RADIO TEST REPORT

Test Report No. : 13684958H-A

Applicant	:	**TOKAI RIKA CO., LTD.**
Type of EUT	:	**RKE Transmitter**
Model Number of EUT	:	**B3W2F2L**
FCC ID	:	**MOZB3W2F2L**
Test regulation	:	**FCC Part 15 Subpart C: 2021**
Test Result	:	**Complied (Refer to SECTION 3)**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in Section 1.

Date of test: April 27, 2021

Representative test engineer:
Hiroyuki Furutaka
Engineer

Approved by:
Shinichi Miyazono
Engineer

CERTIFICATE 5107.02

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

UL Japan, Inc.
Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

REVISION HISTORY

Original Test Report No.: 13684958H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13684958H-A	May 19, 2021	-	-

UL Japan, Inc.
Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer information

Company Name	:	TOKAI RIKA CO., LTD.
Address	:	3-260 Toyota, Oguchi-cho, Niwa-gun, Aichi-ken, 480-0195 Japan
Telephone Number	:	+81-587-95-0093
Facsimile Number	:	+81-587-95-5471
Contact Person	:	Hiroki Unno

The information provided from the customer is as follows;
- Applicant, Type 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
- 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	:	RKE Transmitter
Model Number	:	B3W2F2L
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 3.0 V
Receipt Date	:	April 22, 2021
Condition	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	:	No Modification by the test lab

2.2 Product Description

Model: B3W2F2L (referred to as the EUT in this report) is a RKE Transmitter.

Radio Specification

Radio Type	:	Transmitter
Frequency of Operation	:	CH1: 314.35 MHz CH2: 312.10 MHz
Modulation	:	FSK
Operating Voltage Range	:	DC 2.5 V to 3.2 V
Clock frequency (Maximum)	:	27.6 MHz

* Model: B3W2F2L has three types; Original (4 switches), Variation A (3 switches), and Variation B (2 switches). The test was performed with Original (4 switches) since there was no difference in radio characteristics by the these variations.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on January 12, 2021 and effective February 11, 2021

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

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	N/A	N/A	*1)
Automatically Deactivate	**FCC:** ANSI C63.10:2013 6 Standard test methods **ISED:** -	**FCC:** Section 15.231(a)(1) **ISED:** RSS-210 A1.1	N/A	Complied a)	Radiated
Electric Field Strength of Fundamental Emission	**FCC:** ANSI C63.10:2013 6 Standard test methods **ISED:** RSS-Gen 6.12	**FCC:** Section 15.231(b) **ISED:** RSS-210 A1.2	4.4 dB 314.35 MHz Horizontal, QP	Complied# b)	Radiated
Electric Field Strength of Spurious Emission	**FCC:** ANSI C63.10:2013 6 Standard test methods **ISED:** RSS-Gen 6.13	**FCC:** Section 15.205 Section 15.209 Section 15.231(b) **ISED:** RSS-210 A1.2 RSS-Gen 8.9	0.2 dB 624.200 MHz Horizontal, QP	Complied# b)	Radiated
-20dB Bandwidth	**FCC:** ANSI C63.10:2013 6 Standard test methods **ISED:** -	**FCC:** Section 15.231(c) **ISED:** Reference data	N/A	Complied c)	Radiated

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) The test is not applicable since the EUT does not have AC Mains.

a) Refer to APPENDIX 1 (data of Automatically deactivate)
b) Refer to APPENDIX 1 (data of Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission))
c) Refer to APPENDIX 1 (data of -20 dB and 99% Occupied Bandwidth)

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.

FCC 15.31 (e)
This test was performed with the New Battery (DC 3.0 V) during the tests. Therefore, the EUT complies with the requirement.

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 % Occupied Bandwidth	**ISED:** RSS-Gen 6.7	**ISED:** RSS-210 A1.3	N/A	-	Radiated
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.					

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

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.

