

RADIO TEST REPORT

Test Report No. 15587018H-A-R1

Customer	TaiyoGikenCo.
Description of EUT	Fully automatic mahjong table
Model Number of EUT	RIICHI-STYLE-HD
FCC ID	2BMR5AMOS001
Test Regulation	FCC Part 15 Subpart C
Test Result	Complied
Issue Date	April 25, 2025
Remarks	-

Representative test engineerYuichiro Yamazaki
Engineer**Approved by**Shinichi Miyazono
Leader

CERTIFICATE 5107.02

- ☐ 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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- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

REVISION HISTORY

Original Test Report No. 15587018H-A

This report is a revised version of 15587018H-A. 15587018H-A is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15587018H-A	January 29, 2025	-
1	15587018H-A-R1	April 25, 2025	Correction of the following items in Clause 2.2; <u>Rating</u> From AC 100 V to 120 V To AC 110 V to 120 V <u>Operating Temperature</u> From -20 deg. C to +50 deg. C To 0 deg. C to +40 deg. C
1	15587018H-A-R1	April 25, 2025	Correction of the mode notation for Radiated Spurious Emission (Plot data) From Mode 1 To Mode 2

Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	ICES	Interference-Causing Equipment Standard
AC	Alternating Current	IEC	International Electrotechnical Commission
AFH	Adaptive Frequency Hopping	IEEE	Institute of Electrical and Electronics Engineers
AM	Amplitude Modulation	IF	Intermediate Frequency
Amp, AMP	Amplifier	ILAC	International Laboratory Accreditation Conference
ANSI	American National Standards Institute	ISED	Innovation, Science and Economic Development Canada
Ant, ANT	Antenna	ISO	International Organization for Standardization
AP	Access Point	JAB	Japan Accreditation Board
ASK	Amplitude Shift Keying	LAN	Local Area Network
Atten., ATT	Attenuator	LIMS	Laboratory Information Management System
AV	Average	MCS	Modulation and Coding Scheme
BPSK	Binary Phase-Shift Keying	MRA	Mutual Recognition Arrangement
BR	Bluetooth Basic Rate	N/A	Not Applicable
BT	Bluetooth	NIST	National Institute of Standards and Technology
BT LE	Bluetooth Low Energy	NS	No signal detect.
BW	BandWidth	NSA	Normalized Site Attenuation
Cal Int	Calibration Interval	NVLAP	National Voluntary Laboratory Accreditation Program
CCK	Complementary Code Keying	OBW	Occupied Band Width
Ch., CH	Channel	OFDM	Orthogonal Frequency Division Multiplexing
CISPR	Comite International Special des Perturbations Radioelectriques	P/M	Power meter
CW	Continuous Wave	PCB	Printed Circuit Board
DBPSK	Differential BPSK	PER	Packet Error Rate
DC	Direct Current	PHY	Physical Layer
D-factor	Distance factor	PK	Peak
DFS	Dynamic Frequency Selection	PN	Pseudo random Noise
DQPSK	Differential QPSK	PRBS	Pseudo-Random Bit Sequence
DSSS	Direct Sequence Spread Spectrum	PSD	Power Spectral Density
EDR	Enhanced Data Rate	QAM	Quadrature Amplitude Modulation
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	QP	Quasi-Peak
EMC	ElectroMagnetic Compatibility	QPSK	Quadri-Phase Shift Keying
EMI	ElectroMagnetic Interference	RBW	Resolution Band Width
EN	European Norm	RDS	Radio Data System
ERP, e.r.p.	Effective Radiated Power	RE	Radio Equipment
EU	European Union	RF	Radio Frequency
EUT	Equipment Under Test	RMS	Root Mean Square
Fac.	Factor	RSS	Radio Standards Specifications
FCC	Federal Communications Commission	Rx	Receiving
FHSS	Frequency Hopping Spread Spectrum	SA, S/A	Spectrum Analyzer
FM	Frequency Modulation	SG	Signal Generator
Freq.	Frequency	SVSWR	Site-Voltage Standing Wave Ratio
FSK	Frequency Shift Keying	TR	Test Receiver
GFSK	Gaussian Frequency-Shift Keying	Tx	Transmitting
GNSS	Global Navigation Satellite System	VBW	Video BandWidth
GPS	Global Positioning System	Vert.	Vertical
Hori.	Horizontal	WLAN	Wireless LAN

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SECTION 1: Customer Information

Company Name	TaiyoGikenCo.
Address	90 Wada, Mihama-cho, Hidaka-Gun,Wakayama Pref. 644-0044 Japan
Telephone Number	+81-738-22-6153
Contact Person	Takeshi Tomita

The information provided by the customer is as follows;

- Customer, Description of EUT, Model Number of EUT, FCC ID on the cover 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

SECTION 2: Equipment Under Test (EUT)

2.1 Identification of EUT

Description	Fully automatic mahjong table
Model Number	RIICHI-STYLE-HD
Serial Number	Refer to SECTION 4.2
Condition	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	December 13, 2024
Test Date	December 13 to 20, 2024

2.2 Product Description

General Specification

Rating	AC 110 V to 120 V
Operating Temperature	0 deg. C to +40 deg. C

Radio Specification

Equipment Type	Transceiver
Frequency of Operation	13.56 MHz
Type of Modulation	ASK

2.3 Variant model(s)

Tested model (RIICHI-STYLE-HD) has a variant model (RIICHI-STYLE-EX).

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart C The latest version on the first day of the testing period
Title	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.225 Operation within the band 13.110-14.010 MHz.

* Also the EUT complies with FCC Part 15 Subpart B.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 8.8	<FCC> Section 15.207 ----- <ISED> RSS-Gen 8.8	11.25 dB 14.03769 MHz QP, Phase L	Complied	-
Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 6.4, 6.12	<FCC> Section 15.225(a) ----- <ISED> RSS-210 B.6 (a)	48.00 dB, 13.56000 MHz, QP, 0 deg.	Complied	Radiated
Spectrum Mask	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 6.4, 6.13	<FCC> Section 15.225(b)(c) ----- <ISED> RSS-210 B.6 (a)	29.00 dB, 13.56700 MHz, QP, 0 deg.	Complied	Radiated
20 dB Bandwidth	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> -	<FCC> Section15.215(c) ----- <ISED> -	See data	Complied	Radiated
Electric Field Strength of Spurious Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 6.4, 6.13	<FCC> Section 15.209, Section 15.225 (d) ----- <ISED> RSS-210 B.6 (a) RSS-Gen 8.9	2.1 dB 51.323 MHz, Vertical, QP	Complied	Radiated
Frequency Tolerance	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 6.11, 8.11	<FCC> Section 15.225(e) ----- <ISED> RSS-210 B.6 (b)	See data	Complied	Radiated

Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.

