RADIO TEST REPORT

Test Report No. : 13294722S-B-R1

Applicant	:	**JVCKENWOOD Corporation**
Type of EUT	:	**GPS NAVIGATION SYSTEM**
Model Number of EUT	:	**DNR1007XR**
FCC ID	:	**IOMJ5240**
Test regulation	:	**FCC Part 15 Subpart C: 2020** ***Wireless LAN part**
Test Result	:	**Complied (Refer to SECTION 3.2)**

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7. The all test items in this test report are conducted by UL Japan, Inc. Shonan 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.
10. This report is a revised version of 13294722S-B. 13294722S-B is replaced with this report.

Date of test: April 1 to 16, 2020

Representative test engineer: T. Kawakami

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☒ There is no testing item of "Non-accreditation".

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REVISION HISTORY

Original Test Report No.: 13294722S-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13294722S-B	May 25, 2020	-	-
1	13294722S-B-R1	June 1, 2020	P.6	Correction of "Clock frequency in the system (Maximum)" from: 6.2208 GHz to: 5.0 GHz

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	:	JVCKENWOOD Corporation
Address	:	2967-3, Ishikawa-machi, Hachioji, Tokyo 192-8525 Japan
Telephone Number	:	+81-42-646-5525
Facsimile Number	:	+81-42-646-1440
Contact Person	:	Seigo Tsutsumi

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 of Equipment	:	GPS NAVIGATION SYSTEM
Model No.	:	DNR1007XR
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 12 V
Receipt Date of Sample (Information from test lab.)	:	April 1, 2020
Country of Mass-production	:	Indonesia
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab.

2.2 Product Description

Model: DNR1007XR (referred to as the EUT in this report) is a GPS NAVIGATION SYSTEM.

There are three variant models DMX1057XR, DMX1037S, KW-Z1000W.
These models are identical except for the presence of Volume type, Navigation function, SD card, Preout level, and these differences do not affect the radio.

Radio Specification

Type of radio	Bluetooth (BR/EDR)	IEEE802.11b	IEEE802.11g	IEEE802.11a	IEEE802.11n (20 MHz BW)	IEEE802.11n (40 MHz BW)	IEEE802.11ac
Frequency of operation	2402 MHz - 2480 MHz	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz	5745 MHz - 5805 MHz	2412 MHz - 2462 MHz 5745 MHz - 5805 MHz	5755 MHz - 5795 MHz	5745 MHz-5805 MHz (20 MHz BW) 5755 MHz-5795 MHz (40 MHz BW) 5775 MHz (80 MHz BW)
Type of modulation	FHSS	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)			OFDM (256QAM, 16QAM, QPSK, BPSK)
Channel spacing	1 MHz	5 MHz		20 MHz	2.4 GHz band 5 MHz 5 GHz band 20 MHz	40 MHz	20 MHz (20 MHz BW) 40 MHz (40 MHz BW) 80 MHz (80 MHz BW)

Antenna type	Internal Antenna (Chip Antenna)
Antenna Gain	Antenna 0 (ANT-0) : -1.6 dBi (2.4 GHz Wireless LAN only), -3.5 dBi (5 GHz) Antenna 1 (ANT-1) : -5.7 dBi (2.4 GHz Bluetooth only), -3.6 dBi (5 GHz),
Power Supply (radio art input)	DC 3.6 V/ 3.3 V/1.8 V
Clock frequency (Maximum)	37.4 MHz
Clock frequency in the system (Maximum)	5.0 GHz

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on April 1, 2020 and effective June 1, 2020 except 15.258
* The revision does not affect the test result conducted before its effective date.

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

* 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	**FCC:** Section 15.207	N/A	N/A *1)	-
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
6 dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(a)(2)	See data.	Complied a)	Conducted
	ISED: -	**ISED:** RSS-247 5.2(a)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(b)(3)		Complied b)	Conducted
	ISED: RSS-Gen 6.12	**ISED:** RSS-247 5.4(d)			
Power Density	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(e)		Complied c)	Conducted
	ISED: -	**ISED:** RSS-247 5.2(b)			
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	4.5 dB 2483.500 MHz, AV, Vert. Mode: Tx 11b 2462 MHz	Complied# d), e)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)
	ISED: RSS-Gen 6.13	**ISED:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

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.
*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6.

a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)
b) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
c) Refer to APPENDIX 1 (data of Power Density)
d) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
e) 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)
The EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage.
Instead of a new battery, DC power supply was used for the test. That does not affect the test result, 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:** -	N/A	- a)	Conducted
a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)					

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 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.