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

Radiated emission

Measurement distance	Frequency range		Uncertainty (+/-)
3 m	9 kHz to 30 MHz		3.3 dB
10 m			3.2 dB
3 m	30 MHz to 200 MHz	(Horizontal)	4.8 dB
		(Vertical)	5.0 dB
	200 MHz to 1000 MHz	(Horizontal)	5.2 dB
		(Vertical)	6.3 dB
10 m	30 MHz to 200 MHz	(Horizontal)	4.8 dB
		(Vertical)	4.8 dB
	200 MHz to 1000 MHz	(Horizontal)	5.0 dB
		(Vertical)	5.0 dB
3 m	1 GHz to 6 GHz		4.9 dB
	6 GHz to 18 GHz		5.2 dB
1 m	10 GHz to 26.5 GHz		5.5 dB
	26.5 GHz to 40 GHz		5.5 dB
10 m	1 GHz to 18 GHz		5.2 dB

Antenna Terminal test

Test Item	Uncertainty (+/-)
Automatically Deactivate	0.10 %
-20 dB Emission Bandwidth / 99 % Occupied Bandwidth	0.96 %

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 199967
ISED Lab Company Number: 2973C / CAB identifier: JP0002
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

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	-	-

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)

Test Item*	Mode
Automatically Deactivate	1) Normal use mode
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission -20 dB & 99 % Occupied Bandwidth	2) Transmitting mode (Tx) *1)

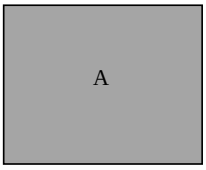
* The system was configured in typical fashion (as a user would normally use it) for testing.
*1) End users cannot change the settings of the output power of the product.

* EUT was set by the software as follows;
Software: 350B_Transmitter_v102.hex Ver. 1.02
(Date: 2021.03.08, 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.

4.2 Configuration and peripherals



* Setup was taken into consideration and test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	RKE Transmitter	B3W2F2L	No.3 *1) No.1 *2)	TOKAI RIKA CO., LTD.	EUT

*1) Used for Normal use mode
*2) Used for Transmitting mode

SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)

Test Procedure and conditions

[For below 30 MHz]
The noise level was checked by moving a search-coil (Loop Antenna) close to the EUT.

[For 30 MHz to 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 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.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The measuring antenna height was varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
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 of the test receiver / spectrum analyzer.

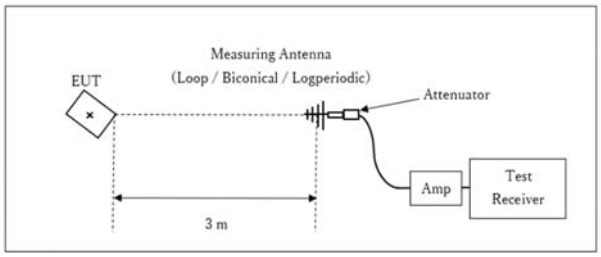
Test Antennas are used as below;

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

	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	Above 1 GHz
Detector Type	Peak	Peak	Peak	Peak	QP	Peak and Peak with Duty factor
IF Bandwidth	200 Hz	200 Hz	9.1 kHz	9.1 kHz	120 kHz	PK: S/A: RBW 1 MHz, VBW: 3 MHz

[Test Setup]

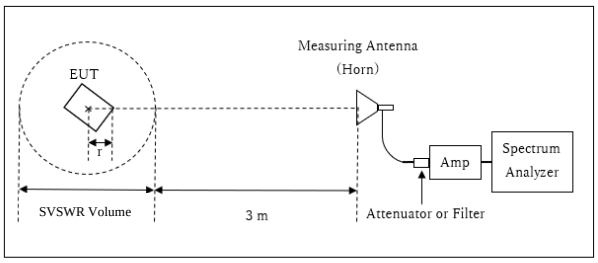
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (4.00 m*/3.0 m) = 2.50 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 4.00m

SVSWR Volume: 2.0m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.0m

* The test was performed with r = 0.0 m since EUT is small and it was the rather conservative condition.

- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.
Noise levels of all the frequencies were measured at the position.

- This EUT has two modes which mechanical key is folded in or out. The worst case was confirmed that mechanical key is folded in or out, as a result, the test which mechanical key was folded in was the worst case. Therefore the test was performed under the worst condition.

*The result is rounded off to the second decimal place, so some differences might be observed.

Measurement range : 9 kHz - 3.2 GHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Automatically deactivate

Test Procedure

The measurement was performed with Electric field strength using a spectrum analyzer.

Test data : APPENDIX
Test result : Pass

SECTION 7: -20 dB and 99 % Occupied Bandwidth

Test Procedure

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	150 kHz	1 kHz	3 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	Max Hold	Spectrum Analyzer
Peak hold was applied as Worst-case measurement.							

