	14.42	12.51	32.11	26.93	73.00	60.00	40.8	33.0	L1	
13	5.75446	35.36	32.33	12.84	48.20	45.17	73.00	60.00	24.8	14.8	L1	
14	7.22560	35.80	33.13	12.90	48.70	46.03	73.00	60.00	24.3	13.9	L1	

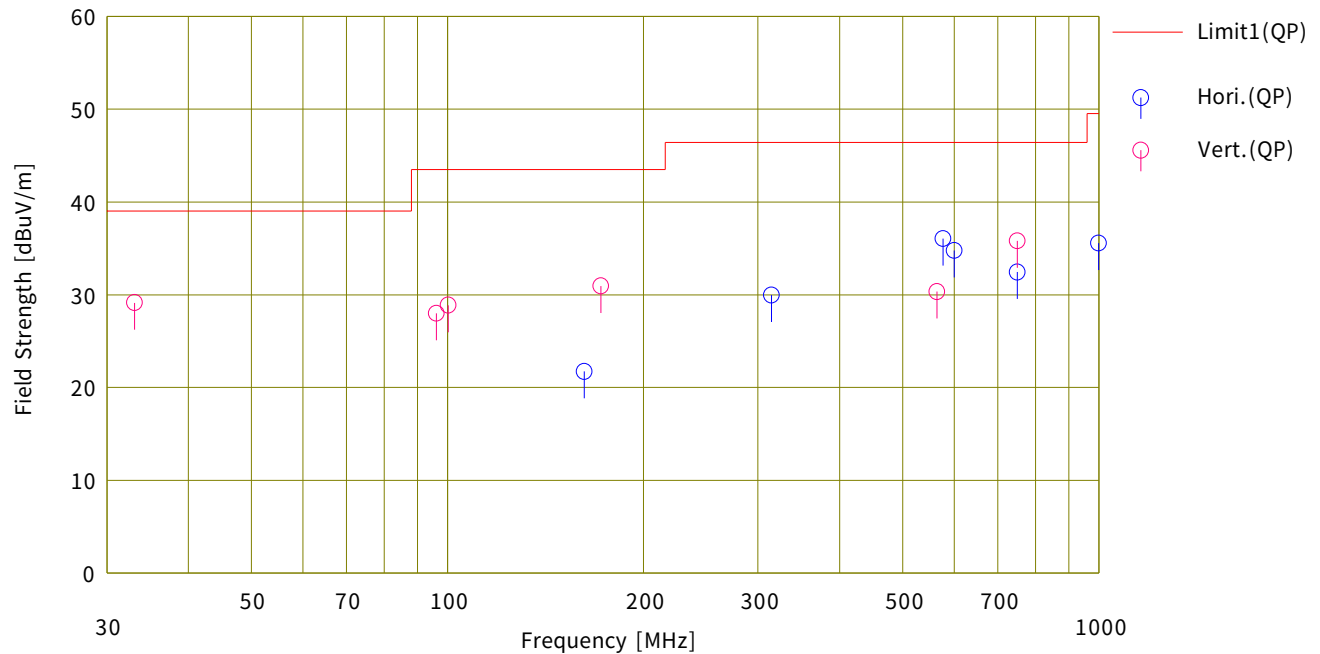
DATA OF RADIATED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.2 Semi-Anechoic Chamber
Date : 2022/02/28

Company : NITTOKU CO., LTD. Mode : Serial Communication
Kind of EUT : LF-Band RFID READER/WRITERW Order No. : 13806752
Model No. : ITS-LRW210 Power : DC 24 V
Serial No. : Refer to Section 4.2 Temp./Humi. : 24 deg.C / 32 %RH
Remarks : Antenna : ITS-LANT30S-1, EUT Axis: Y, Antenna Axis:Y, with Tag