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4,5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.5 dB	2.6 dB
Radiated emission	9 kHz-30 MHz	3.0 dB	3.0 dB	3.0 dB	-
(Measurement distance: 3 m)	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.0 dB	-
	1 GHz-6 GHz	4.9 dB	4.9 dB	4.9 dB	-
	6 GHz-18 GHz	5.5 dB	5.5 dB	5.5 dB	-
	18 GHz-40 GHz	5.4 dB	5.4 dB	5.4 dB	-
Radiated emission	1 GHz-18 GHz	5.8 dB	5.8 dB	5.8 dB	-
(Measurement distance: 1 m)	18 GHz-40 GHz	5.7 dB	5.7 dB	5.7 dB	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.98 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.75 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.12 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.06 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.24 dB
Spurious emission (Conducted) below 1GHz	0.9 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.9 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.9 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.0 dB
Bandwidth Measurement	0.07 %
Duty cycle and Time Measurement	0.262 %

3.5 Test Location

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A2LA Certificate Number: 1266.03 (FCC Test Firm Registration Number: 626366, ISED Lab Company Number: 2973D)

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	2.55 x 4.1 x 2.5	-	-

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)

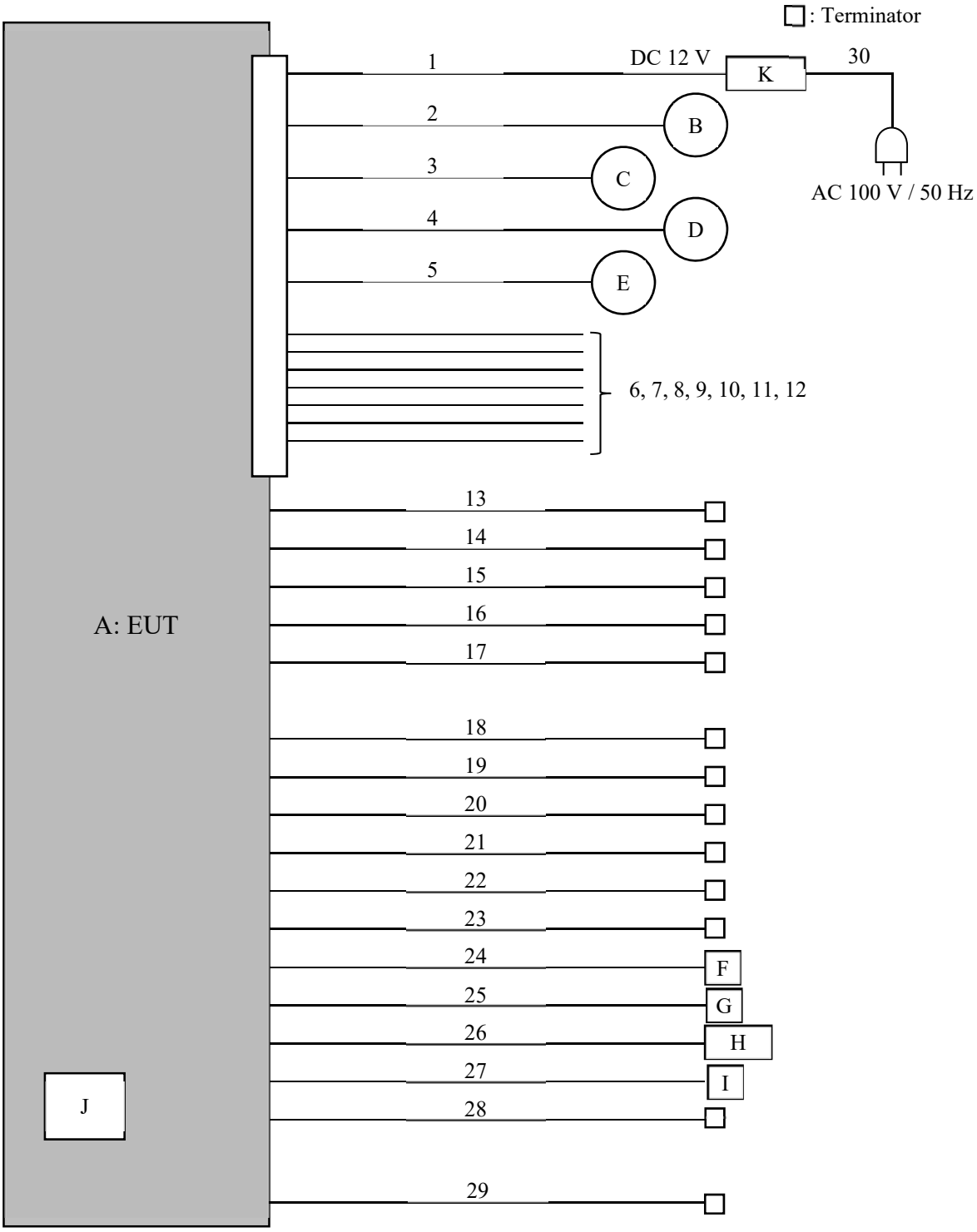
Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - " of TCB Council Workshop October 2009 and also was judged the necessity of 802.11ac mode by the pre-test.

