



RADIO TEST REPORT

Test Report No. : 13324451H-B-R3

Applicant : MinebeaMitsumi Inc.
Type of EUT : Parking Sensor
Model Number of EUT : NDPM003 US
FCC ID : 2AWRLNDPM003US
Test regulation : FCC Part 15 Subpart C: 2020
Test Result : Complied (Refer to SECTION 3.2)

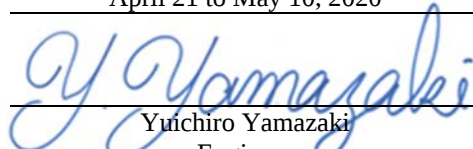
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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report covers Radio technical requirements.

It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)

6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 13324451H-B-R2. 13324451H-B-R2 is replaced with this report.

Date of test: April 21 to May 10, 2020

Representative test engineer:


Yuichiro Yamazaki
Engineer
Consumer Technology Division

Approved by:


Tsubasa Takayama
Leader
Consumer Technology Division



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- ☐ This report contains data that are not covered by the NVLAP accreditation.
☒ There is no testing item of "Non-accreditation".

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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.: 13324451H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13324451H-B	July 8, 2020	-	-
1	13324451H-B-R1	August 3, 2020	P.7	Correction of erroneous description for Clause 3.1; from May 26, 2020 to June 26, 2020
1	13324451H-B-R1	August 3, 2020	P.14	Correction of the test voltage From DC 3.3 V to DC 3.6 V
2	13324451H-B-R2	September 1, 2020	P.6	Correction of Steerable Antenna for Sensor in Clause 2.2; From Electronically to None
2	13324451H-B-R2	September 1, 2020	P.12	Deletion of “*1)” in the list for Radiated emission test of Clause 4.2
2	13324451H-B-R2	September 1, 2020	P.12	Correction of erroneous description about No.2 cable of Clause 4.2; From Shielded to Unshielded
2	13324451H-B-R2	September 1, 2020	corresponding page	Deletion of all contents related to Conducted emission test.
3	13324451H-B-R3	September 8, 2020	P.12	Addition of USB Cable in configuration diagram and Cable list of Clause 4.2
3	13324451H-B-R3	September 8, 2020	P.13	Correction of Serial number for EUT of configuration diagram in Clause 4.2; From 20 to 21

Reference: Abbreviations (Including words undescribed in this report)

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

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

Telephone : +81 596 24 8999

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SECTION 1: Customer information

Company Name	:	MinebeaMitsumi Inc.
Address	:	3-9-6 Mita, Minato-ku, Tokyo 108-8330 Japan
Telephone Number	:	+81-3-6758-6711
Facsimile Number	:	+81-3-6758-6700
Contact Person	:	Kosuke Sumi

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)
- 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	:	Parking Sensor
Model Number	:	NDPM003 US
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 3.6 V (3 AA-sized batteries)
Receipt Date	:	April 9, 2020
Country of Mass-production	:	Thailand
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: NDPM003 US (referred to as the EUT in this report) is a Parking Sensor.

General Specificaion

Clock frequency(ies) in the system	:	50 MHz
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Radio Specification

Sub-GHz Radio Interface *1)

Radio Type	:	Transceiver
Frequency of Operation	:	902.42 MHz - 927.58 MHz
Modulation	:	GFSK
Antenna type	:	Reverse F Antenna
Antenna Gain	:	2.3 dBi (max)
TX mode	:	Frequency Hopping Spread Spectrum
Ch. Spacing	:	340 kHz
Channels	:	75

Sensor

Radio Type	:	Transceiver
Frequency of Operation	:	24.15 GHz
Modulation	:	Unmodulation
Antenna type	:	Patch Antenna
Antenna connector	:	None (Internal Antenna)
Antenna Gain	:	4.0 dBi (max)
Steerable Antenna	:	None

*1) This test report applies to Sub-GHz Radio Interface.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on June 26, 2020 and effective July 27, 2020 except 15.258

Title : FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz,
and 5725-5850 MHz

* The revision does not affect the test result conducted before its effective date.

* 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	N/A	N/A	*1)
Carrier Frequency Separation	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(1) ISED: RSS-247 5.1 (b)	See data.	Complied a)	Conducted
20dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(1)(i) ISED: RSS-247 5.1 (c)		Complied a)	Conducted
Number of Hopping Frequency	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(1)(i) ISED: RSS-247 5.1 (c)		Complied b)	Conducted
Dwell time	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(1)(i) ISED: RSS-247 5.1 (c)		Complied c)	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.12	FCC: Section 15.247(b)(2) ISED: RSS-247 5.4 (a)		Complied d)	Conducted
Spurious Emission & Band Edge Compliance	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.13	FCC: Section 15.247(d) ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	0.2 dB 5414.520 MHz, AV, Horizontal	Complied# e) / f)	Conducted/ Radiated (above 30 MHz) *2)
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 is not the device that is designed to be connected to the public utility (AC) power line. *2) Radiated test was selected over 30 MHz based on section 15.247(d). a) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation) b) Refer to APPENDIX 1 (data of Number of Hopping Frequency) c) Refer to APPENDIX 1 (data of Dwell time) d) Refer to APPENDIX 1 (data of Maximum Peak Output Power) e) Refer to APPENDIX 1 (data of Conducted Spurious Emission) f) Refer to APPENDIX 1 (data of Radiated Spurious 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.					

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

FCC Part 15.31 (e)

This EUT provides stable voltage constantly to RF Module regardless of input voltage. Therefore, this 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: -	N/A	- a)	Conducted
a) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)					

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

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Facsimile : +81 596 24 8124

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the 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 $k=2$.
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Antenna Terminal test

Test Item	Uncertainty (+/-)
20 dB Bandwidth / 99 % Occupied Bandwidth	0.96 %
Maximum Peak Output Power / Average Output Power	1.4 dB
Carrier Frequency Separation	0.42 %
Dwell time / Burst rate	0.10 %
Conducted Spurious Emission	2.6 dB

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) (Vertical)	4.8 dB
		5.0 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.2 dB
		6.3 dB
10 m	30 MHz to 200 MHz (Horizontal) (Vertical)	4.8 dB
		4.8 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.0 dB
		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

3.5 Test Location

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*NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C

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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.11 measurement room	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Mode	Remarks
Transmitting (Tx)	-
*EUT has the power settings by the software as follows; Power settings: 13 dBm Software: PE-STONE-RADIO-TESTER V1.10.0 (Date: April 21, 2020, Storage location: Driven by connected PC) *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.	

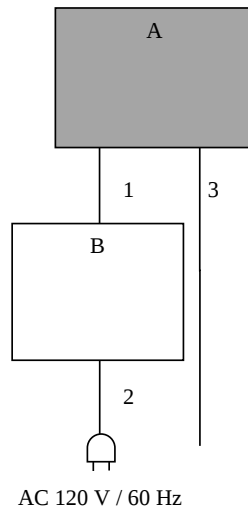
Details of Operating Mode(s)

Test Item	Operating Mode	Tested frequency
Spurious Emission (Conducted/Radiated)	Tx (Hopping Off)	902.42 MHz 915.00 MHz 927.58 MHz
Carrier Frequency Separation 20dB Bandwidth 99%Occupied Bandwidth	Tx (Hopping Off)	902.42 MHz 915.00 MHz 927.58 MHz
Number of Hopping Frequency	Tx (Hopping On)	-
Dwell time ^{*1)}	Tx (Hopping On)	-
Maximum Peak Output Power	Tx (Hopping Off)	902.42 MHz 915.00 MHz 927.58 MHz
Band Edge Compliance (Conducted)	Tx -Hopping On -Hopping Off	902.42 MHz 927.58 MHz

*1) The test was performed with Payload length setting: 106 and 100.