*1) The test was not performed since the EUT was DC device.

FCC Part 15.31 (e)

The stable voltage was supplied by the end product which was required to have a power supply regulator.

Therefore, the EUT complies with the requirement.

However, the supply voltage was varied and tested at 85 % and 115 % of the nominal rated supply voltage during frequency tolerance test according to Section 15.225(e).

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT.

Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% emission bandwidth	<ISED>RSS-Gen 6.7	-	N/A	-	Radiated

Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.
Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

Measurement uncertainty is not taken into account when stating conformity with a specified requirement.
Note: When margins obtained from test results are less than the measurement uncertainty, the test results may exceed the limit.

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

Conducted emission

Item	Frequency range	Unit	Calculated Uncertainty (+/-)
AMN (LISN)	0.15 MHz to 30 MHz	dB	3.3

Radiated emission

Measurement distance	Frequency range	Unit	Calculated Uncertainty (+/-)
3 m	9 kHz to 30 MHz	dB	3.3
10 m		dB	3.1
3 m	30 MHz to 200 MHz	Horizontal	5.0
		Vertical	5.0
	200 MHz to 1000 MHz	Horizontal	5.2
		Vertical	6.2
10 m	30 MHz to 200 MHz	Horizontal	5.5
		Vertical	5.4
	200 MHz to 1000 MHz	Horizontal	5.5
		Vertical	5.5

-20 dB Bandwidth and 99% Occupied Bandwidth, Frequency Tolerance

Item	Unit	Calculated Uncertainty (+/-)
Bandwidth (OBW)	%	0.96
Frequency Readout (Frequency counter)	ppm	0.67
Frequency Readout (Spectrum analyzer frequency readout function)	ppm	2.13

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan

Telephone: +81-596-24-8999

*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919

ISED Lab Company Number: 2973C / CAB identifier: JP0002

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.5 measurement room	6.4 x 6.4 x 3.0	6.4 x 6.4	-	-
No.6 shielded room	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	3.1 x 5.0 x 2.7	3.1 x 5.0	-	-
No.9 measurement room	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.10 shielded room	3.8 x 2.8 x 2.8	3.8 x 2.8	-	-
No.11 measurement room	4.0 x 3.4 x 2.5	N/A	-	-
No.12 measurement room	2.6 x 3.4 x 2.5	N/A	-	-
Large Chamber	16.9 x 22.1 x 10.17	16.9 x 22.1	-	10 m
Small Chamber	5.3 x 6.69 x 3.59	5.3 x 6.69	-	-

* Size of vertical conducting plane (for Conducted Emission test): 2.0 x 3.0 m for No.1, No.2, No.3, No.4, and No.5 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

The mode is used:

Test mode	Remarks
1) Transmitting mode (Tx) With Tag	The EUT Transmits and Receives at the same time and there is no receiving mode.
2) Transmitting mode (Tx) Without Tag	
3) Transmitting mode (Tx) 50 ohm terminated	
The EUT was operated in a manner similar to typical use during the tests.	
*Power of the EUT was set by the software as follows; Software: TRF03 Version: 1.091 (Date: 2022.12.01, Storage location: EUT memory)	
*This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	
Justification: The system was configured in typical fashion (as a user would normally use it) for testing.	

Test Item	Operating mode
Conducted Emission	Mode 1 to 3
Electric Field Strength of Fundamental Emission	Mode 1, 2
Spectrum Mask	Mode 1, 2
20 dB Bandwidth and 99 % Occupied Bandwidth	Mode 1, 2
Electric Field Strength of Spurious Emission	Mode 2 ^{*1)}
Frequency Tolerance	Mode 2 ^{*2)}

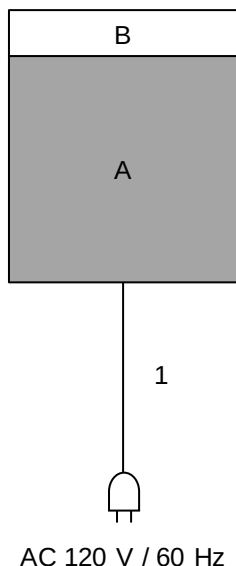
*1) After the comparison of the test data between with Tag and without Tag, the tests were performed with the worst case.

*2) Only one antenna is driven.

Frequency Tolerance	
Temperature	-20 deg. C to +50 deg. C (Step 10 deg. C)
Voltage	Normal Voltage DC 5 V Maximum Voltage DC 5.75 V (DC 5 V +15 %) Minimum Voltage DC 4.25 V (DC 5 V -15 %)
*This EUT provides stable voltage constantly to RF Part regardless of input voltage	

4.2 Configuration and peripherals

[Conducted Emission and Radiated Emission tests]



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

Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Fully automatic mahjong table	RIICHI-STYLE-HD	24L0000	TaiyoGikenCo.	EUT
B	Tag	-	-	-	*1)

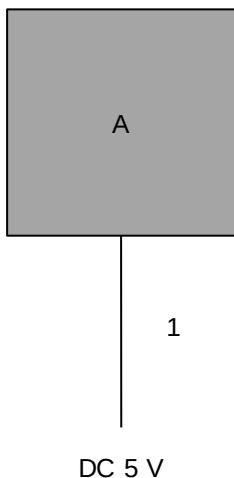
*1) Used for Mode1 only.

Tag was installed the predetermined numbers in the prescribed position as one set with 52.

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	AC Cable	2.5	Unshielded	Unshielded	-

[Frequency Tolerance test]



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

Description of EUT

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Transceiver unit for FT	RIICHI-STYLE-HD	RF241219	TaiyoGikenCo.	EUT

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.5	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane 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 aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

2) For the tests on EUT itself (as a stand alone equipment)

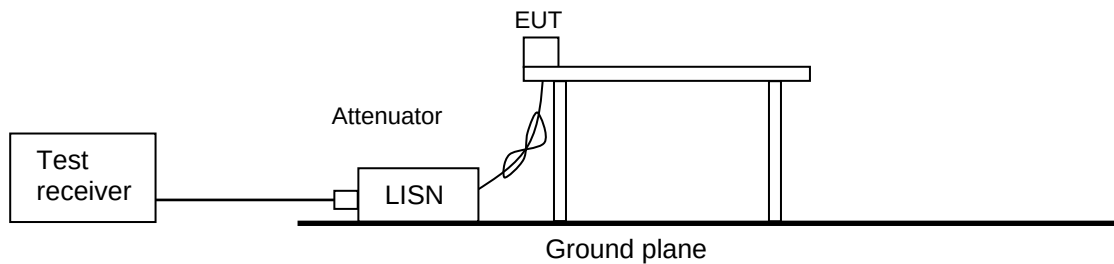
Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN / (AMN) to the input power source.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

Figure 1: Test Setup



The test results and limit are rounded off to one decimal place, so some differences might be observed.