Limit : FCC_Part 15 Subpart B(15.109)_Class A

Engineer : Shiro Kobayashi



No.	Freq. [MHz]	Reading <QP>	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	S.Fac [dB]	Result <QP>	Limit <QP>	Margin <QP>	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]					[dBuV/m]	[dBuV/m]	[dB]					
1	162.240	29.51	15.30	8.64	31.83	0.11	21.73	43.50	21.7	Hori.	400	15	BC	
2	314.545	40.97	14.15	6.55	31.70	0.00	29.97	46.40	16.4	Hori.	294	103	LP	
3	576.741	40.86	18.72	8.12	31.65	0.00	36.05	46.40	10.3	Hori.	192	264	LP	
4	599.947	38.80	19.35	8.24	31.63	0.00	34.76	46.40	11.6	Hori.	171	262	LP	
5	749.934	34.60	20.32	8.99	31.47	0.00	32.44	46.40	13.9	Hori.	267	125	LP	
6	999.910	32.97	22.51	10.18	30.10	0.00	35.56	49.50	13.9	Hori.	100	115	LP	
7	33.085	36.69	17.50	7.00	31.93	-0.11	29.15	39.00	9.8	Vert.	100	86	BC	
8	96.179	42.36	9.44	7.92	31.89	0.17	28.00	43.50	15.5	Vert.	100	268	BC	
9	100.320	42.47	10.27	7.97	31.89	0.05	28.87	43.50	14.6	Vert.	100	266	BC	
10	171.996	38.22	15.76	8.74	31.82	0.04	30.94	43.50	12.5	Vert.	100	51	BC	
11	564.400	35.62	18.32	8.06	31.66	0.00	30.34	46.40	16.0	Vert.	100	355	LP	
12	749.934	37.96	20.32	8.99	31.47	0.00	35.80	46.40	10.6	Vert.	267	125	LP	

Calculation: Result[dBuV/m] = Reading[dBuV] + Ant.Fac[dB/m] + Loss(Cable + ATT)[dB] - Gain(AMP)[dB] + S.Fac(ΔAF)[dB]

Ant. Type = BC: Biconical Antenna LP: Logperiodic Antenna **SH*: Horn Antenna

DATA OF RADIATED EMISSION TEST

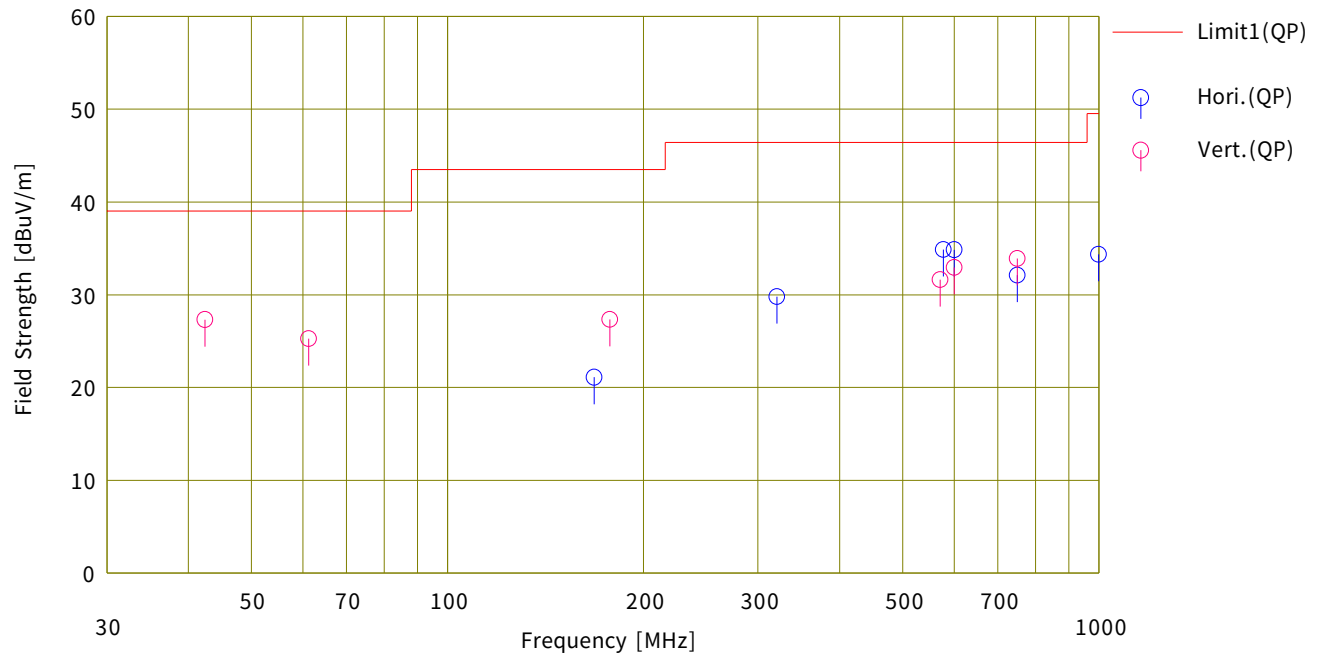
UL Japan, Inc. Shonan EMC Lab. No.2 Semi-Anechoic Chamber
Date : 2022/02/28