4.2 Configuration and peripherals

[Radiated emission test]



* 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	Parking Sensor	NDPM003 US	24	MinebeaMitsumi Inc.	EUT
B	DC Power Supply	RPE-4323	824B168G2	RS PRO	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.8	Unshielded	Unshielded	-
2	AC Cable	2.0	Unshielded	Unshielded	-
3	USB Cable	1.8	Shielded	Shielded	-

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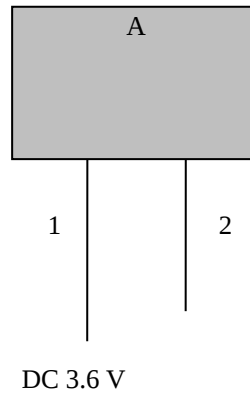
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[Antenna Terminal Conducted test]



* 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	Parking Sensor	NDPM003 US	21	MinebeaMitsumi Inc.	EUT

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	USB Cable	1.5	Shielded	Shielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 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 height of the measuring antenna 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 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 with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

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.

Test Antennas are used as below;

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

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

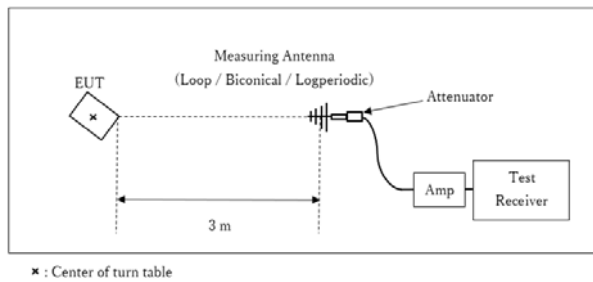
Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer *a)		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on KDB 558074 D01 15.247 Meas Guidance v05r02.

*a) The Spectrum Analyzer was used in 3 dB resolution bandwidth.

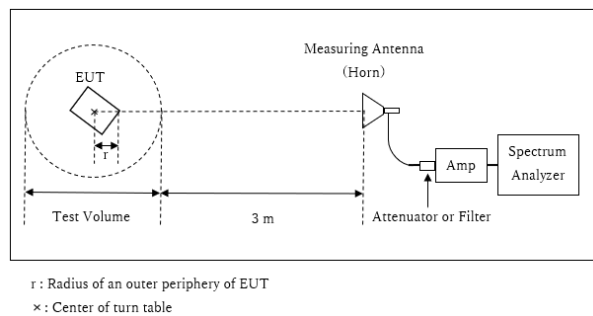
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

1 GHz - 10 GHz



Distance Factor: $20 \times \log (3.65 \text{ m} / 3.0 \text{ m}) = 1.7 \text{ dB}$

* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.65 \text{ m}$

Test Volume : 1.5 m

(Test Volume has been calibrated based on CISPR 16-1-4.)

$r = 0.1 \text{ m}$

- The carrier level and 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.

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

Measurement range	: 30 MHz - 10 GHz
Test data	: APPENDIX
Test result	: Pass

SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	500 kHz	5.1 kHz	15 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *2)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	1 MHz	10 kHz	30 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	200 kHz	620 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz,	300 kHz,	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *3) *4)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) Peak hold was applied as Worst-case measurement.

*2) Reference data

*3) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was low enough as shown in the chart.

(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz).

*4) 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.

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

The equipment and cables were not used for factor 0 dB of the data sheets.

Test data : APPENDIX

Test result : Pass

APPENDIX 1: Test data

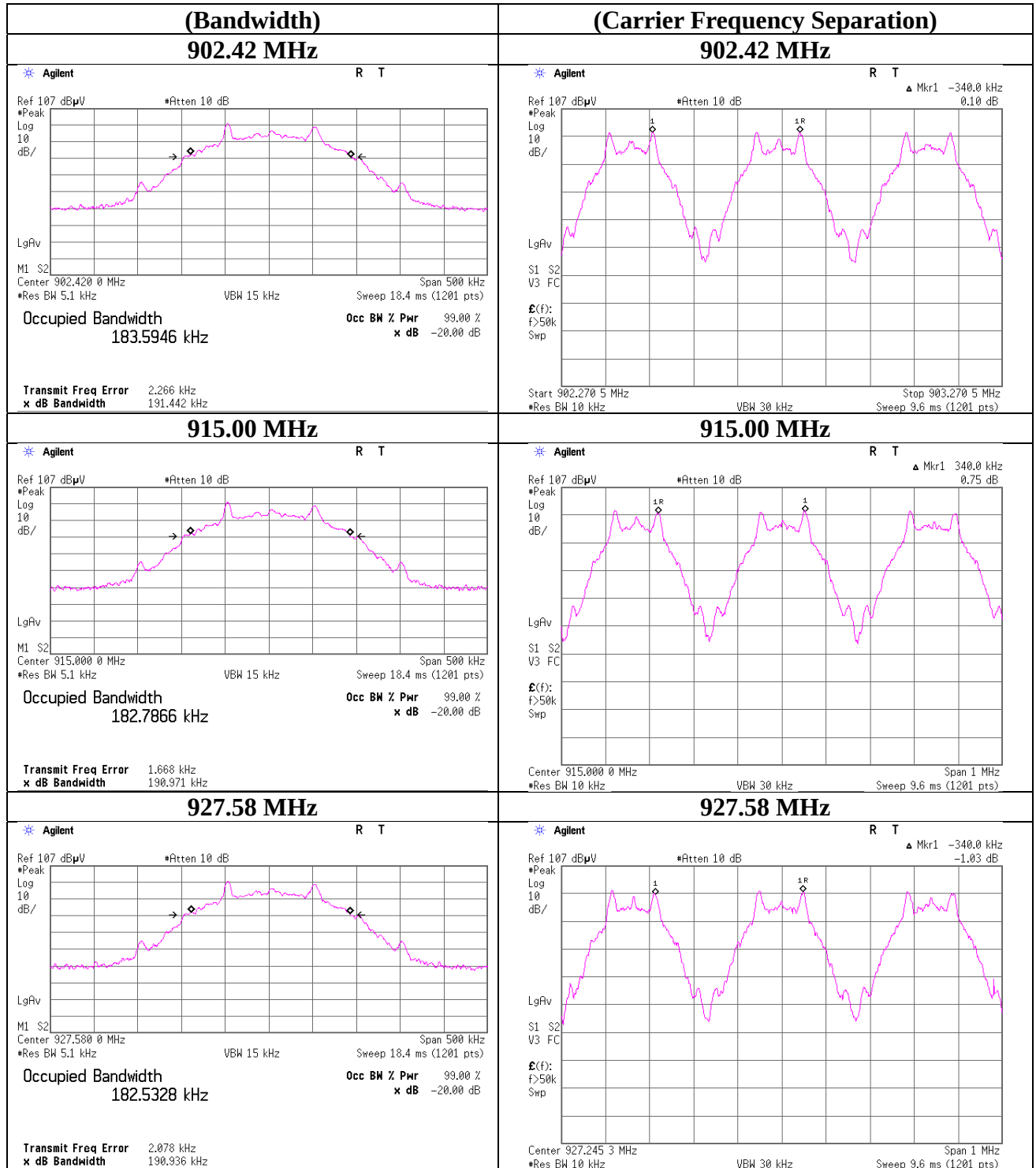
20dB Bandwidth, 99% Occupied Bandwidth and Carrier Frequency Separation

Report No. 13324451H
Test place Ise EMC Lab. No.6 Measurement Room
Date April 23, 2020
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Ken Fujita
Mode Tx, Hopping Off

Freq. [MHz]	20dB Bandwidth [kHz]	Limit for 20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [kHz]	Limit for Carrier Frequency separation [kHz]
902.42	191.442	500.000	183.595	340.000	>= 191.442
915.00	190.971	500.000	182.787	340.000	>= 190.971
927.58	190.936	500.000	182.533	340.000	>= 190.936

Limit: 20dB Bandwidth or 25kHz (whichever is greater).