Detector	: QP and CISPR AV
Measurement range	: 0.15 MHz to 30 MHz
Test data	: APPENDIX
Test result	: Pass

SECTION 6: Radiated Emission (Fundamental, Spurious Emission and Spectrum Mask)

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[Limit conversion]

The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohms. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to $45.5 - 51.5 = -6.0$ dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

[Frequency: From 9 kHz to 30 MHz]

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg., 135 deg., and 180 deg.) and horizontal polarization.

*Refer to Figure 3 about Direction of the Loop Antenna.

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane. However test results were confirmed to pass against standard limit.

[Frequency: From 30 MHz to 1 GHz]

The measuring antenna height varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

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

[Test instruments and test settings]

Frequency	Below 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz
Antenna Type	Loop	Biconical	Logperiodic

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

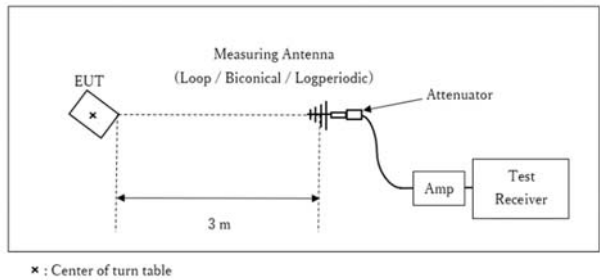
Frequency	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz
Instrument used	Test Receiver				
Detector	PK / AV	QP	PK / AV	QP	QP
IF Bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz
Test Distance	3 m *1)	3 m *1)	3 m *1)	3 m *2)	3 m

*1) Distance Factor: $40 \times \log (3 \text{ m} / 300 \text{ m}) = -80 \text{ dB}$

*2) Distance Factor: $40 \times \log (3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

Figure 2: Test Setup

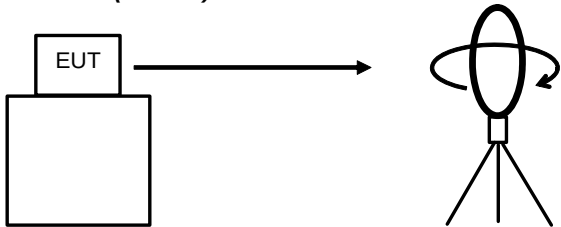
Below 1 GHz



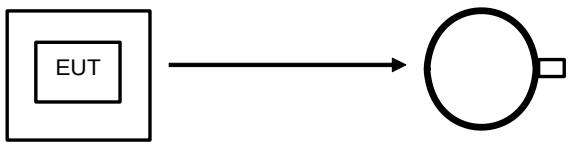
Test Distance: 3 m

Figure 3: Direction of the Loop Antenna

Side View (Vertical)

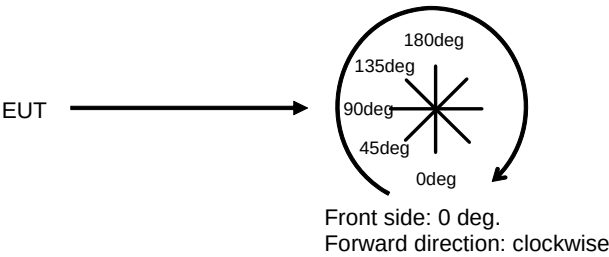


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



The test was made on EUT at the normal use position.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 9 kHz to 1 GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Other tests

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	1.5 MHz	10 kHz	30 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Spectrum Analyzer *2)
*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %. Peak hold was applied as Worst-case measurement.							
*2) The measurement was performed with Marker Frequency Counter Function.							

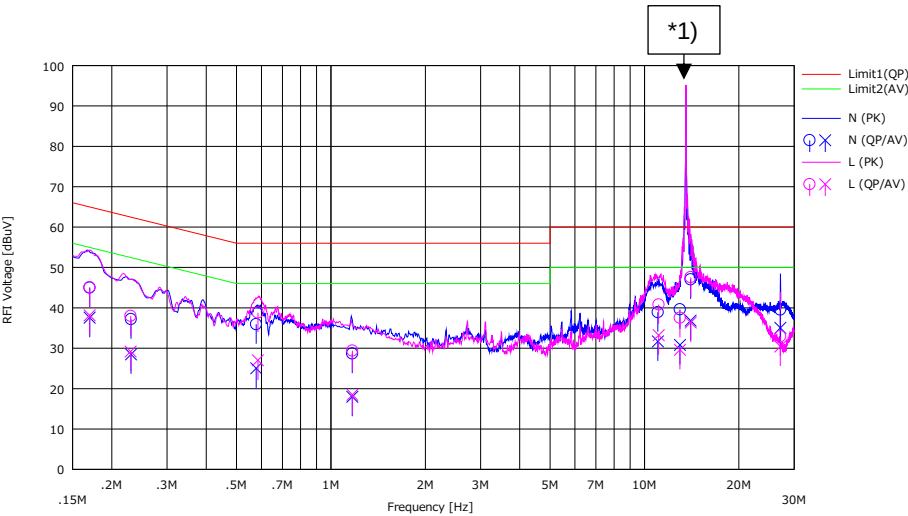
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date December 19, 2024
Temperature / Humidity 27 deg. C / 37 % RH
Engineer Yuichiro Yamazaki
Mode Mode 1