Mode	Remarks*
IEEE 802.11b (11b)	1 Mbps, PN9
IEEE 802.11g (11g)	48 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 5, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: Fixed Software: Syscom : 0.1.0403.1000 Panel CPU : 1.0.0209.3100 SoC : 0.0.2303.1000 (Date: 2020.4.1, 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.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested Antenna	Tested frequency
6 dB Bandwidth Maximum Peak Output Power Power Density 99 % Occupied Bandwidth Spurious Emission (Radiated)	11b Tx 11g Tx 11n-20 Tx	ANT-0	2412 MHz 2437 MHz 2462 MHz
Spurious Emission (Conducted)	11n-20 Tx	ANT-0	2412 MHz

4.2 Configuration and peripherals



* 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	GPS NAVIGATION SYSTEM	DNX1007XR	PK-X0035 *1) PK-X0020 *2)	JVCKENWOOD	EUT
B	Speaker Dummy	-	-	-	-
C	Speaker Dummy	-	-	-	-
D	Speaker Dummy	-	-	-	-
E	Speaker Dummy	-	-	-	-
F	GPS ANTENNA	T9A-0070-00	-	JVCKENWOOD	-
G	USB Memory	JetFlash 128MB	-	Transcend	-
H	Microphone	T9B-0066-00	-	JVCKENWOOD	-
I	iPhone 7	A1779	F71WF850HG81	Apple Inc.	-
J	MicroSDHC Card	4GB	-	TDK	-
K	DC Power Supply	PAN35-10A	DE001677	KIKUSUI	-