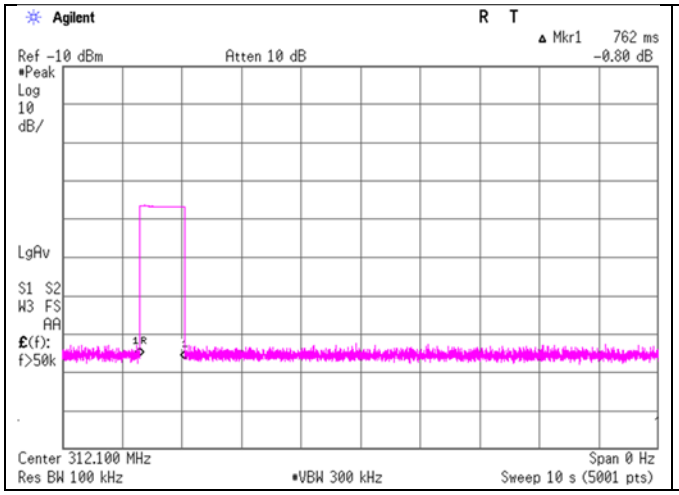
Test data : APPENDIX
Test result : Pass

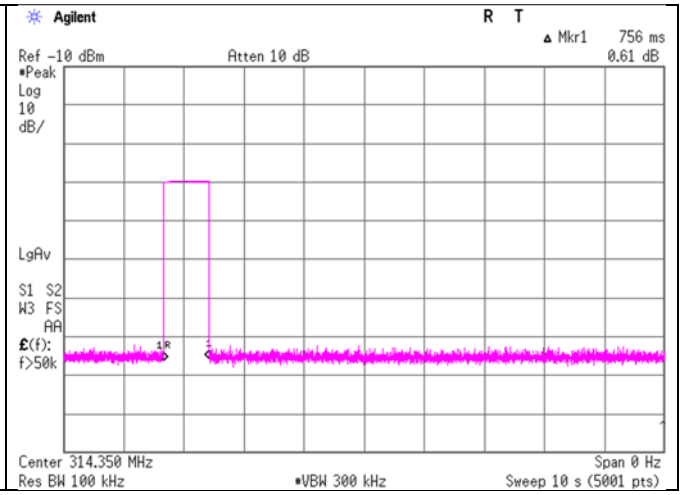
APPENDIX 1: Test data

Automatically deactivate

Report No.	13684958H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	April 27, 2021
Temperature / Humidity	21 deg. C / 40 % RH
Engineer	Hiroyuki Furutaka
Mode	Normal use mode 312.10 MHz / 314.35 MHz

Tx Frequency [MHz]	Time of Transmitting [sec]	Limit [sec]	Result
312.10	0.762	5.00	Pass
314.35	0.756	5.00	Pass





Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Report No.	13684958H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	April 27, 2021
Temperature / Humidity	21 deg. C / 40 % RH
Engineer	Hiroyuki Furutaka
Mode	Transmitting mode (Tx) 312.10 MHz

QP or PK

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]		Remark Inside or Outside
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver	of Restricted Bands
312.100	QP	78.4	74.4	13.8	9.6	31.3	-	70.6	66.6	75.4	4.8	8.8	Carrier
624.200	QP	56.0	54.9	19.4	11.3	31.5	-	55.2	54.1	55.4	0.2	1.3	Outside
936.300	QP	42.4	38.2	21.9	12.5	30.5	-	46.3	42.1	55.4	9.1	13.3	Outside
1248.400	PK	51.3	49.9	25.2	6.1	33.8	-	48.7	47.4	75.4	26.7	28.1	Outside
1560.500	PK	44.7	43.3	25.0	5.5	33.1	-	42.1	40.7	73.9	31.8	33.2	Inside
1872.600	PK	45.1	46.4	25.4	5.5	32.3	-	43.8	45.0	75.4	31.6	30.4	Outside
2184.700	PK	45.6	45.5	28.2	5.6	31.9	-	47.4	47.3	75.4	28.0	28.1	Outside
2496.800	PK	42.6	44.0	27.6	5.7	31.8	-	44.1	45.5	73.9	29.8	28.4	Inside
2808.900	PK	44.0	44.5	28.5	5.8	31.7	-	46.6	47.1	73.9	27.3	26.8	Inside
3121.000	PK	43.6	45.0	28.9	5.9	31.6	-	46.7	48.1	75.4	28.7	27.3	Outside