20 dB Bandwidth, 99 % Occupied Bandwidth and Carrier Frequency Separation



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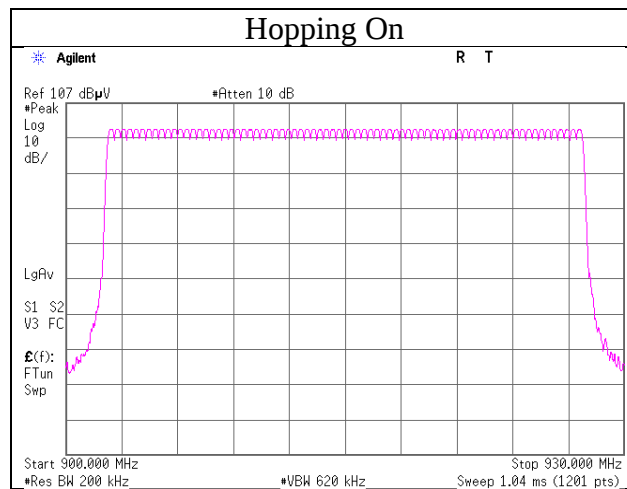
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Number of Hopping Frequency

Report No.	13324451H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	April 23, 2020
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Ken Fujita

Mode	Number of channel [channels]	Limit [channels]
Transmitting	75	>= 50



Dwell time

Report No.	13324451H
Test place	Ise EMC Lab. No.2 Measurement Room
Date	May 10, 2020
Temperature / Humidity	22 deg. C / 65 % RH
Engineer	Yuichiro Yamazaki
Mode	Tx, Hopping On

Payload length setting: 106

Mode	Number of transmission in a 20 sec.	Number of burst in 1 transmission [times]	Length of 1 burst [msec]	Length of transmission [msec]	Result [sec]	Limit [sec]
Tx	3.0 times / 60 sec. x 20.0 sec. = 1 times	18	9.484	170.712	0.171	0.400

Sample Calculation

Result = Number of transmission x Number of burst x Length of 1 burst

* Average data of 5 tests of 1 transmission.

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
Tx	18	18	18	18	18	18

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

* Average data of 5 tests of 60s.

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
Tx	3	3	3	3	3	3

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

Payload length setting: 100

Mode	Number of transmission in a 20 sec.	Number of burst in 1 transmission [times]	Length of 1 burst [msec]	Length of transmission [msec]	Result [sec]	Limit [sec]
Tx	3.0 times / 60 sec. x 20.0 sec. = 1 times	18	9.003	162.054	0.162	0.400

Sample Calculation

Result = Number of transmission x Number of burst x Length of 1 burst

* Average data of 5 tests of 1 transmission.

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
Tx	18	18	18	18	18	18

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

* Average data of 5 tests of 60s.

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
Tx	3	3	3	3	3	3

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

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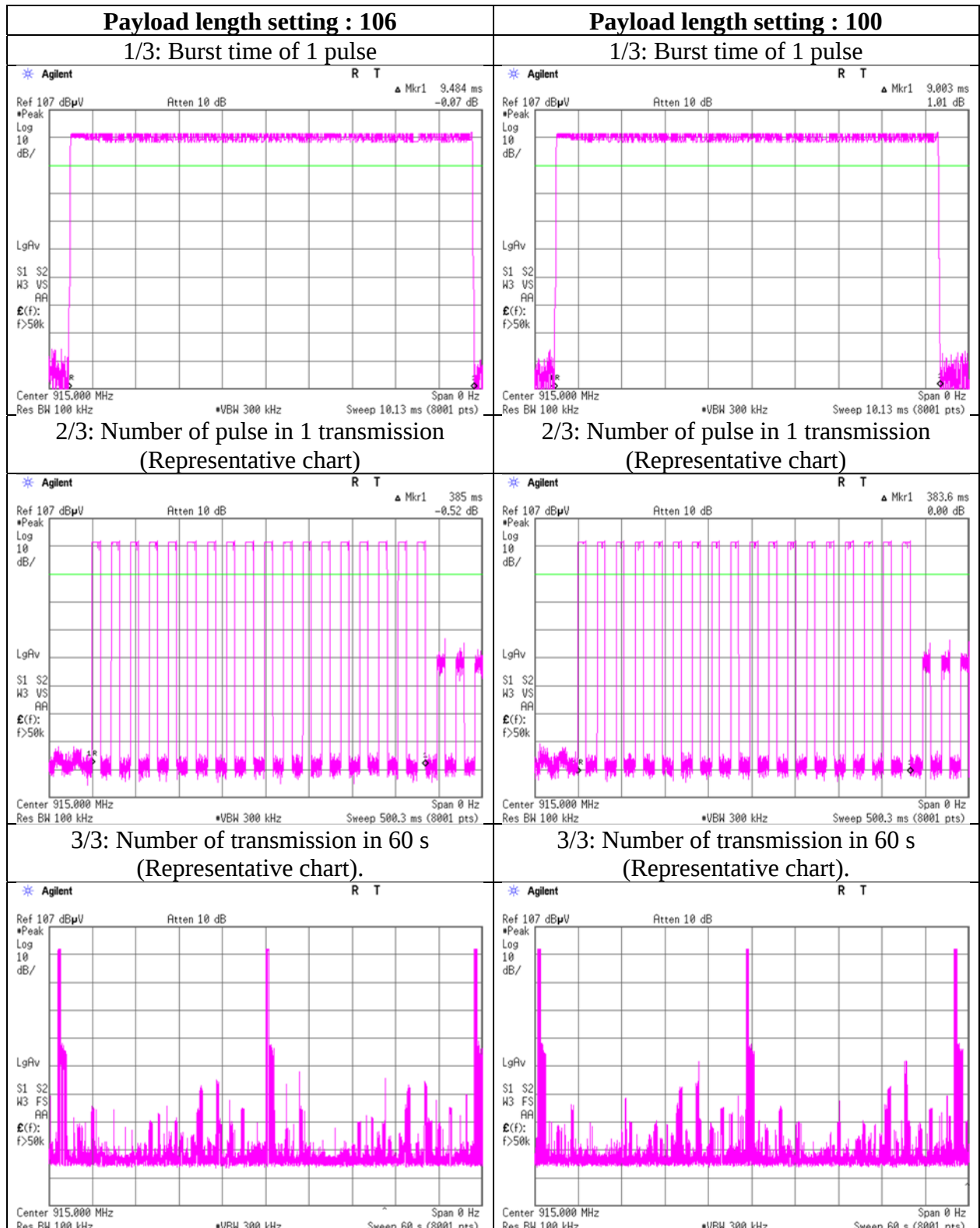
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Dwell time



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Maximum Peak Output Power

Report No. 13324451H
Test place Ise EMC Lab. No.5 Measurement Room
Date April 21, 2020
Temperature / Humidity 20 deg. C / 64 % RH
Engineer Yuichiro Yamazaki
Mode Tx, Hopping Off

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
902.42	-8.03	0.36	19.92	12.25	16.79	30.00	1000	17.75	2.30	14.55	28.51	36.02	4000	21.47
915.00	-8.06	0.36	19.92	12.22	16.67	30.00	1000	17.78	2.30	14.52	28.31	36.02	4000	21.50
927.58	-8.18	0.37	19.92	12.11	16.26	30.00	1000	17.89	2.30	14.41	27.61	36.02	4000	21.61

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

e.i.r.p. Result = Conducted Power Result + Antenna Gain

*The equipment and cables were not used for factor 0 dB of the data sheets.

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Average Output Power
(Reference data for RF Exposure)

Report No. 13324451H
Test place Ise EMC Lab. No.5 Measurement Room
Date April 21, 2020
Temperature / Humidity 20 deg. C / 64 % RH
Engineer Yuichiro Yamazaki
Mode Tx, Hopping Off

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
902.42	-8.18	0.36	19.92	12.10	16.22	0.00	12.10	16.22
915.00	-8.26	0.36	19.92	12.02	15.92	0.00	12.02	15.92
927.58	-8.36	0.37	19.92	11.93	15.60	0.00	11.93	15.60

Sample Calculation:

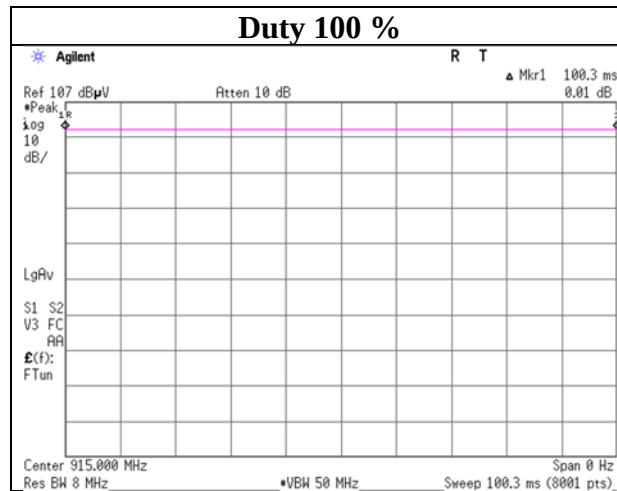
Result (Time average) = Reading + Cable Loss + Attenuator Loss