*1) Used for Antenna Terminal conducted test
*2) Used for Conducted Emission test and Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC (ACC, B+, GND)	1.5 + 1.5	Unshielded	Unshielded	-
2	Speaker (Front-L) +/-	1.5	Unshielded	Unshielded	-
3	Speaker (Front-R) +/-	1.5	Unshielded	Unshielded	-
4	Speaker (Rear-L) +/-	1.5	Unshielded	Unshielded	-
5	Speaker (Rear-R) +/-	1.5	Unshielded	Unshielded	-
6	ANT. CONT	0.1 + 1.0	Unshielded	Unshielded	-
7	ILLUMI	0.1 + 1.0	Unshielded	Unshielded	-
8	P-CONT	0.1 + 1.0	Unshielded	Unshielded	-
9	REMOTE CONT	0.1 + 1.0	Unshielded	Unshielded	-
10	MUTE	0.1 + 1.0	Unshielded	Unshielded	-
11	REVERSE	5.5	Unshielded	Unshielded	-
12	PRK SW	2.0	Unshielded	Unshielded	-
13	VIDEO IN	0.2 + 1.5	Shielded	Shielded	-
14	VIDEO OUT	0.2 + 1.8	Shielded	Shielded	-
15	FRONT View CAM/DASH CAM	0.1 + 1.0	Shielded	Shielded	-
16	REAR VIEW CAMERA	0.1 + 1.0	Shielded	Shielded	-
17	3rd VIEW CAMERA	0.1 + 1.0	Shielded	Shielded	-
18	Front Preout	1.0	Shielded	Shielded	-
19	Rear Preout	1.0	Shielded	Shielded	-
20	Subwoofer Preout	1.2	Shielded	Shielded	-
21	AV OUT(Audio)	1.5	Shielded	Shielded	-
22	AV IN(Audio)	1.5	Shielded	Shielded	-
23	FM/AM ANT	0.1 + 2.0	Shielded	Shielded	-
24	GPS	3.5	Shielded	Shielded	-
25	USB	0.2 + 1.0	Shielded	Shielded	-
26	MIC	3.0	Shielded	Shielded	-
27	HDMI / Lightning	1.0 + 0.1	Shielded	Shielded	-
28	EXT I/F	1.0	Shielded	Shielded	-
29	iDATA I/F	1.0	Shielded	Shielded	-
30	AC	2.0	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "8.5 and 8.6 of KDB 558074 D01 15.247 Meas Guidance v05r02".

[For below 1 GHz]
EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 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.

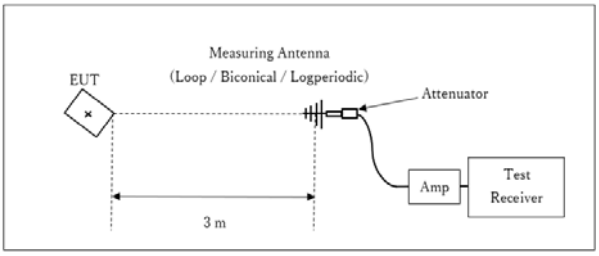
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	11.12.2.5.2 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (Linear voltage) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on ANSI C63.10-2013.

Figure 2: Test Setup

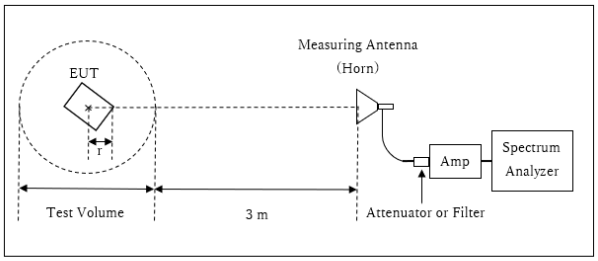
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 13 GHz

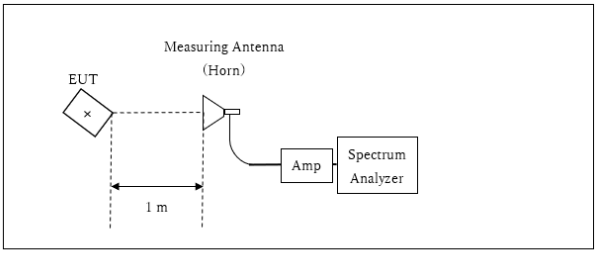


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.85 m / 3.0 m) = 2.17dB
* Test Distance: (3 + Test Volume /2) - r = 3.85 m

Test Volume : 2.0 m
(Test Volume has been calibrated based on CISPR 16-1-4.)
r = 0.15 m

13 GHz – 40 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.54 dB
*Test Distance: 1 m

- The carrier level and noise levels were confirmed at each position of 0 deg. and 30 deg. of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Antenna polarization	Carrier	Spurious (30 MHz - 1 GHz)	Spurious (1 GHz – 2.8 GHz)	Spurious (2.8 GHz – 13 GHz)	Spurious (13 GHz – 18 GHz)	Spurious (18 GHz – 26.5 GHz)	Spurious (26.5 GHz – 40 GHz)
Horizontal	0 deg.	30 deg.	0 deg.	30 deg.	0 deg.	0 deg.	0 deg.
Vertical	0 deg.	30 deg.	0 deg.	30 deg.	0 deg.	0 deg.	0 deg.