PK with Duty factor

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]		Remark
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver	
1248.400	PK	51.3	49.9	25.2	6.1	33.8	0.0	48.7	47.4	55.4	6.7	8.1	Outside
1560.500	PK	44.7	43.3	25.0	5.5	33.1	0.0	42.1	40.7	53.9	11.8	13.2	Inside
1872.600	PK	45.1	46.4	25.4	5.5	32.3	0.0	43.8	45.0	55.4	11.6	10.4	Outside
2184.700	PK	45.6	45.5	28.2	5.6	31.9	0.0	47.4	47.3	55.4	8.0	8.1	Outside
2496.800	PK	42.6	44.0	27.6	5.7	31.8	0.0	44.1	45.5	53.9	9.8	8.4	Inside
2808.900	PK	44.0	44.5	28.5	5.8	31.7	0.0	46.6	47.1	53.9	7.3	6.8	Inside
3121.000	PK	43.6	45.0	28.9	5.9	31.6	0.0	46.7	48.1	55.4	8.7	7.3	Outside

Sample calculation:
Result of PK = Reading + Ant Factor + Loss {Cable + Attenuator + Filter (above 1GHz) +Distance factor (above 1 GHz)} - Gain (Amplifier)
Result of PK with Duty factor = Reading + Ant Factor + Loss {Cable + Attenuator + Filter (above 1 GHz) +Distance factor (above 1 GHz)} - Gain (Amplifier) + Duty factor (Refer to Duty factor data sheet)

For above 1GHz : Distance Factor: 20 x log (4.0 m/3.0 m) = 2.50 dB
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Since the peak emission result satisfied the average limit, duty factor was omitted.
Although Duty of this product was 100% or less, the result of AV (PK with Duty factor) was calculated by applying Duty 100% as worst.

Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Report No.	13684958H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	April 27, 2021
Temperature / Humidity	21 deg. C / 40 % RH
Engineer	Hiroyuki Furutaka
Mode	Transmitting mode (Tx) 314.35 MHz

QP or PK

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]		Remark Inside or Outside
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver	of Restricted Bands
314.350	QP	78.8	74.4	13.9	9.7	31.3	-	71.1	66.7	75.5	4.4	8.8	Carrier
628.700	QP	55.6	53.6	19.4	11.3	31.5	-	54.8	52.8	55.5	0.7	2.7	Outside
943.050	QP	33.9	29.6	21.8	12.5	30.4	-	37.9	33.6	55.5	17.7	22.0	Outside
1257.400	PK	51.0	49.9	25.2	6.1	33.8	-	48.5	47.5	75.5	27.0	28.1	Outside
1571.750	PK	44.3	43.9	25.0	5.5	33.0	-	41.7	41.4	73.9	32.2	32.6	Inside
1886.100	PK	46.5	46.7	25.4	5.5	32.3	-	45.2	45.4	75.5	30.3	30.1	Outside
2200.450	PK	46.8	47.3	28.2	5.6	31.9	-	48.7	49.2	73.9	25.2	24.7	Inside
2514.800	PK	44.4	45.4	27.7	5.7	31.8	-	46.0	47.0	75.5	29.5	28.5	Outside
2829.150	PK	46.0	47.9	28.5	5.8	31.7	-	48.6	50.5	73.9	25.3	23.4	Inside
3143.500	PK	45.1	43.4	28.8	5.9	31.6	-	48.3	46.5	75.5	27.3	29.0	Outside

PK with Duty factor

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]		Remark
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver	
1257.400	PK	51.0	49.9	25.2	6.1	33.8	0.0	48.5	47.5	55.5	7.0	8.1	Outside
1571.750	PK	44.3	43.9	25.0	5.5	33.0	0.0	41.7	41.4	53.9	12.2	12.6	Inside
1886.100	PK	46.5	46.7	25.4	5.5	32.3	0.0	45.2	45.4	55.5	10.3	10.1	Outside
2200.450	PK	46.8	47.3	28.2	5.6	31.9	0.0	48.7	49.2	53.9	5.2	4.7	Inside
2514.800	PK	44.4	45.4	27.7	5.7	31.8	0.0	46.0	47.0	55.5	9.5	8.5	Outside
2829.150	PK	46.0	47.9	28.5	5.8	31.7	0.0	48.6	50.5	53.9	5.3	3.4	Inside
3143.500	PK	45.1	43.4	28.8	5.9	31.6	0.0	48.3	46.5	55.5	7.3	9.0	Outside