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq. [MHz]	Reading		USN [dB]	LOSS [dB]	Results		Limit		Margin		Phase	Comment
		(QP) [dBuV]	(AV) [dBuV]			(QP) [dBuV]	(AV) [dBuV]	(QP) [dBuV]	(AV) [dBuV]	(QP) [dB]	(AV) [dB]		
1	0.17000	31.80	24.40	0.06	13.12	44.98	37.58	64.96	54.96	19.98	17.38	N	
2	0.23035	24.00	15.30	0.05	13.13	37.18	28.48	62.44	52.44	25.26	23.96	N	
3	0.57745	22.70	11.80	0.06	13.17	35.93	25.03	56.00	46.00	20.07	20.97	N	
4	1.17034	15.40	4.70	0.06	13.21	28.67	17.97	56.00	46.00	27.33	28.03	N	
5	11.03820	25.00	17.80	0.28	13.62	38.90	31.70	60.00	50.00	21.10	18.30	N	
6	12.97704	25.60	16.80	0.33	13.67	39.60	30.80	60.00	50.00	20.40	19.20	N	
7	14.03679	33.00	22.80	0.34	13.69	47.03	36.83	60.00	50.00	12.97	13.17	N	
8	27.12000	25.00	20.50	0.56	13.98	39.54	35.04	60.00	50.00	20.46	14.96	N	
9	0.17000	31.90	25.00	0.04	13.12	45.06	38.16	64.96	54.96	19.90	16.80	L	
10	0.22974	24.80	16.00	0.04	13.13	37.97	29.17	62.46	52.46	24.49	23.29	L	
11	0.58495	25.60	13.80	0.04	13.17	38.81	27.01	56.00	46.00	17.19	18.99	L	
12	1.17081	16.10	5.20	0.05	13.21	29.36	18.46	56.00	46.00	26.64	27.54	L	
13	11.10180	26.90	19.30	0.29	13.62	40.81	33.21	60.00	50.00	19.19	16.79	L	
14	12.97712	23.50	15.60	0.34	13.67	37.51	29.61	60.00	50.00	22.49	20.39	L	
15	14.04768	33.50	22.30	0.36	13.70	47.56	36.36	60.00	50.00	12.44	13.64	L	
16	27.12000	18.40	15.90	0.55	13.98	32.93	30.43	60.00	50.00	27.07	19.57	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)
Except for the above table: adequate margin data below the limits.

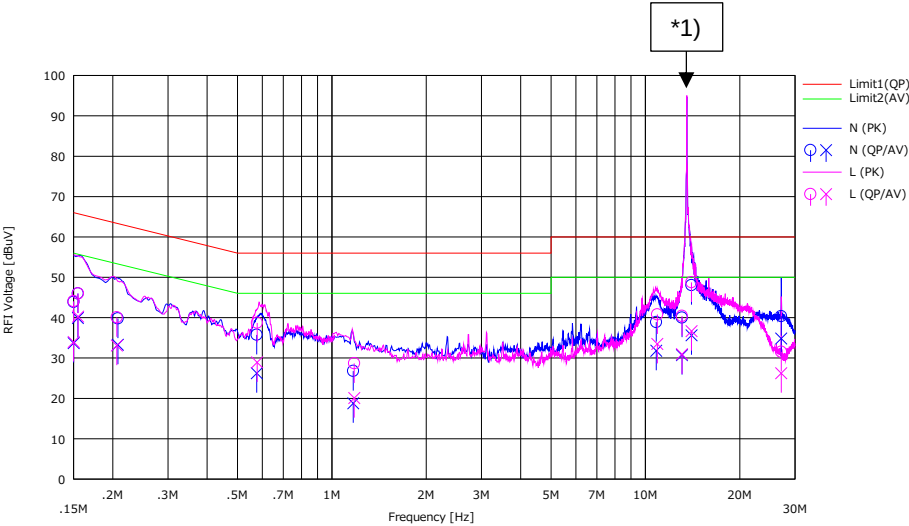
*1) 13.56 MHz: RFID Carrier Frequency

Conducted Emission

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab.
No.3
December 19, 2024
27 deg. C / 37 % RH
Yuichiro Yamazaki
Mode 2

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq. [MHz]	Reading		LISN [dB]	LOSS [dB]	Results		Limit		Margin		Phase	Comment
		(QP)	(AV)			(QP)	(AV)	(QP)	(AV)	(QP)	(AV)		
		[dBuV]	[dBuV]			[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	30.70	20.50	0.06	13.12	43.88	33.68	66.00	56.00	22.12	22.32	N	
2	0.15481	32.80	26.70	0.06	13.12	45.98	39.88	65.74	55.74	19.76	15.86	N	
3	0.20775	26.60	20.10	0.05	13.13	39.78	33.28	63.29	53.29	23.51	20.01	N	
4	0.57584	22.50	13.00	0.06	13.17	35.73	26.23	56.00	46.00	20.27	19.77	N	
5	1.16967	13.50	5.50	0.06	13.21	26.77	18.77	56.00	46.00	29.23	27.23	N	
6	10.83500	25.00	17.90	0.27	13.61	38.88	31.78	60.00	50.00	21.12	18.22	N	
7	13.08327	26.00	16.70	0.33	13.67	40.00	30.70	60.00	50.00	20.00	19.30	N	
8	14.03674	34.00	21.60	0.34	13.69	48.03	35.63	60.00	50.00	11.97	14.37	N	
9	27.12000	25.80	20.30	0.56	13.98	40.34	34.84	60.00	50.00	19.66	15.16	N	
10	0.15000	30.90	20.80	0.04	13.12	44.06	33.96	66.00	56.00	21.94	22.04	L	
11	0.15504	32.80	27.10	0.04	13.12	45.96	40.26	65.73	55.73	19.77	15.47	L	
12	0.20612	26.90	19.90	0.04	13.13	40.07	33.07	63.36	53.36	23.29	20.29	L	
13	0.57758	25.50	15.70	0.04	13.17	38.71	28.91	56.00	46.00	17.29	17.09	L	
14	1.17801	15.40	6.80	0.05	13.21	28.66	20.06	56.00	46.00	27.34	25.94	L	
15	10.92070	26.90	19.60	0.28	13.61	40.79	33.49	60.00	50.00	19.21	16.51	L	
16	13.08850	26.40	16.90	0.34	13.67	40.41	30.91	60.00	50.00	19.59	19.09	L	
17	14.03769	34.70	22.60	0.36	13.69	48.75	36.65	60.00	50.00	11.25	13.35	L	
18	27.12000	17.00	11.70	0.55	13.98	31.53	26.23	60.00	50.00	28.47	23.77	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)
Except for the above table: adequate margin data below the limits.

*1) 13.56 MHz: RFID Carrier Frequency

Conducted Emission

Test place

Semi Anechoic Chamber

Date

Temperature / Humidity

Engineer

Mode

Ise EMC Lab.