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

Measurement range : 30 MHz - 40 GHz
Test data : APPENDIX
Test result : Pass
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
6 dB Bandwidth	Enough width to display emission skirts	100 kHz	300 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: 160 MHz BW)
Peak Power Density	1.5 times the 6 dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4) *5)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".
*4) 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 not detected as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)
*5) 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 Ohmes. 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

6 dB Bandwidth and 99 % Occupied Bandwidth

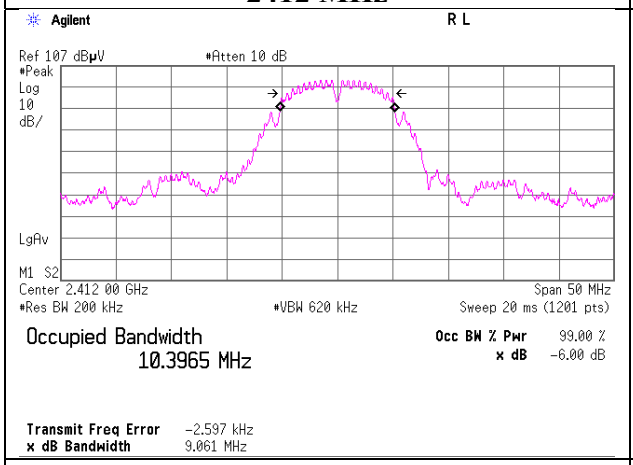
Report No.	13294722S-B-R1	
Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	April 7, 2020	April 15, 2020
Temperature / Humidity	24 deg. C / 30 % RH	22 deg. C / 31 % RH
Engineer	Hiromasa Sato	Shiro Kobayashi
Mode	Tx	

Mode	Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
11b	2412	10396.5	8.557	> 0.5000
	2437	10409.7	8.586	> 0.5000
	2462	10398.5	8.578	> 0.5000
11g	2412	16945.7	16.473	> 0.5000
	2437	16940.6	16.470	> 0.5000
	2462	16931.3	16.473	> 0.5000
11n-20	2412	18101.0	17.753	> 0.5000
	2437	18093.1	17.753	> 0.5000
	2462	18103.6	17.759	> 0.5000