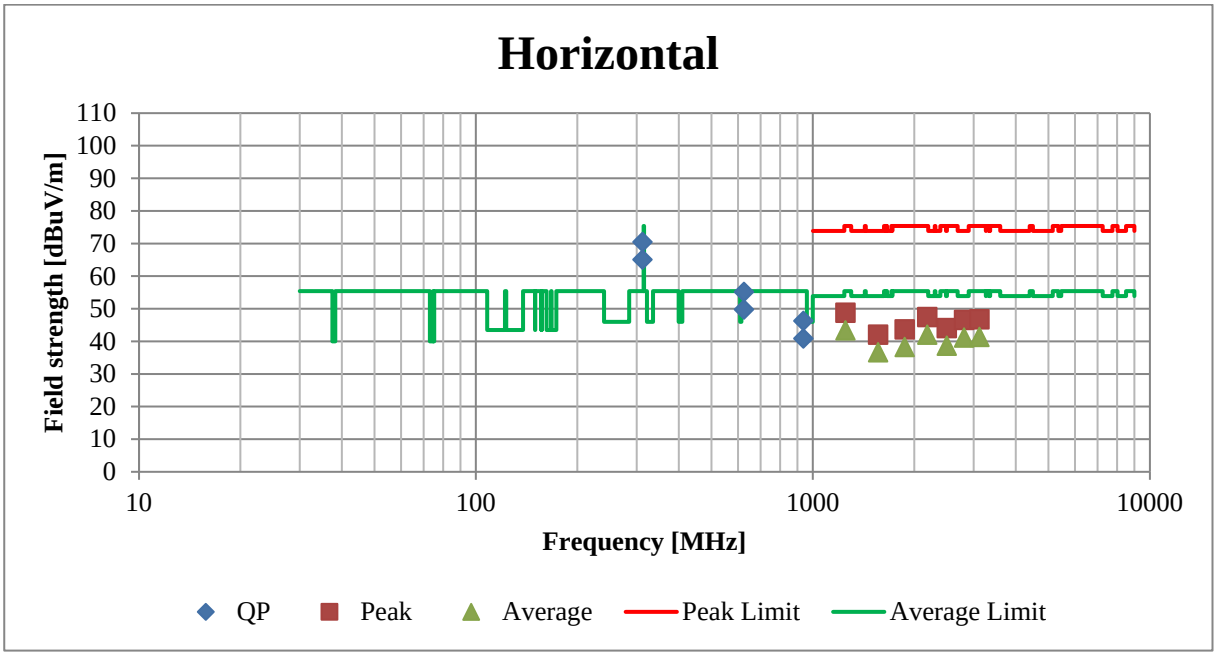
Sample calculation:
Result of PK = Reading + Ant Factor + Loss {Cable + Attenuator + Filter (above 1GHz) +Distance factor (above 1 GHz)} - Gain (Amplifier)
Result of PK with Duty factor = Reading + Ant Factor + Loss {Cable + Attenuator + Filter (above 1 GHz) +Distance factor (above 1 GHz)} - Gain (Amplifier) + Duty factor (Refer to Duty factor data sheet)