Result (Burst power average) = Time average + Duty factor

*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst Rate Confirmation

Report No. 13324451H
Test place Ise EMC Lab. No.5 Measurement Room
Date April 21, 2020
Temperature / Humidity 20 deg. C / 64 % RH
Engineer Yuichiro Yamazaki
Mode Tx, Hopping Off



* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Radiated Spurious Emission

Report No.	13324451H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	May 2, 2020	May 3, 2020
Temperature / Humidity	21 deg. C / 61 % RH	21 deg. C / 60 % RH
Engineer	Takeshi Hiyaji	Takeshi Hiyaji
	Below 1GHz	Above 1GHz
Mode	Tx, Hopping Off 902.42 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	34.272	QP	28.3	17.1	7.1	30.5	-	22.0	40.0	18.0	
Hori.	179.038	QP	24.6	16.0	8.8	29.7	-	19.7	43.5	23.8	
Hori.	343.274	QP	24.2	14.9	10.1	29.4	-	19.8	46.0	26.2	
Hori.	720.012	QP	23.0	20.0	12.1	29.3	-	25.8	46.0	20.2	
Hori.	899.992	QP	31.4	22.0	13.0	28.4	-	38.0	46.0	8.0	
Hori.	2707.260	PK	53.9	28.2	5.0	35.1	-	52.0	73.9	21.9	
Hori.	3609.680	PK	47.3	29.2	5.3	34.5	-	47.3	73.9	26.6	
Hori.	4512.100	PK	44.6	30.8	5.7	34.3	-	46.8	73.9	27.1	
Hori.	5414.520	PK	53.7	31.7	6.2	34.2	-	57.4	73.9	16.5	
Hori.	7219.360	PK	45.8	36.1	6.7	34.3	-	54.2	73.9	19.7	
Hori.	8121.780	PK	41.5	36.7	7.0	34.7	-	50.5	73.9	23.4	
Hori.	9024.200	PK	41.8	37.6	7.4	34.7	-	52.1	73.9	21.8	
Hori.	2707.260	AV	51.9	28.2	5.0	35.1	-	50.0	53.9	3.9	
Hori.	3609.680	AV	44.0	29.2	5.3	34.5	-	44.0	53.9	9.9	
Hori.	4512.100	AV	38.4	30.8	5.7	34.3	-	40.6	53.9	13.3	
Hori.	5414.520	AV	50.0	31.7	6.2	34.2	-	53.7	53.9	0.2	
Hori.	7219.360	AV	39.5	36.1	6.7	34.3	-	48.0	53.9	6.0	
Hori.	8121.780	AV	34.7	36.7	7.0	34.7	-	43.7	53.9	10.2	
Hori.	9024.200	AV	33.8	37.6	7.4	34.7	-	44.1	53.9	9.8	
Vert.	38.461	QP	28.3	15.5	7.1	30.4	-	20.5	40.0	19.5	
Vert.	145.723	QP	25.4	14.8	8.5	29.9	-	18.7	43.5	24.8	
Vert.	297.381	QP	27.2	13.4	9.8	29.2	-	21.2	46.0	24.8	
Vert.	366.077	QP	25.6	15.0	10.3	29.5	-	21.4	46.0	24.6	
Vert.	900.025	QP	29.3	22.0	13.0	28.4	-	35.9	46.0	10.1	
Vert.	2707.260	PK	56.6	28.2	5.0	35.1	-	54.6	73.9	19.3	
Vert.	3609.680	PK	43.6	29.2	5.3	34.5	-	43.7	73.9	30.3	
Vert.	4512.100	PK	43.5	30.8	5.7	34.3	-	45.7	73.9	28.3	
Vert.	5414.520	PK	48.9	31.7	6.2	34.2	-	52.6	73.9	21.3	
Vert.	7219.360	PK	44.8	36.1	6.7	34.3	-	53.2	73.9	20.7	
Vert.	8121.780	PK	42.5	36.7	7.0	34.7	-	51.5	73.9	22.4	
Vert.	9024.200	PK	42.3	37.6	7.4	34.7	-	52.6	73.9	21.3	
Vert.	2707.260	AV	54.8	28.2	5.0	35.1	-	52.9	53.9	1.0	
Vert.	3609.680	AV	38.8	29.2	5.3	34.5	-	38.8	53.9	15.1	
Vert.	4512.100	AV	37.9	30.8	5.7	34.3	-	40.1	53.9	13.8	
Vert.	5414.520	AV	46.3	31.7	6.2	34.2	-	50.1	53.9	3.8	
Vert.	7219.360	AV	38.4	36.1	6.7	34.3	-	46.8	53.9	7.1	
Vert.	8121.780	AV	35.8	36.7	7.0	34.7	-	44.8	53.9	9.1	
Vert.	9024.200	AV	34.1	37.6	7.4	34.7	-	44.4	53.9	9.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(3.65\text{ m} / 3.0\text{ m}) = 1.70\text{ dB}$

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	902.420	PK	98.3	22.0	13.0	28.3	104.9	-	-	Carrier
Hori.	902.000	PK	59.1	22.0	13.0	28.3	65.6	84.9	19.2	
Hori.	1804.840	PK	66.8	25.3	4.7	35.6	61.2	84.9	23.6	
Hori.	6316.940	PK	45.0	33.1	6.6	34.2	50.4	84.9	34.4	
Vert.	902.420	PK	98.0	22.0	13.0	28.3	104.6	-	-	Carrier
Vert.	902.000	PK	56.5	22.0	13.0	28.3	63.1	84.6	21.6	
Vert.	1804.840	PK	68.3	25.3	4.7	35.6	62.7	84.6	21.9	
Vert.	6316.940	PK	42.4	33.1	6.6	34.2	47.8	84.6	36.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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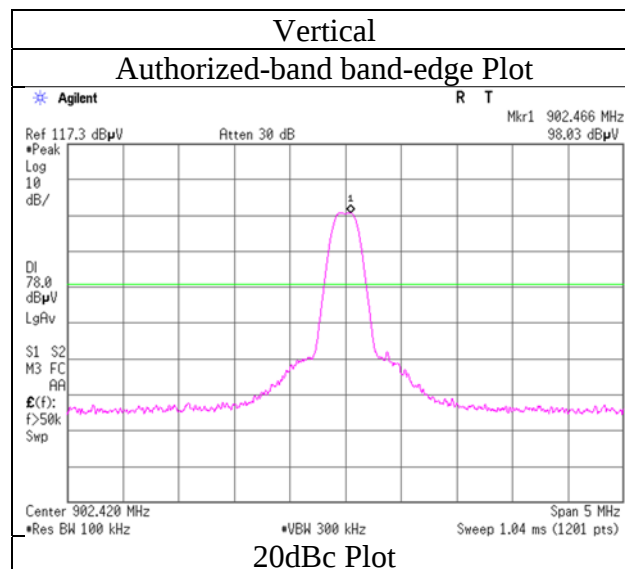
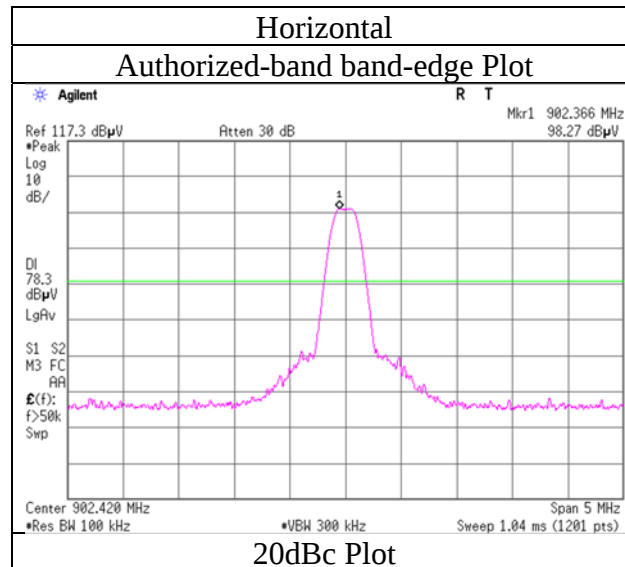
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13324451H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	May 2, 2020
Temperature / Humidity	21 deg. C / 61 % RH
Engineer	Takeshi Hiyaji
Mode	Tx, Hopping Off 902.42 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions. Final result of restricted band edge was shown in tabular data.