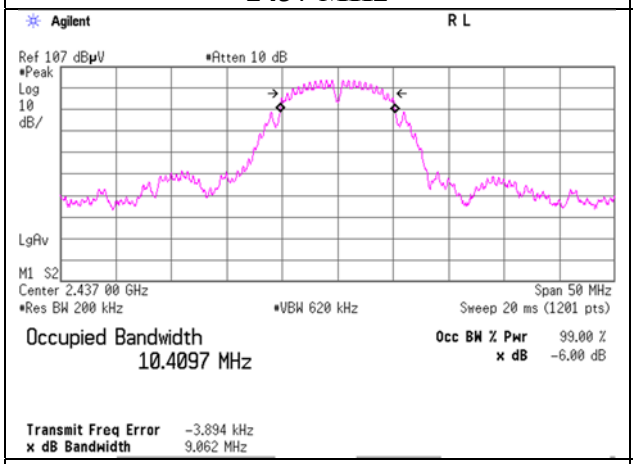
99 %Occupied Bandwidth

11b

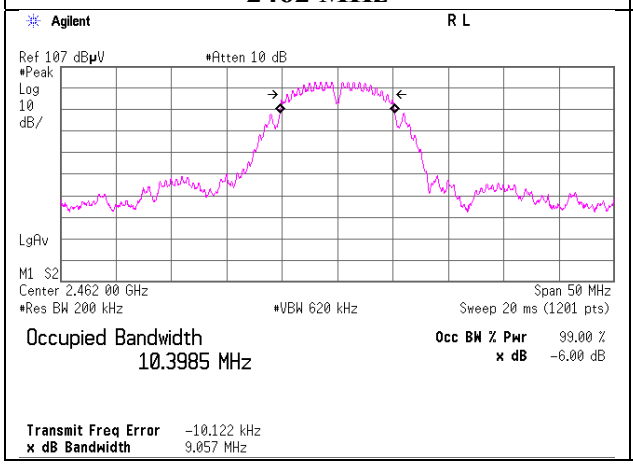
2412 MHz



2437 MHz

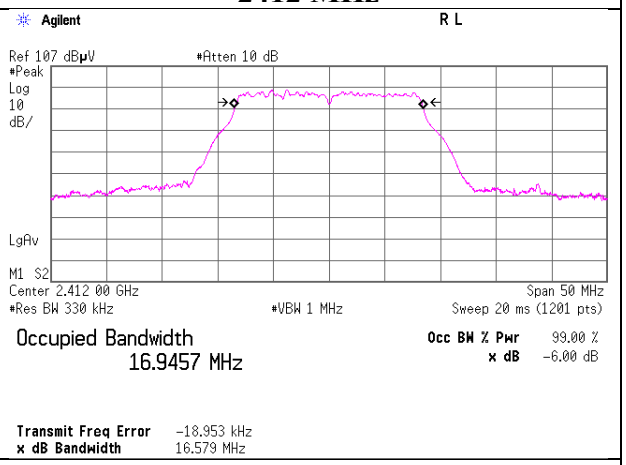


2462 MHz

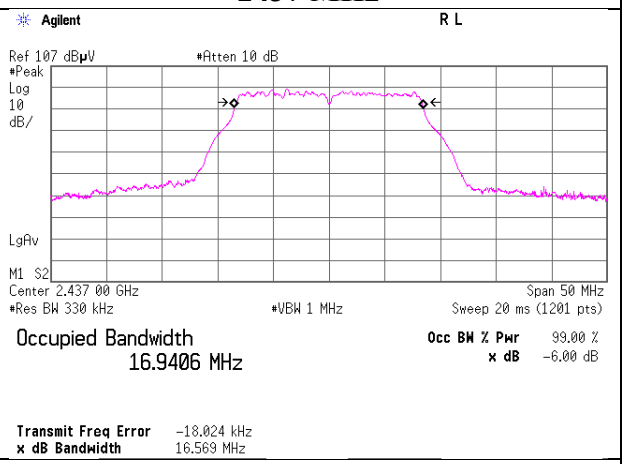


11g

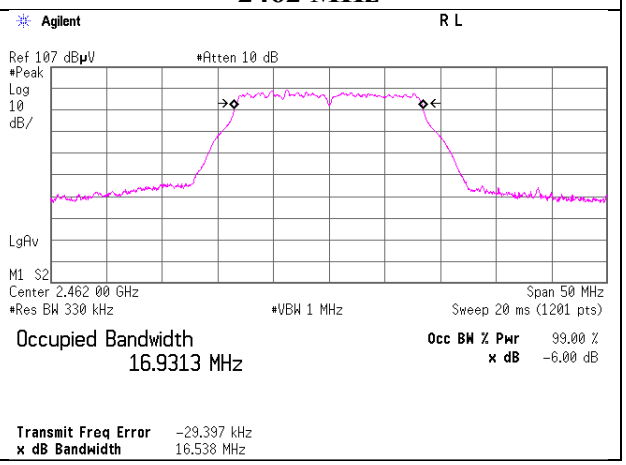
2412 MHz



2437 MHz