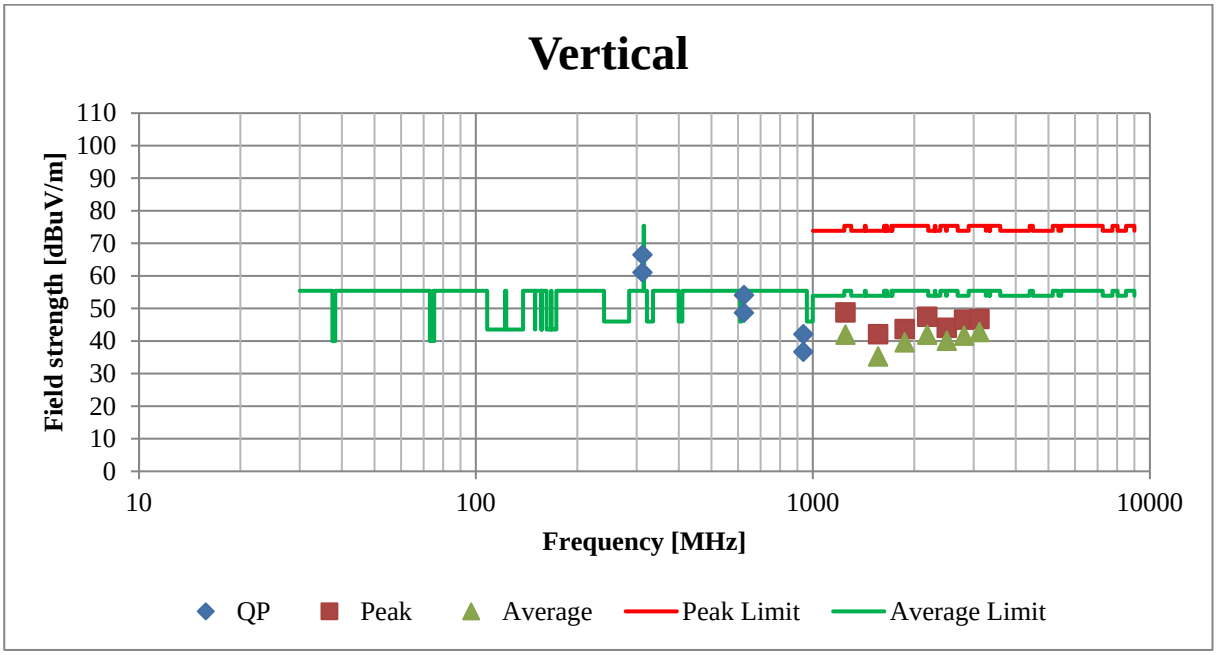
For above 1GHz : Distance Factor: 20 x log (4.0 m/3.0 m) = 2.50 dB
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Since the peak emission result satisfied the average limit, duty factor was omitted.
Although Duty of this product was 100% or less, the result of AV (PK with Duty factor) was calculated by applying Duty 100% as worst.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13684958H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	April 27, 2021
Temperature / Humidity	21 deg. C / 40 % RH
Engineer	Hiroyuki Furutaka
Mode	Transmitting mode (Tx) 312.10 MHz





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

-20 dB and 99% Occupied Bandwidth

312.10 MHz / 314.35 MHz

Report No.	13684958H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	April 27, 2021
Temperature / Humidity	21 deg. C / 40 % RH
Engineer	Hiroyuki Furutaka
Mode	Transmitting mode (Tx)

Bandwidth Limit : Fundamental Frequency **312.10** MHz x 0.25% = 780.25 kHz

* The above limit was calculated from more stringent nominal frequency.

* Method of KDB 926416 for systems employing non sweeping frequencies was referred.

312.10MHz

-20dB Bandwidth [kHz]
58.505

314.35MHz

-20dB Bandwidth [kHz]
58.479

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
116.984	780.25	Pass

Bandwidth Limit : Fundamental Frequency **312.10** MHz x 0.25% = 780.25 kHz

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
61.5057	780.25	Pass

Bandwidth Limit : Fundamental Frequency **314.35** MHz x 0.25% = 785.88 kHz

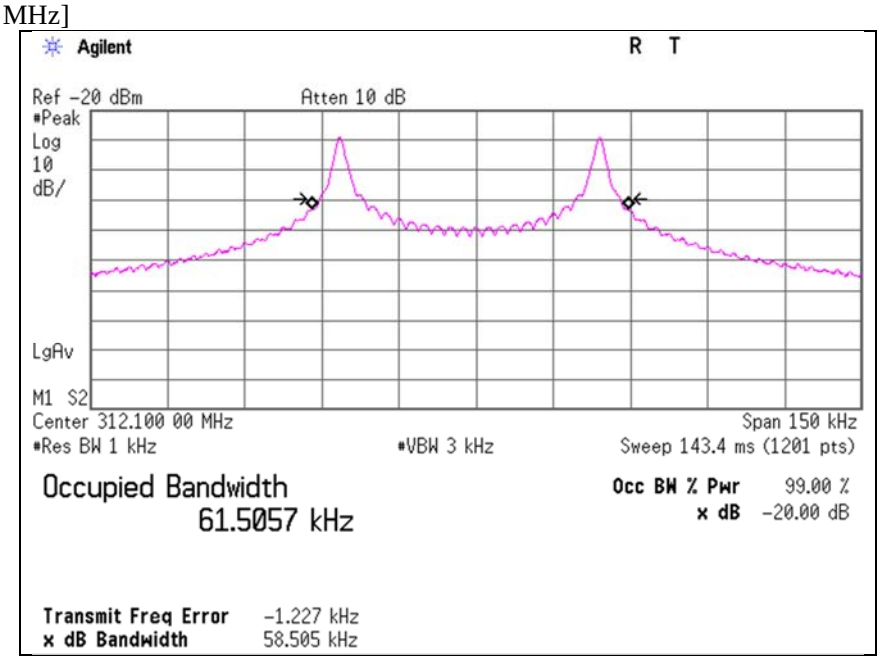
99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
61.6096	785.88	Pass