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Radiated Spurious Emission

Report No. 13324451H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date May 2, 2020 No.2
Temperature / Humidity 21 deg. C / 61 % RH May 3, 2020
Engineer Takeshi Hiyaji Takeshi Hiyaji
Below 1GHz Above 1GHz
Mode Tx, Hopping Off 915.00 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	34.523	QP	28.4	16.9	7.1	30.5	-	22.0	40.0	18.0	
Hori.	170.623	QP	24.4	15.8	8.7	29.8	-	19.2	43.5	24.3	
Hori.	391.734	QP	24.0	15.4	10.5	29.7	-	20.2	46.0	25.8	
Hori.	904.856	QP	30.5	22.0	13.0	28.3	-	37.1	46.0	8.9	
Hori.	925.257	QP	28.9	21.8	13.1	28.2	-	35.6	46.0	10.4	
Hori.	2745.000	PK	52.8	28.2	5.0	35.1	-	50.9	73.9	23.0	
Hori.	3660.000	PK	46.5	29.2	5.3	34.5	-	46.6	73.9	27.3	
Hori.	4575.000	PK	44.3	30.9	5.8	34.4	-	46.6	73.9	27.3	
Hori.	7320.000	PK	44.8	36.1	6.7	34.4	-	53.2	73.9	20.7	
Hori.	8235.000	PK	42.2	36.3	7.1	34.7	-	50.9	73.9	23.0	
Hori.	9150.000	PK	43.0	38.3	7.5	34.8	-	54.0	73.9	19.9	
Hori.	2745.000	AV	50.4	28.2	5.0	35.1	-	48.5	53.9	5.4	
Hori.	3660.000	AV	42.5	29.2	5.3	34.5	-	42.6	53.9	11.3	
Hori.	4575.000	AV	39.6	30.9	5.8	34.4	-	41.9	53.9	12.0	
Hori.	7320.000	AV	39.2	36.1	6.7	34.4	-	47.6	53.9	6.3	
Hori.	8235.000	AV	35.3	36.3	7.1	34.7	-	44.0	53.9	9.9	
Hori.	9150.000	AV	34.2	38.3	7.5	34.8	-	45.2	53.9	8.7	
Vert.	38.843	QP	28.4	15.3	7.2	30.4	-	20.5	40.0	19.6	
Vert.	146.049	QP	25.6	14.8	8.5	29.9	-	18.9	43.5	24.6	
Vert.	293.130	QP	27.2	13.3	9.7	29.2	-	21.1	46.0	24.9	
Vert.	904.888	QP	30.5	22.0	13.0	28.3	-	37.1	46.0	8.9	
Vert.	925.238	QP	29.2	21.8	13.1	28.2	-	35.9	46.0	10.1	
Vert.	2745.000	PK	56.5	28.2	5.0	35.1	-	54.6	73.9	19.3	
Vert.	3660.000	PK	45.2	29.2	5.3	34.5	-	45.3	73.9	28.6	
Vert.	4575.000	PK	43.7	30.9	5.8	34.4	-	46.1	73.9	27.8	
Vert.	7320.000	PK	43.9	36.1	6.7	34.4	-	52.3	73.9	21.6	
Vert.	8235.000	PK	41.7	36.3	7.1	34.7	-	50.4	73.9	23.5	
Vert.	9150.000	PK	43.1	38.3	7.5	34.8	-	54.1	73.9	19.8	
Vert.	2745.000	AV	54.9	28.2	5.0	35.1	-	53.0	53.9	0.9	
Vert.	3660.000	AV	40.6	29.2	5.3	34.5	-	40.7	53.9	13.2	
Vert.	4575.000	AV	38.2	30.9	5.8	34.4	-	40.5	53.9	13.4	
Vert.	7320.000	AV	37.4	36.1	6.7	34.4	-	45.8	53.9	8.1	
Vert.	8235.000	AV	35.2	36.3	7.1	34.7	-	43.9	53.9	10.0	
Vert.	9150.000	AV	34.1	38.3	7.5	34.8	-	45.1	53.9	8.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (3.65 m / 3.0 m) = 1.70 dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	915.000	PK	99.2	21.9	13.0	28.3	105.8	-	-	Carrier
Hori.	914.596	PK	58.9	21.9	13.0	28.3	65.5	85.8	20.3	
Hori.	1830.000	PK	68.9	25.4	4.7	35.5	63.4	85.8	22.4	
Hori.	5490.000	PK	54.2	31.9	6.3	34.2	58.2	85.8	27.7	
Hori.	6405.000	PK	46.1	33.5	6.6	34.2	52.0	85.8	33.8	
Vert.	915.000	PK	97.6	21.9	13.0	28.3	104.2	-	-	Carrier
Vert.	914.575	PK	56.8	21.9	13.0	28.3	63.5	84.2	20.8	
Vert.	1830.000	PK	69.0	25.4	4.7	35.5	63.5	84.2	20.7	
Vert.	5490.000	PK	48.0	31.9	6.3	34.2	52.0	84.2	32.2	
Vert.	6405.000	PK	41.6	33.5	6.6	34.2	47.5	84.2	36.7	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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Radiated Spurious Emission