Company : NITTOKU CO., LTD.
Kind of EUT : LF-Band RFID READER/WRITER
Model No. : ITS-LRW210
Serial No. : Refer to Section 4.2
Remarks : Antenna : ITS-LANT30S-2U, EUT Axis: Y, Antenna Axis:Y, with Tag

Mode : Serial Communication
Order No. : 13806752
Power : DC 24 V
Temp./Humi. : 24 deg.C / 32 %RH

Limit : FCC_Part 15 Subpart B(15.109)_Class A

Engineer : Shiro Kobayashi



No.	Freq. [MHz]	Reading <QP>	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	S.Fac [dB]	Result <QP>	Limit <QP>	Margin <QP>	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]					[dBuV/m]	[dBuV/m]	[dB]					
1	168.029	28.60	15.54	8.70	31.82	0.08	21.10	43.50	22.4	Hori.	400	163	BC	
2	320.644	40.48	14.41	6.59	31.69	0.00	29.79	46.40	16.6	Hori.	310	114	LP	
3	577.387	39.65	18.75	8.13	31.65	0.00	34.88	46.40	11.5	Hori.	185	263	LP	
4	599.949	38.88	19.35	8.24	31.63	0.00	34.84	46.40	11.5	Hori.	175	261	LP	
5	749.941	34.26	20.32	8.99	31.47	0.00	32.10	46.40	14.3	Hori.	348	126	LP	
6	999.917	31.76	22.51	10.18	30.10	0.00	34.35	49.50	15.1	Hori.	100	109	LP	
7	42.454	38.18	13.93	7.16	31.92	-0.04	27.31	39.00	11.6	Vert.	100	271	BC	
8	61.220	42.28	7.86	7.44	31.91	-0.40	25.27	39.00	13.7	Vert.	212	70	BC	
9	177.602	34.36	16.02	8.79	31.81	-0.03	27.33	43.50	16.1	Vert.	100	21	BC	
10	570.862	36.67	18.52	8.09	31.65	0.00	31.63	46.40	14.7	Vert.	100	1	LP	
11	599.947	36.97	19.35	8.24	31.63	0.00	32.93	46.40	13.4	Vert.	100	109	LP	
12	749.933	36.07	20.32	8.99	31.47	0.00	33.91	46.40	12.4	Vert.	226	182	LP	

Calculation: Result[dBuV/m] = Reading[dBuV] + Ant.Fac[dB/m] + Loss(Cable + ATT)[dB] - Gain(AMP)[dB] + S.Fac(ΔAF)[dB]