No.3

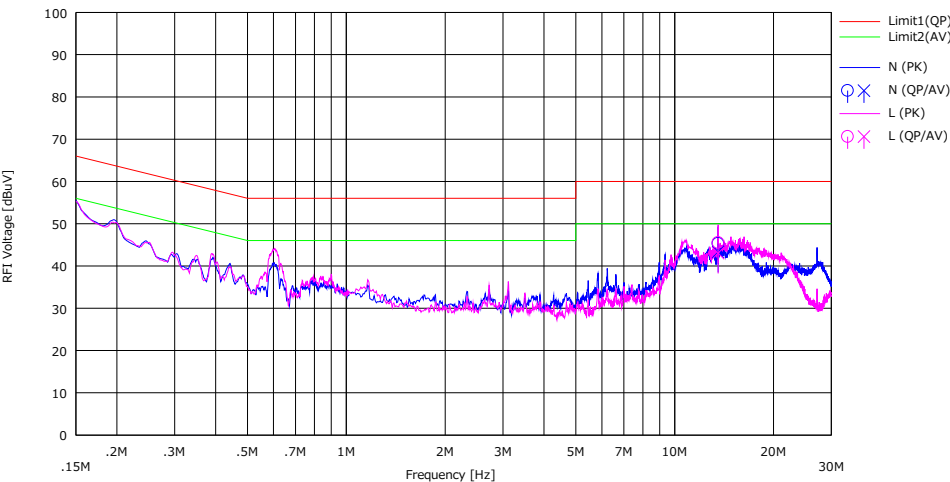
December 19, 2024

27 deg. C / 37 % RH

Yuichiro Yamazaki

Mode 3

Limit : FCC_Part 15 Subpart C(15.207)



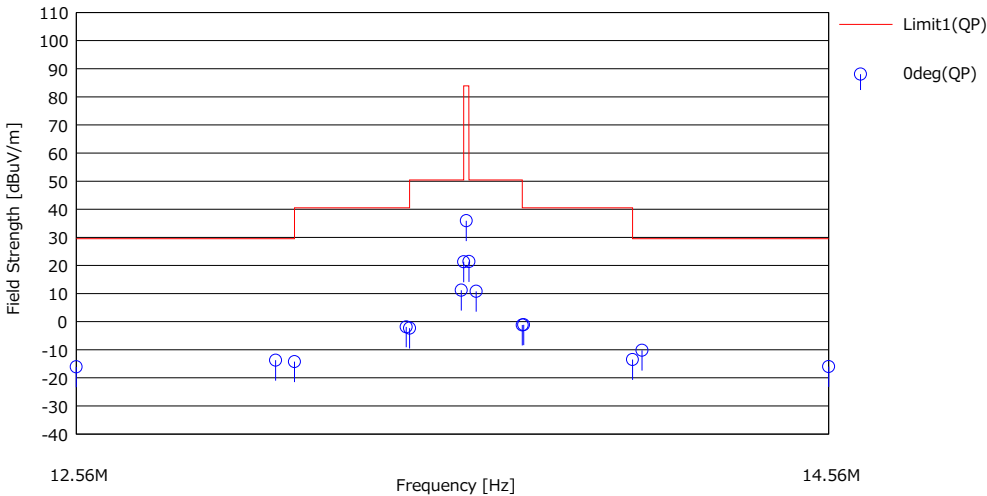
No.	Freq. [MHz]	Reading		LISN [dB]	LOSS [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]			<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
		[dBuV]	[dBuV]			[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	13.56000	31.30	29.30	0.33	13.68	45.31	43.31	60.00	50.00	14.69	6.69	N	
2	13.56000	31.50	29.00	0.35	13.68	45.53	43.03	60.00	50.00	14.47	6.97	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Fundamental Emission and Spectrum Mask

Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date December 13, 2024
Temperature / Humidity 19 deg. C / 36 % RH
Engineer Yuichiro Yamazaki
Mode Mode 1

Limit : FCC15.225(a), 9-90kHz:PK, 110-490kHz:PK, other:QP



No.	Freq. [MHz]	Reading [QP]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit	Margin	Antenna [deg]	Table	Comment
		[dBuV]				[dBuV/m]	[QP] [dBuV/m]	[QP] [dB]			
1	12.56000	30.70	18.91	-33.45	32.23	-16.07	29.50	45.57	0deg	224	
2	13.06169	33.10	18.84	-33.44	32.23	-13.73	29.50	43.23	0deg	224	
3	13.11000	32.60	18.83	-33.44	32.23	-14.24	29.50	43.74	0deg	224	
4	13.40113	45.00	18.79	-33.43	32.23	-1.87	40.50	42.37	0deg	224	
5	13.41000	44.60	18.78	-33.43	32.23	-2.28	40.50	42.78	0deg	224	
6	13.54663	58.10	18.76	-33.43	32.23	11.20	50.40	39.20	0deg	224	
7	13.55300	68.20	18.76	-33.43	32.23	21.30	50.40	29.10	0deg	224	
8	13.56000	82.80	18.76	-33.43	32.23	35.90	83.90	48.00	0deg	224	
9	13.56700	68.30	18.76	-33.43	32.23	21.40	50.40	29.00	0deg	224	
10	13.58623	57.70	18.76	-33.43	32.23	10.80	50.40	39.60	0deg	224	
11	13.71000	45.70	18.74	-33.42	32.23	-1.21	40.50	41.71	0deg	224	
12	13.71362	45.80	18.74	-33.42	32.23	-1.11	40.50	41.61	0deg	224	
13	14.01000	33.50	18.69	-33.41	32.23	-13.45	29.50	42.95	0deg	224	
14	14.03623	36.80	18.69	-33.41	32.23	-10.15	29.50	39.65	0deg	224	
15	14.56000	30.90	18.75	-33.39	32.23	-15.97	29.50	45.47	0deg	224	

RESULT = READING + ANT FACTOR + LOSS (CABLE + Attenuator + Distance Factor*) - GAIN(AMP))
*) Distance Factor: 40 x log (3 m / 30 m) = -40 dB

Result of the fundamental Emission at 3 m without Distance factor

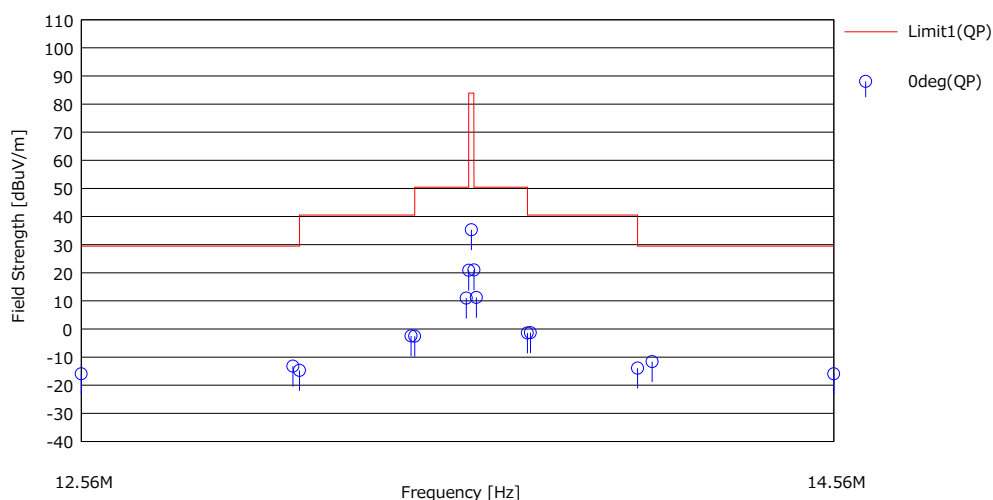
QP											
Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	13.56000	QP	82.80	18.76	6.57	32.23	-	75.90	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