Report No.	13324451H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	May 2, 2020
Temperature / Humidity	21 deg. C / 61 % RH
Engineer	Takeshi Hiyaji
Mode	Below 1GHz
	Above 1GHz
	Tx, Hopping Off 927.58 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	34.568	QP	28.2	16.9	7.1	30.5	-	21.8	40.0	18.3	
Hori.	167.582	QP	24.5	15.6	8.7	29.8	-	19.0	43.5	24.5	
Hori.	355.369	QP	24.3	15.0	10.2	29.5	-	20.1	46.0	25.9	
Hori.	609.489	QP	24.5	19.3	11.6	29.8	-	25.6	46.0	20.4	
Hori.	936.500	QP	28.7	21.8	13.1	28.1	-	35.5	46.0	10.5	
Hori.	2782.740	PK	53.2	28.3	5.0	35.1	-	51.5	73.9	22.4	
Hori.	3710.320	PK	46.6	29.3	5.3	34.4	-	46.8	73.9	27.1	
Hori.	4637.900	PK	44.5	31.1	5.8	34.4	-	47.0	73.9	26.9	
Hori.	7420.640	PK	41.5	36.3	6.8	34.4	-	50.1	73.9	23.8	
Hori.	8348.220	PK	42.1	36.2	7.1	34.7	-	50.7	73.9	23.2	
Hori.	9275.800	PK	43.0	38.6	7.6	34.8	-	54.3	73.9	19.6	
Hori.	2782.740	AV	50.9	28.3	5.0	35.1	-	49.2	53.9	4.8	
Hori.	3710.320	AV	41.3	29.3	5.3	34.4	-	41.5	53.9	12.4	
Hori.	4637.900	AV	39.6	31.1	5.8	34.4	-	42.1	53.9	11.8	
Hori.	7420.640	AV	34.7	36.3	6.8	34.4	-	43.3	53.9	10.6	
Hori.	8348.220	AV	36.6	36.2	7.1	34.7	-	45.2	53.9	8.7	
Hori.	9275.800	AV	33.4	38.6	7.6	34.8	-	44.7	53.9	9.2	
Vert.	38.723	QP	28.2	15.4	7.2	30.4	-	20.3	40.0	19.7	
Vert.	145.842	QP	25.5	14.8	8.5	29.9	-	18.8	43.5	24.7	
Vert.	298.699	QP	28.7	13.4	9.8	29.2	-	22.7	46.0	23.3	
Vert.	344.482	QP	26.3	14.9	10.2	29.4	-	22.0	46.0	24.1	
Vert.	811.624	QP	21.6	20.9	12.5	28.8	-	26.2	46.0	19.8	
Vert.	2782.740	PK	54.9	28.3	5.0	35.1	-	53.2	73.9	20.8	
Vert.	3710.320	PK	44.4	29.3	5.3	34.4	-	44.6	73.9	29.3	
Vert.	4637.900	PK	42.7	31.1	5.8	34.4	-	45.2	73.9	28.7	
Vert.	7420.640	PK	43.5	36.3	6.8	34.4	-	52.1	73.9	21.8	
Vert.	8348.220	PK	42.6	36.2	7.1	34.7	-	51.2	73.9	22.8	
Vert.	9275.800	PK	42.8	38.6	7.6	34.8	-	54.1	73.9	19.8	
Vert.	2782.740	AV	53.3	28.3	5.0	35.1	-	51.5	53.9	2.4	
Vert.	3710.320	AV	39.9	29.3	5.3	34.4	-	40.1	53.9	13.8	
Vert.	4637.900	AV	36.2	31.1	5.8	34.4	-	38.7	53.9	15.2	
Vert.	7420.640	AV	36.2	36.3	6.8	34.4	-	44.8	53.9	9.1	
Vert.	8348.220	AV	36.1	36.2	7.1	34.7	-	44.7	53.9	9.2	
Vert.	9275.800	AV	34.8	38.6	7.6	34.8	-	46.1	53.9	7.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (3.65 m / 3.0 m) = 1.70 dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	927.580	PK	97.9	21.8	13.1	28.2	104.6	-	-	Carrier
Hori.	928.047	PK	55.5	21.8	13.1	28.2	62.2	84.6	22.4	
Hori.	1855.160	PK	68.3	25.5	4.7	35.5	63.0	84.6	21.7	
Hori.	5565.480	PK	54.8	31.7	6.3	34.2	58.7	84.6	26.0	
Hori.	6493.060	PK	45.9	34.1	6.6	34.2	52.4	84.6	32.2	
Vert.	927.580	PK	96.5	21.8	13.1	28.2	103.1	-	-	Carrier
Vert.	928.000	PK	56.0	21.8	13.1	28.2	62.7	83.1	20.4	
Vert.	1855.160	PK	69.1	25.5	4.7	35.5	63.8	83.1	19.4	
Vert.	5565.480	PK	50.4	31.7	6.3	34.2	54.3	83.1	28.9	
Vert.	6493.060	PK	42.8	34.1	6.6	34.2	49.3	83.1	33.9	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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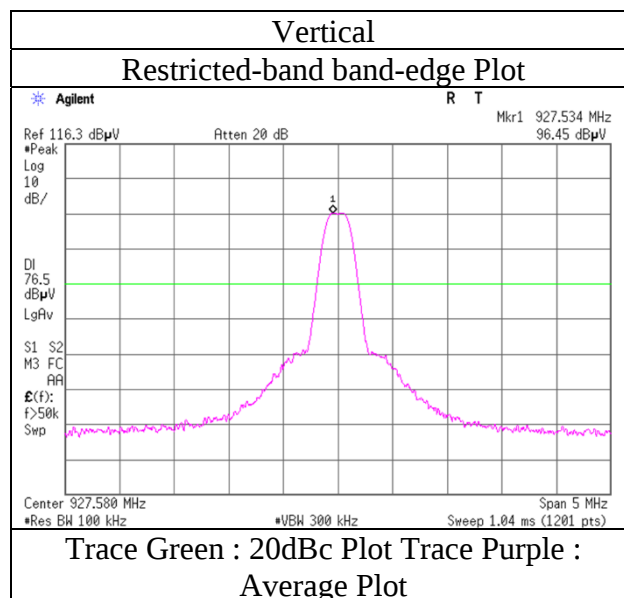
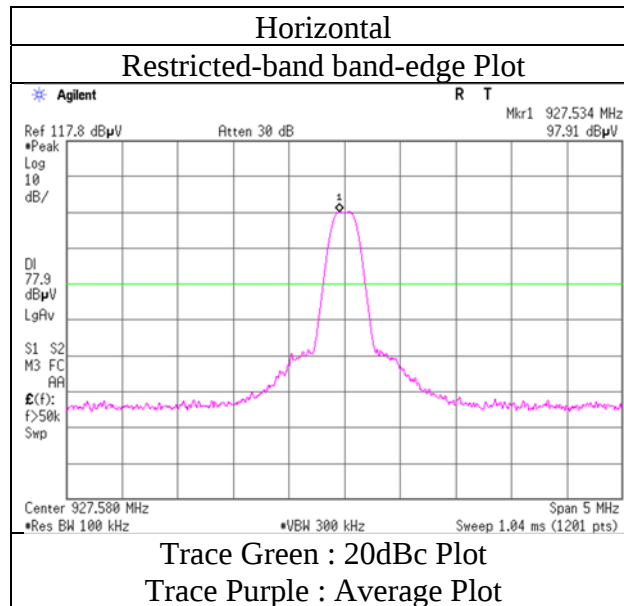
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Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13324451H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	May 2, 2020
Temperature / Humidity	21 deg. C / 61 % RH
Engineer	Takeshi Hiyaji
Mode	Tx, Hopping Off 927.58 MHz



* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions. Final result of restricted band edge was shown in tabular data.

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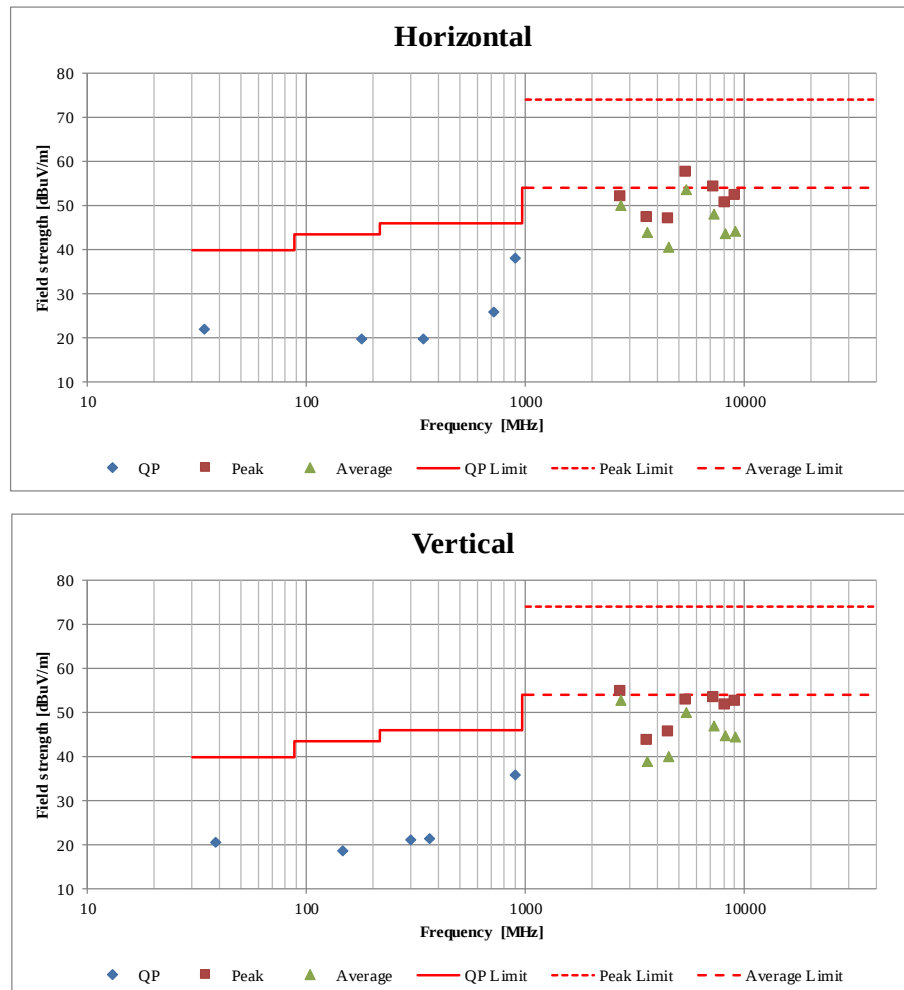
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Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Spurious Emission (Plot data, Worst case)