Ant. Type = BC: Biconical Antenna LP: Logperiodic Antenna **SH*: Horn Antenna

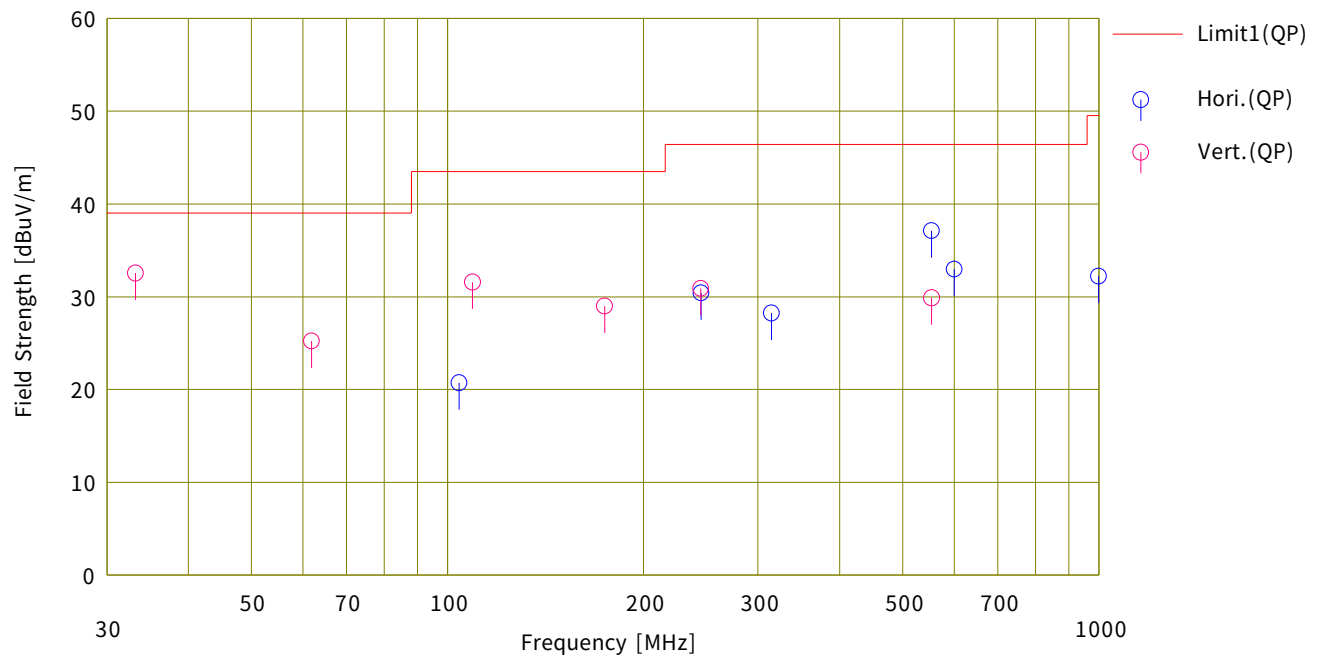
DATA OF RADIATED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.2 Semi-Anechoic Chamber
Date : 2022/02/28

Company : NITTOKU CO., LTD. Mode : Ethernet Communication
Kind of EUT : LF-Band RFID READER/WRITER Order No. : 13806752
Model No. : ITS-LRW210 Power : DC 24 V
Serial No. : Refer to Section 4.2 Temp./Humi. : 24 deg.C / 32 %RH
Remarks : Antenna : ITS-LANT30S-1, EUT Axis: Y, Antenna Axis:Y, with Tag

Limit : FCC_Part 15 Subpart B(15.109)_Class A

Engineer : Shiro Kobayashi



No.	Freq. [MHz]	Reading <QP>	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	S.Fac [dB]	Result <QP>	Limit <QP>	Margin <QP>	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]					[dBuV/m]	[dBuV/m]	[dB]					
1	104.276	33.68	10.95	8.02	31.89	-0.03	20.73	43.50	22.7	Hori.	400	181	BC	
2	245.035	44.29	11.80	6.05	31.74	0.00	30.40	46.40	16.0	Hori.	329	72	LP	
3	314.512	39.24	14.15	6.55	31.70	0.00	28.24	46.40	18.1	Hori.	295	92	LP	
4	553.804	42.67	18.10	8.01	31.67	0.00	37.11	46.40	9.2	Hori.	250	328	LP	
5	599.945	37.01	19.35	8.24	31.63	0.00	32.97	46.40	13.4	Hori.	155	314	LP	
6	999.903	29.61	22.51	10.18	30.10	0.00	32.20	49.50	17.3	Hori.	100	192	LP	
7	33.194	40.12	17.45	7.00	31.93	-0.10	32.54	39.00	6.4	Vert.	100	145	BC	
8	61.854	42.34	7.75	7.45	31.91	-0.41	25.22	39.00	13.7	Vert.	206	274	BC	
9	109.361	43.76	11.73	8.07	31.88	-0.12	31.56	43.50	11.9	Vert.	100	241	BC	
10	174.272	36.29	15.76	8.76	31.82	0.01	29.00	43.50	14.5	Vert.	100	225	BC	
11	245.000	44.80	11.80	6.05	31.75	0.00	30.90	46.40	15.5	Vert.	100	197	LP	
12	553.965	35.45	18.10	8.01	31.67	0.00	29.89	46.40	16.5	Vert.	177	323	LP	