-20dB and 99% Occupied Bandwidth

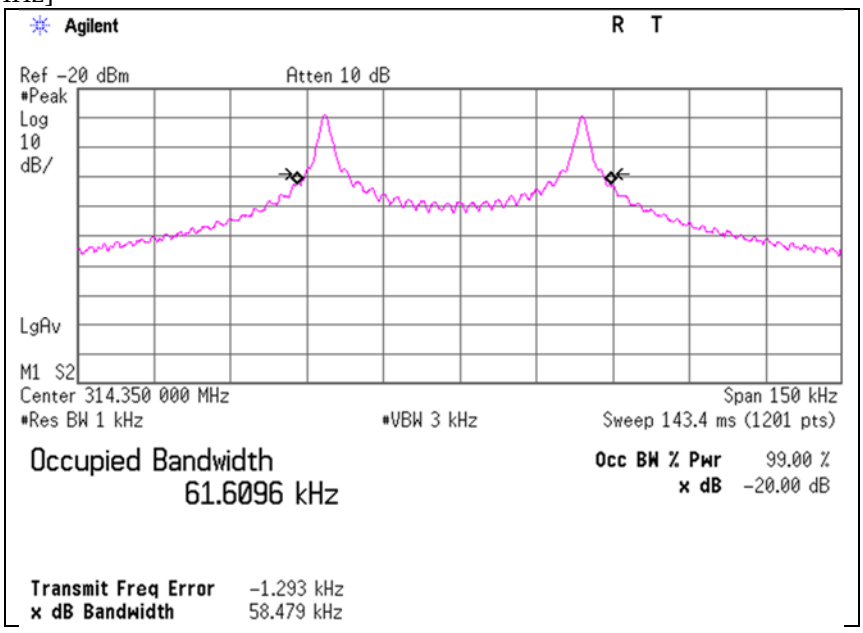
312.10 MHz / 314.35 MHz

Report No.	13684958H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	April 27, 2021
Temperature / Humidity	21 deg. C / 40 % RH
Engineer	Hiroyuki Furutaka
Mode	Transmitting mode (Tx)

[312.10 MHz]



[314.35 MHz]



APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MHF-27	141297	High Pass Filter (1.1-10GHz)	TOKYO KEIKI	TF219CD1	1001	01/14/2021	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/18/2021	12
RE	MLA-23	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-192	09/02/2020	12
RE	MCC-50	141397	Coaxial Cable	UL Japan	-	-	11/06/2020	12
RE	MAT-34	141331	Attenuator(6dB)	TME	UFA-01	-	02/02/2021	12
RE	MPA-24	141594	Pre Amplifier	Keysight Technologies Inc	8447D	2944A10150	02/18/2021	12
RE	MTR-10	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	03/09/2021	12
RE	MSA-15	141902	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187105	10/15/2020	12
RE	MCC-246	199563	Microwave Cable	Huber+Suhner	SF126E/11PC35/ 11PC35/1000M,5000M	537061/126E / 537072/126E	06/11/2020	12
RE	MPA-12	141581	MicroWave System Amplifier	Keysight Technologies Inc	83017A	00650	10/19/2020	12
RE	MHA-21	141508	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	557	05/22/2020	12
RE	MBA-05	141425	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103+BBA9106	VHA 91031302	08/31/2020	12
RE	MPA-14	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	02/18/2021	12
RE	MAEC-04	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/25/2020	24
RE	MOS-15	141562	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0010	01/15/2021	12
RE	MMM-10	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	01/07/2021	12
RE	MAEC-04-SVSWR	142017	AC4_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/12/2021	24
RE	MLPA-07	142645	Loop Antenna	UL Japan	-	-	-	-

***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:
RE: Radiated emission, 99 % Occupied Bandwidth, -20 dB bandwidth, and Automatically deactivate tests