Report No.	13324451H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	May 2, 2020	May 3, 2020
Temperature / Humidity	21 deg. C / 61 % RH	21 deg. C / 60 % RH
Engineer	Takeshi Hiyaji	Takeshi Hiyaji
	Below 1GHz	Above 1GHz
Mode	Tx, Hopping Off 902.42 MHz	

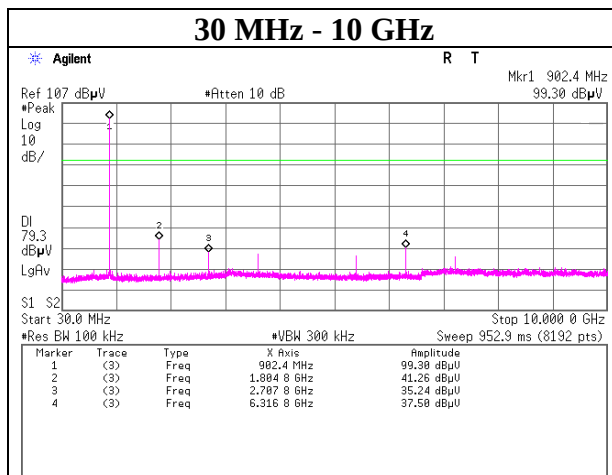
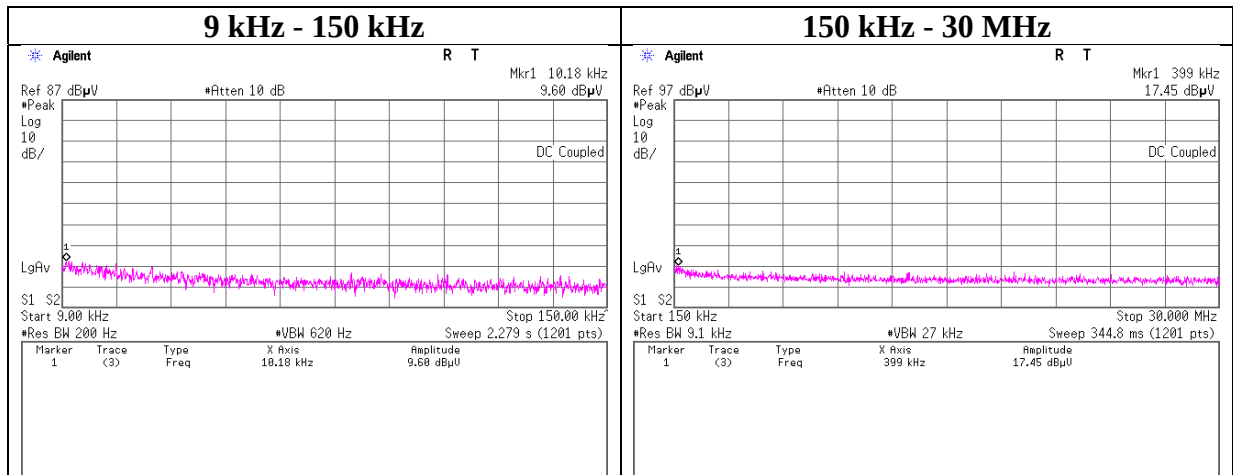


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Report No.	13324451H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	April 23, 2020
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Ken Fujita
Mode	Tx, Hopping Off

920.42 MHz



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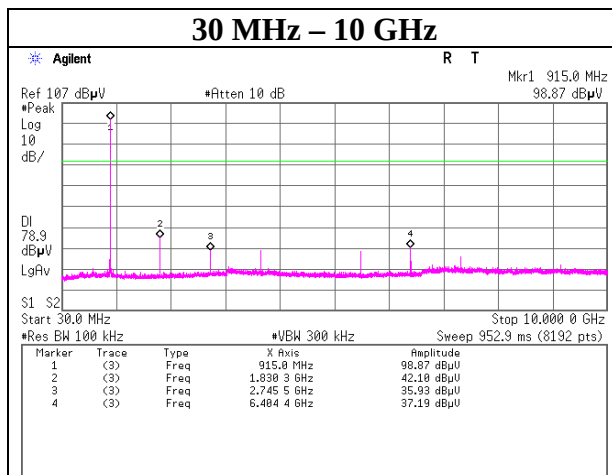
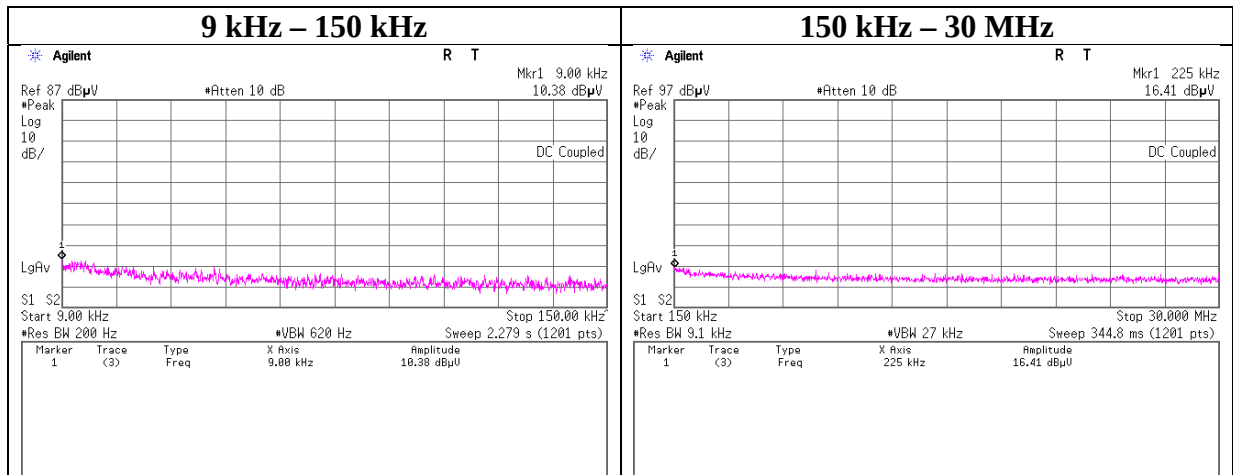
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Report No. 13324451H
Test place Ise EMC Lab. No.6 Measurement Room
Date April 23, 2020
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Ken Fujita
Mode Tx, Hopping Off

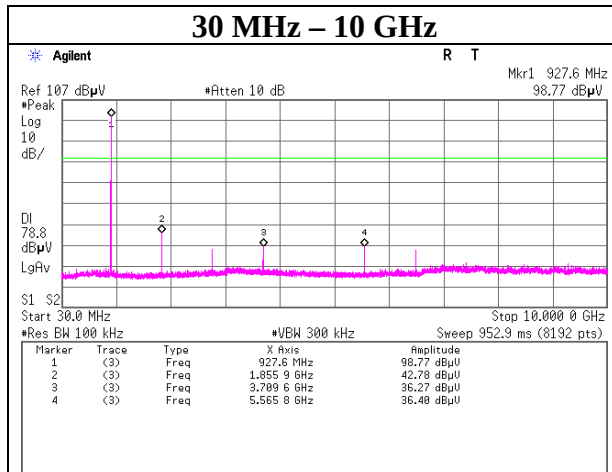
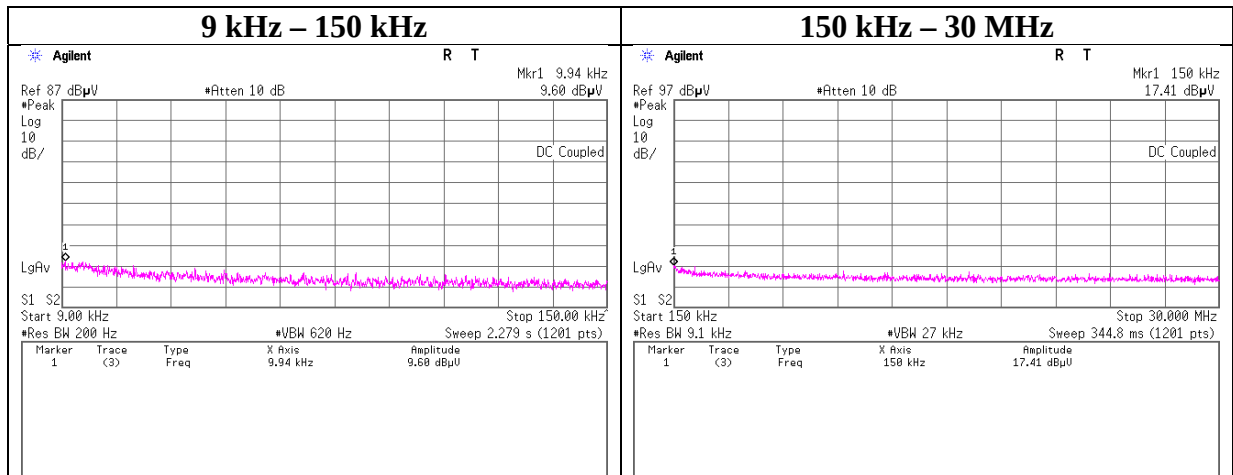
915.00 MHz



Conducted Spurious Emission

Report No.	13324451H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	April 23, 2020
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Ken Fujita
Mode	Tx, Hopping Off

927.58 MHz



UL Japan, Inc.