Calculation: Result[dBuV/m] = Reading[dBuV] + Ant.Fac[dB/m] + Loss(Cable + ATT)[dB] - Gain(AMP)[dB] + S.Fac(ΔAF)[dB]

Ant. Type = BC: Biconical Antenna LP: Logperiodic Antenna **SH*: Horn Antenna

DATA OF RADIATED EMISSION TEST

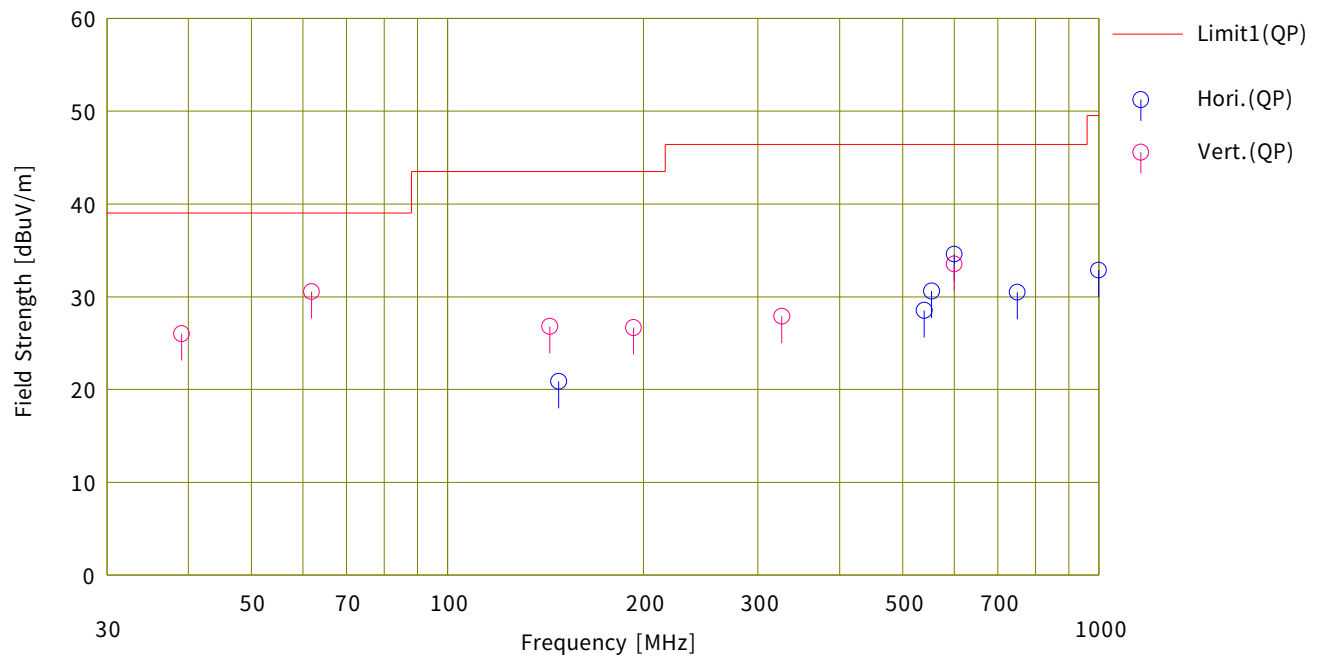
UL Japan,Inc. Shonan EMC Lab. No.2 Semi-Anechoic Chamber
Date : 2022/02/28

Company : NITTOKU CO., LTD.
Kind of EUT : LF-Band RFID READER/WRITER
Model No. : ITS-LRW210
Serial No. : Refer to Section 4.2
Remarks : Antenna : ITS-LANT30S-2U, EUT Axis: Y, Antenna Axis:Y, with Tag