Fundamental Emission and Spectrum Mask

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	December 13, 2024
Temperature / Humidity	19 deg. C / 36 % RH
Engineer	Yuichiro Yamazaki
Mode	Mode 2

Limit : FCC15.225(a), 9-90kHz:PK, 110-490kHz:PK, other:QP



No.	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
		<QP>				<QP>	<QP>	<deg>			
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]			
1	12.56 000	30.80	18.91	-33.45	32.23	-15.97	29.50	45.47	Odeg	275	
2	13.09 328	33.60	18.84	-33.44	32.23	-13.23	29.50	42.73	Odeg	275	
3	13.11 000	32.10	18.83	-33.44	32.23	-14.74	29.50	44.24	Odeg	275	
4	13.40 063	44.40	18.79	-33.43	32.23	-2.47	40.50	42.97	Odeg	275	
5	13.41 000	44.30	18.78	-33.43	32.23	-2.58	40.50	43.08	Odeg	275	
6	13.54 651	57.90	18.76	-33.43	32.23	11.00	50.40	39.40	Odeg	275	
7	13.55 300	67.80	18.76	-33.43	32.23	20.90	50.40	29.50	Odeg	275	
8	13.56 000	82.20	18.76	-33.43	32.23	35.30	83.90	48.60	Odeg	275	
9	13.56 700	67.90	18.76	-33.43	32.23	21.00	50.40	29.40	Odeg	275	
10	13.57 325	58.10	18.76	-33.43	32.23	11.20	50.40	39.20	Odeg	275	
11	13.71 000	45.50	18.74	-33.42	32.23	-1.41	40.50	41.91	Odeg	275	
12	13.71 812	45.60	18.74	-33.42	32.23	-1.31	40.50	41.81	Odeg	275	
13	14.01 000	33.00	18.69	-33.41	32.23	-13.95	29.50	43.45	Odeg	275	
14	14.05 007	35.30	18.70	-33.40	32.23	-11.63	29.50	41.13	Odeg	275	
15	14.56 000	30.90	18.75	-33.39	32.23	-15.97	29.50	45.47	Odeg	275	

$$\text{RESULT} = \text{READING} + \text{ANT FACTOR} + \text{LOSS (CABLE + Attenuator + Distance Factor*)} - \text{GAIN(AMP)}$$

*) Distance Factor: $40 \times \log (3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

Result of the fundamental Emission at 3 m without Distance factor

QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	13.56000	OP	82.20	18.76	6.57	32.23	-	75.30	-	-	Fundamental

$$\text{Result} = \text{Reading} + \text{Ant Factor} + \text{Loss (Cable+Attenuator+Filter)} - \text{Gain(Amplifier)}$$

Spurious Emission

Test place	Ise EMC Lab.	No.3
Semi Anechoic Chamber	No.3	No.3
Date	December 13, 2024	December 19, 2024
Temperature / Humidity	19 deg. C / 36 % RH	27 deg. C / 37 % RH
Engineer	Yuichiro Yamazaki	Yuichiro Yamazaki
	(Below 30 MHz)	(Above 30 MHz)
Mode	Mode 2	

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Odeg	27.120	QP	34.40	19.78	-33.09	32.21	-	-11.12	29.5	40.62	
Hori.	40.680	QP	41.50	14.54	7.13	32.20	-	30.97	40.0	9.03	
Hori.	51.197	QP	46.10	10.79	7.29	32.19	-	31.99	40.0	8.01	
Hori.	54.240	QP	41.50	9.77	7.33	32.19	-	26.41	40.0	13.59	
Hori.	67.800	QP	49.80	6.57	7.53	32.18	-	31.72	40.0	8.28	
Hori.	94.920	QP	49.30	9.39	7.86	32.16	-	34.39	43.5	9.13	
Hori.	108.480	QP	47.70	11.62	8.01	32.14	-	35.19	43.5	8.33	
Hori.	122.040	QP	41.90	13.03	8.14	32.13	-	30.94	43.5	12.58	
Hori.	135.600	QP	43.80	14.01	8.29	32.11	-	33.99	43.5	9.53	
Hori.	155.086	QP	42.30	15.15	8.49	32.09	-	33.85	43.5	9.67	
Hori.	189.840	QP	36.50	16.41	8.80	32.06	-	29.65	43.5	13.87	
Hori.	772.920	QP	34.40	20.58	12.39	31.67	-	35.70	46.0	10.32	
Hori.	800.040	QP	34.30	20.95	12.52	31.52	-	36.25	46.0	9.77	
Hori.	827.160	QP	37.00	21.00	12.65	31.37	-	39.3	46.0	6.7	
Hori.	854.280	QP	37.10	21.72	12.78	31.22	-	40.4	46.0	5.6	
Hori.	935.640	QP	36.50	22.08	13.18	30.77	-	41.0	46.0	5.0	
Vert.	40.680	QP	39.50	14.54	7.13	32.20	-	29.0	40.0	11.0	
Vert.	51.323	QP	52.10	10.75	7.29	32.19	-	38.0	40.0	2.1	
Vert.	54.240	QP	47.40	9.77	7.33	32.19	-	32.3	40.0	7.7	
Vert.	67.800	QP	45.40	6.57	7.53	32.18	-	27.3	40.0	12.7	
Vert.	94.920	QP	50.70	9.39	7.86	32.16	-	35.8	43.5	7.7	
Vert.	108.480	QP	49.00	11.62	8.01	32.14	-	36.5	43.5	7.0	
Vert.	122.040	QP	42.50	13.03	8.14	32.13	-	31.5	43.5	12.0	
Vert.	135.600	QP	41.70	14.01	8.29	32.11	-	31.9	43.5	11.6	
Vert.	156.240	QP	39.00	15.19	8.50	32.09	-	30.6	43.5	12.9	
Vert.	189.840	QP	34.40	16.41	8.80	32.06	-	27.6	43.5	16.0	
Vert.	772.920	QP	38.90	20.58	12.39	31.67	-	40.2	46.0	5.8	
Vert.	800.040	QP	39.30	20.95	12.52	31.52	-	41.3	46.0	4.8	
Vert.	827.160	QP	37.60	21.00	12.65	31.37	-	39.9	46.0	6.1	
Vert.	854.280	QP	35.50	21.72	12.78	31.22	-	38.8	46.0	7.2	