Ise EMC Lab.

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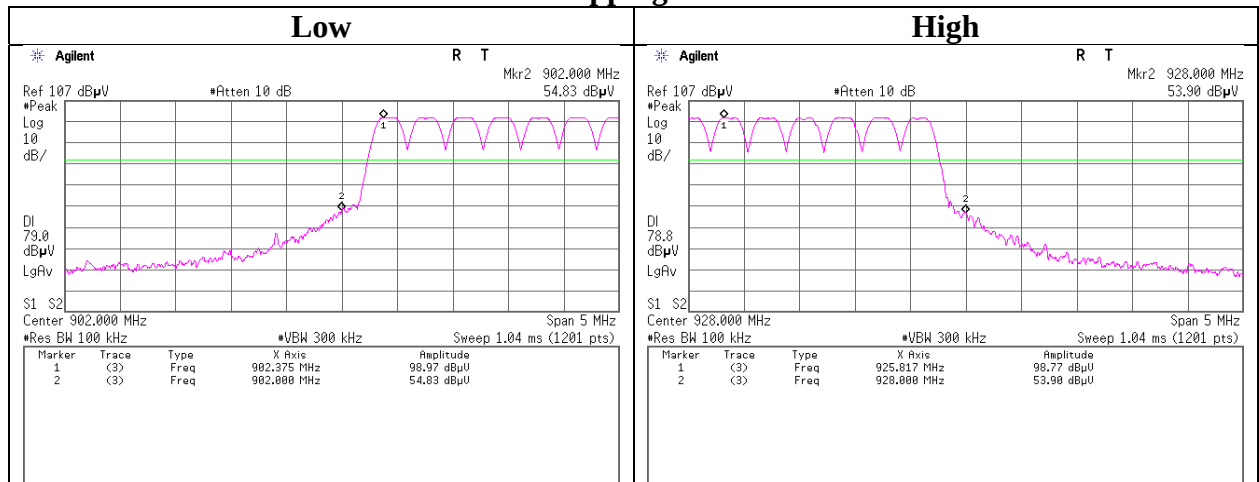
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

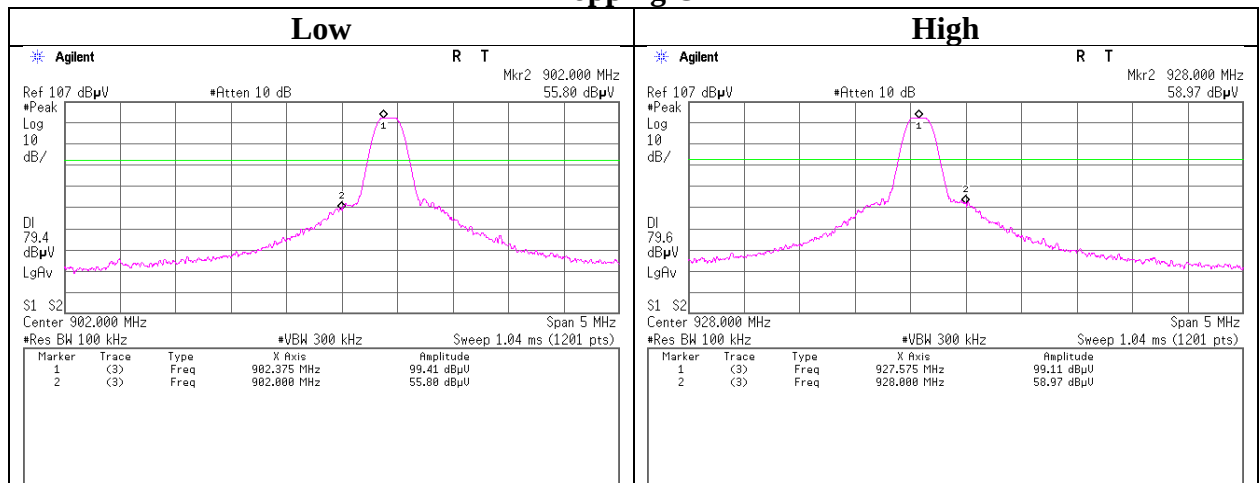
Conducted Emission Band Edge compliance

Report No.	13324451H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	April 23, 2020
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Ken Fujita
Mode	Tx, Hopping On, Tx, Hopping Off

Hopping On



Hopping Off



UL Japan, Inc.

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Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MLA-21	141265	Logperiodic Antenna(200-1000MHz)	Schwarzbeck Mess - Elektronik	VUSLP9111B	9111B-190	08/23/2019	12
RE	MBA-08	141427	Biconical Antenna	Schwarzbeck Mess - Elektronik	VHA9103B+BBA9106	8031	08/23/2019	12
RE	MSA-03	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	03/04/2020	12
RE	MPA-09	141578	Pre Amplifier	Keysight Technologies Inc	8447D	2944A10845	09/06/2019	12
RE	MCC-12	141317	Coaxial Cable	Fujikura/Agilent	-	-	09/03/2019	12
RE	MPA-10	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	01/07/2020	12
RE	MCC-216	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 537073/126E(5 m)	02/18/2020	12
RE	MHF-27	141297	High Pass Filter(1.1-10GHz)	TOKYO KEIKI	TF219CD1	1001	01/09/2020	12
RE	MHA-06	141512	Horn Antenna 1-18GHz	Schwarzbeck Mess - Elektronik	BBHA9120D	254	09/03/2019	12
RE	MAEC-02	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	06/29/2018	24
RE	MOS-41	192300	Thermo-Hygrometer	CUSTOM	CTH-201	0013	12/19/2019	12
RE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/20/2019	12
RE	MJM-27	142228	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-02-SVSWR	142006	AC2_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/01/2019	24
AT	MOS-17	141563	Thermo-Hygrometer	TFA	CTH-180	1005	01/07/2020	12
AT	MMM-11	141546	Digital HiTESTER	Hioki	3805	60100600	05/07/2020	12
AT	MJM-28	142229	Measure	KOMELON	KMC-36	-	-	-
AT	MRENT-130	141855	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187750	11/19/2019	12
AT	MPM-13	141810	Power Meter	ANRITSU	ML2495A	824014	10/09/2019	12
AT	MPSE-18	141832	Power sensor	ANRITSU	MA2411B	738174	10/09/2019	12
AT	MCC-212	141391	Microwave Cable	RS Pro	R-132G7210200CD	-	04/13/2020	12
AT	MAT-17	141171	Attenuator(20dB)_DC-1GHz_N	Weinschel Corp	MODEL 1	BG0143	12/09/2019	12
AT	MSA-14	141901	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY48250080	10/06/2019	12
AT	MPM-12	141809	Power Meter	ANRITSU	ML2495A	825002	05/07/2020	12
AT	MPSE-17	141830	Power sensor	ANRITSU	MA2411B	738285	05/07/2020	12
AT	MOS-14	141561	Thermo-Hygrometer	CUSTOM	CTH-201	1401	01/07/2020	12
AT	MMM-12	141547	DIGITAL HiTESTER	Hioki	3805	60500120	02/03/2020	12
AT	MSA-15	141902	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187105	10/09/2019	12
AT	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/20/2019	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:

RE: Radiated Emission test

AT: Antenna Terminal Conducted test

UL Japan, Inc.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124