Mode : Ethernet Communication
Order No. : 13806752
Power : DC 24 V
Temp./Humi. : 24 deg.C / 32 %RH

Limit : FCC_Part 15 Subpart B(15.109)_Class A

Engineer : Shiro Kobayashi



No.	Freq. [MHz]	Reading <QP>	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	S.Fac [dB]	Result <QP>	Limit <QP>	Margin <QP>	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]					[dBuV/m]	[dBuV/m]	[dB]					
1	148.258	29.41	14.72	8.50	31.84	0.09	20.88	43.50	22.6	Hori.	331	134	BC	
2	539.748	34.40	17.86	7.93	31.67	0.00	28.52	46.40	17.8	Hori.	189	10	LP	
3	553.903	36.17	18.10	8.01	31.67	0.00	30.61	46.40	15.7	Hori.	167	359	LP	
4	599.945	38.64	19.35	8.24	31.63	0.00	34.60	46.40	11.8	Hori.	221	258	LP	
5	749.935	32.64	20.32	8.99	31.47	0.00	30.48	46.40	15.9	Hori.	152	267	LP	
6	999.911	30.27	22.51	10.18	30.10	0.00	32.86	49.50	16.6	Hori.	100	280	LP	
7	39.064	35.68	15.23	7.10	31.93	-0.07	26.01	39.00	12.9	Vert.	100	235	BC	
8	61.831	47.67	7.75	7.45	31.91	-0.41	30.55	39.00	8.4	Vert.	100	238	BC	
9	143.635	35.64	14.51	8.45	31.85	0.05	26.80	43.50	16.7	Vert.	100	267	BC	
10	193.036	33.20	16.45	8.94	31.80	-0.13	26.66	43.50	16.8	Vert.	100	302	BC	
11	326.190	38.31	14.64	6.63	31.69	0.00	27.89	46.40	18.5	Vert.	100	356	LP	
12	599.942	37.57	19.35	8.24	31.63	0.00	33.53	46.40	12.8	Vert.	100	329	LP	

Calculation: Result[dBuV/m] = Reading[dBuV] + Ant.Fac[dB/m] + Loss(Cable + ATT)[dB] - Gain(AMP)[dB] + S.Fac(ΔAF)[dB]

Ant.Type=BC: Biconical Antenna LP: Logperiodic Antenna **SH*: Horn Antenna

APPENDIX 2

Test Instruments

EMI test equipment

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
CE	KAT3-12	144896	Attenuator	JFW IND. INC.	50HF-003N	-	2021/07/12	12
CE	SCC-B12/B13/SRS E-02	144969	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-270(RF Selector)	2021/04/12	12
CE	SLS-03	145540	LISN	Rohde & Schwarz	ENV216	100513	2022/02/23	12
CE	SLS-04	145541	LISN	Rohde & Schwarz	ENV216	100514	2022/02/23	12
CE	SOS-22	191839	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/10/14	12
CE	STM-03	146188	Terminator	TME	CT-01 BP	-	2021/12/10	12
CE,RE	COTS-SEMI-5	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
CE,RE	SJM-20	207277	Measuring	ASKUL	-	-	-	-
CE,RE	STR-07	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2021/09/17	12
CE,RE	STS-02	145793	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997819	2021/04/28	12
RE	SAEC-02(NSA)	145563	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	2021/03/16	12
RE	SAF-02	145004	Pre Amplifier	SONOMA	310N	290212	2022/02/24	12
RE	SAT3-11	150921	Attenuator	JFW	50HF-003N	-	2022/02/21	12
RE	SAT6-14	167095	Attenuator	JFW	50HF-006N	-	2022/02/21	12
RE	SBA-02	145022	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032665	2021/04/10	12
RE	SCC-B1/B3/B5/B7/B8/B13/SRSE-02	144975	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	2021/04/12	12
RE	SCC-B2/B4/B6/B7/B8/B13/SRSE-02	144976	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	2021/04/12	12
RE	SLA-06	145528	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	195	2021/04/10	12
RE	SOS-21	191838	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12

*Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

The expiration date of the calibration is the end of the expired month.

As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards

Test Item:

CE: Conducted emission,

RE: Radiated emission