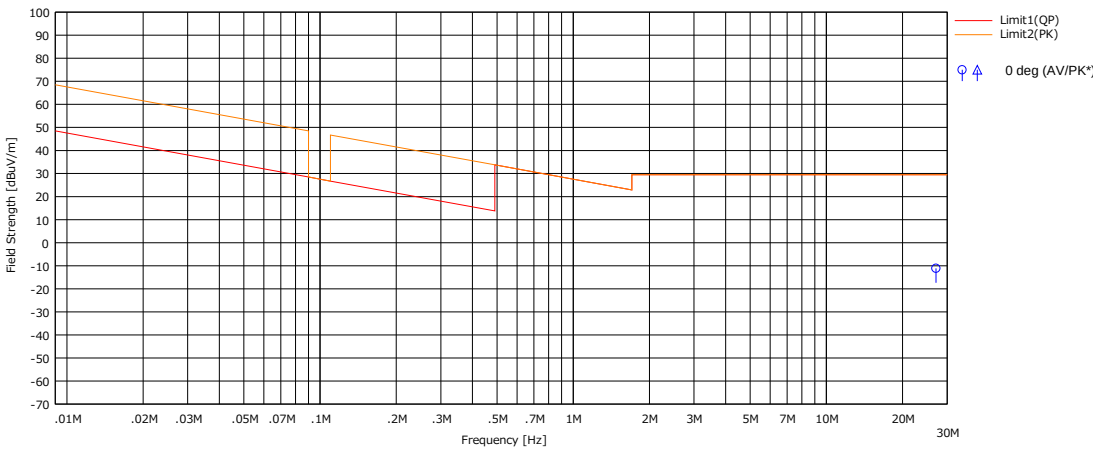
Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

Radiated Spurious Emission
(Plot data, Worst case for Spurious Emission)

Test place	Ise EMC Lab.	No.3
Semi Anechoic Chamber	No.3	No.3
Date	December 13, 2024	December 19, 2024
Temperature / Humidity	19 deg. C / 36 % RH	27 deg. C / 37 % RH
Engineer	Yuichiro Yamazaki	Yuichiro Yamazaki
	(Below 30 MHz)	(Above 30 MHz)
Mode	Mode 2	

(below 30MHz)

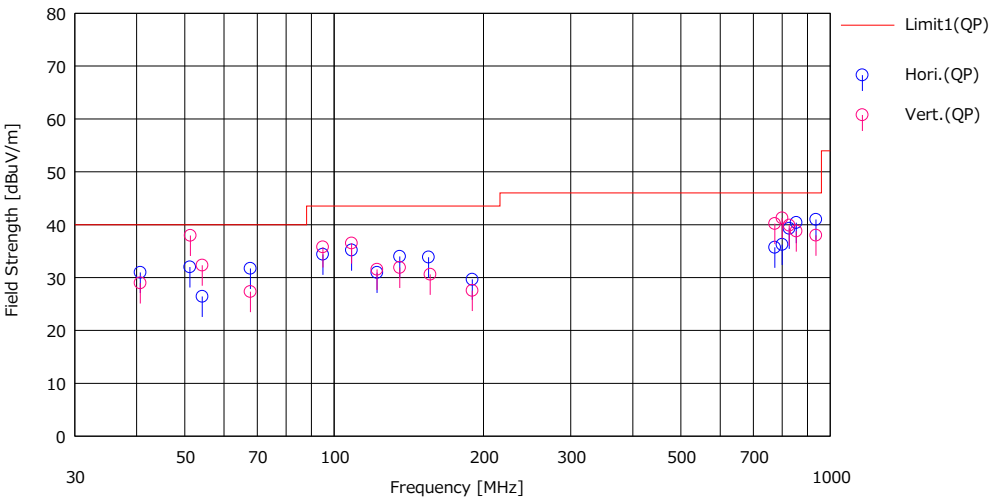
Limit : FCC15.209(a), 9-90kHz:PK, 110-490kHz:PK, other:QP



* Data above 490 kHz were measured using a QP detector.

(above 30MHz)

Limit : FCC15.209 3 m, below 1 GHz:QP, above 1 GHz:AV/PK



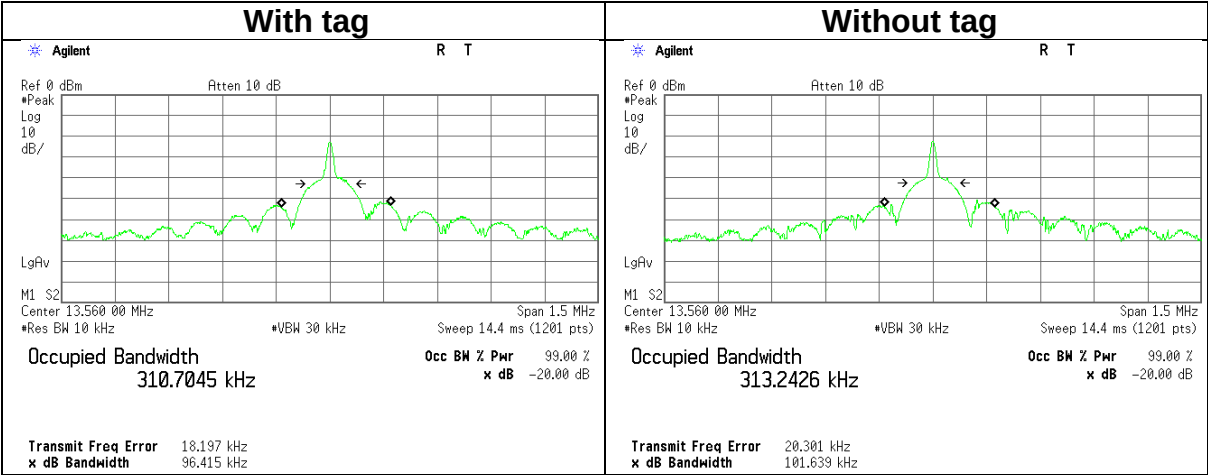
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

20 dB Bandwidth and 99% Occupied Bandwidth

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab.
No.3
December 13, 2024
19 deg. C / 36 % RH
Yuichiro Yamazaki
Mode 1, 2

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	96.415	310.7045
	Without Tag	101.639	313.2426



Since the transmitter signal is CW-like it is impractical to use a RBW setting of 1 - 5 % of the emission bandwidth since the emission bandwidth will be proportional to the RBW

Frequency Tolerance

Test place Ise EMC Lab.
Measurement Room No.6
Date December 20, 2024
Temperature / Humidity 24 deg. C / 39 % RH
Engineer Daiki Matsui
Mode Mode 2

Test condition		Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result		Limit [+/- %]
Temp. [deg. C]	Voltage [V]				[%]	[ppm]	
50	5	Power on	13.559955	-0.000045	-0.00033	-3.3	0.01
		+ 2 min.	13.559948	-0.000052	-0.00039	-3.9	0.01
		+ 5 min.	13.559948	-0.000052	-0.00039	-3.9	0.01
		+ 10 min.	13.559947	-0.000053	-0.00039	-3.9	0.01
40	5	Power on	13.559977	-0.000023	-0.00017	-1.7	0.01
		+ 2 min.	13.559971	-0.000029	-0.00021	-2.1	0.01
		+ 5 min.	13.559968	-0.000032	-0.00023	-2.3	0.01
		+ 10 min.	13.559967	-0.000033	-0.00025	-2.5	0.01
30	5	Power on	13.560009	0.000009	0.00006	0.6	0.01
		+ 2 min.	13.560001	0.000001	0.00001	0.1	0.01
		+ 5 min.	13.559995	-0.000005	-0.00004	-0.4	0.01
		+ 10 min.	13.559995	-0.000005	-0.00004	-0.4	0.01
20	5	Power on	13.560044	0.000044	0.00032	3.2	0.01
		+ 2 min.	13.560034	0.000034	0.00025	2.5	0.01
		+ 5 min.	13.560029	0.000029	0.00021	2.1	0.01
		+ 10 min.	13.560028	0.000028	0.00021	2.1	0.01
20	4.25 (5V -15%)	Power on	13.560021	0.000021	0.00016	1.6	0.01
		+ 2 min.	13.560020	0.000020	0.00015	1.5	0.01
		+ 5 min.	13.560019	0.000019	0.00014	1.4	0.01
		+ 10 min.	13.560019	0.000019	0.00014	1.4	0.01
20	5.75 (5V +15%)	Power on	13.560035	0.000035	0.00026	2.6	0.01
		+ 2 min.	13.560026	0.000026	0.00019	1.9	0.01
		+ 5 min.	13.560024	0.000024	0.00017	1.7	0.01
		+ 10 min.	13.560023	0.000023	0.00017	1.7	0.01
10	5	Power on	13.560056	0.000056	0.00041	4.1	0.01
		+ 2 min.	13.560053	0.000053	0.00039	3.9	0.01
		+ 5 min.	13.560052	0.000052	0.00038	3.8	0.01
		+ 10 min.	13.560052	0.000052	0.00039	3.9	0.01
0	5	Power on	13.560069	0.000069	0.00051	5.1	0.01
		+ 2 min.	13.560070	0.000070	0.00052	5.2	0.01
		+ 5 min.	13.560070	0.000070	0.00051	5.1	0.01
		+ 10 min.	13.560070	0.000070	0.00052	5.2	0.01
-10	5	Power on	13.560057	0.000057	0.00042	4.2	0.01
		+ 2 min.	13.560067	0.000067	0.00049	4.9	0.01
		+ 5 min.	13.560067	0.000067	0.00050	5.0	0.01
		+ 10 min.	13.560066	0.000066	0.00049	4.9	0.01
-20	5	Power on	13.560003	0.000003	0.00002	0.2	0.01
		+ 2 min.	13.560016	0.000016	0.00011	1.1	0.01
		+ 5 min.	13.560031	0.000031	0.00023	2.3	0.01
		+ 10 min.	13.560030	0.000030	0.00022	2.2	0.01

Calculation formula: Frequency error = Measured frequency - Tested frequency
Result [%] = Frequency error / Tested frequency * 100

Tested frequency: 13.56 MHz
Limit (+/-): 0.01 % (+/- 100ppm)

*The test was begun from 50 deg. C and the temperature was lowered each 10 deg. C.

APPENDIX 2: Test instruments

Test Equipment

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
CE	141216	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM14/ suoform141-PE/ 421-010/RFM-E321(SW)	-/00640	07/06/2024	12
CE	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	12/03/2024	12
CE	141358	LISN(AMN)	Schwarzbeck Mess- Elektronik OHG	NSLK8127	8127-730	07/09/2024	12
CE	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	051201197	01/31/2024	12
CE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	05/17/2024	12
CE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	12/11/2023	24
CE	142183	Measure	KOMELON	KMC-36	-	10/21/2024	12
CE	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
CE	244709	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202103	01/25/2024	12
RE	141216	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM14/ suoform141-PE/ 421-010/RFM-E321(SW)	-/00640	07/06/2024	12
RE	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess- Elektronik OHG	VUSLP9111B	9111B-191	08/23/2024	12
RE	141323	Coaxial cable	UL-ISE	-	-	09/13/2024	12
RE	141424	Biconical Antenna	Schwarzbeck Mess- Elektronik OHG	VHA9103+BBA9106	1915	03/15/2024	12
RE	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	051201197	01/31/2024	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/17/2024	12
RE	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	05/09/2024	12
RE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	05/17/2024	12
RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	12/11/2023	24
RE	142183	Measure	KOMELON	KMC-36	-	10/21/2024	12
RE	142314	Attenuator	Pasternack Enterprises	PE7390-6	D/C 1504	06/06/2024	12
RE	146613	Loop Antenna	Rohde & Schwarz	HFH2-Z2	842906/011	09/02/2024	12
RE	159670	Coaxial Cable	UL-ISE	-	-	11/11/2024	12
RE	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	244709	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202103	01/25/2024	12
FT	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	11/11/2024	12
FT	141429	Temperature and Humidity Chamber	Espec	PL-2KP	14015723	08/23/2024	12
FT	141558	Digital Tester(TRUE RMS MULTIMETER)	Fluke Corporation	115	17930030	05/17/2024	12
FT	141902	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187105	05/30/2024	12
FT	244712	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202106	01/25/2024	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

FT: Frequency Tolerance