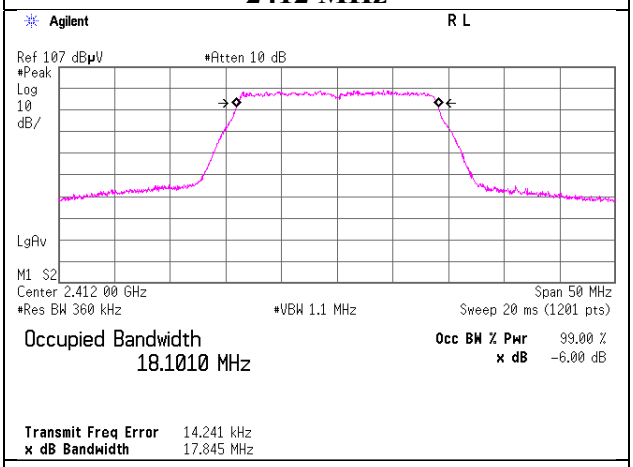
2462 MHz



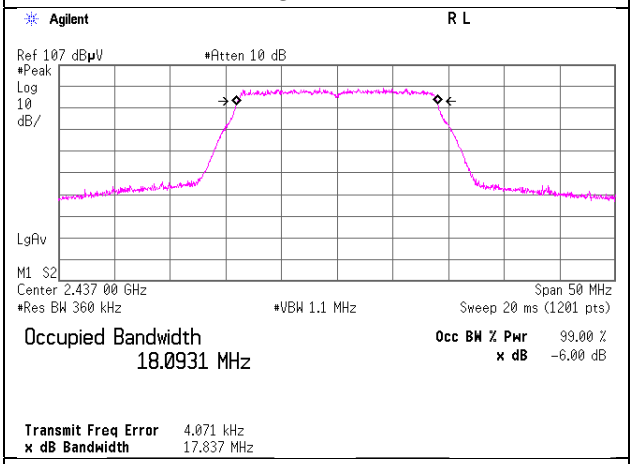
99 % Occupied Bandwidth

11n-20

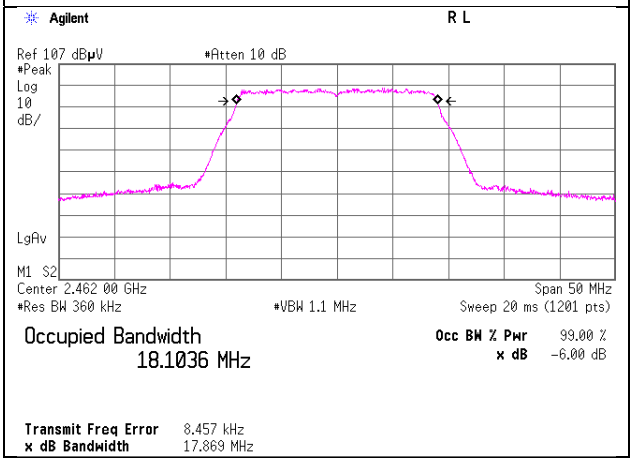
2412 MHz



2437 MHz



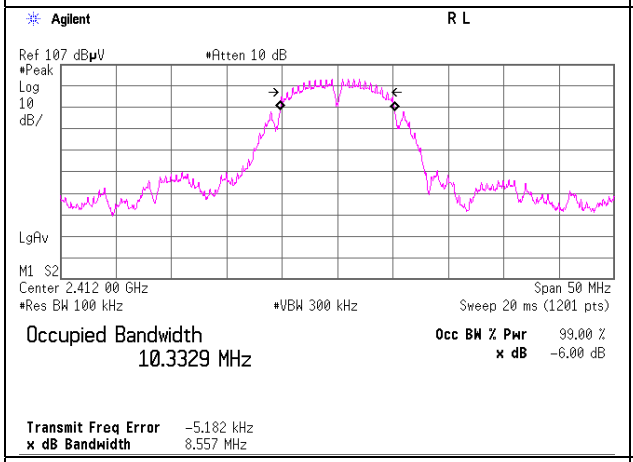
2462 MHz



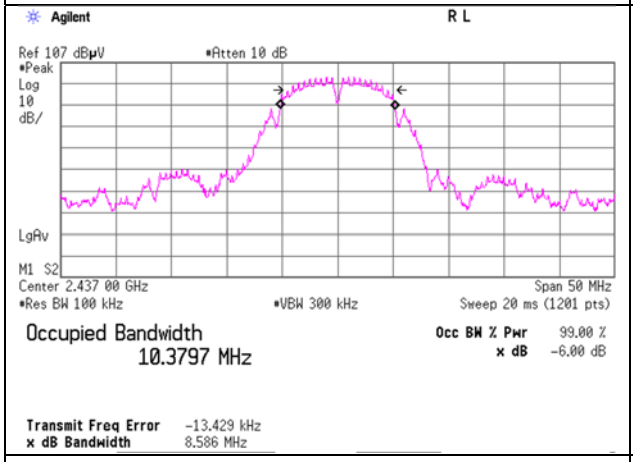
6 dB Bandwidth

11b

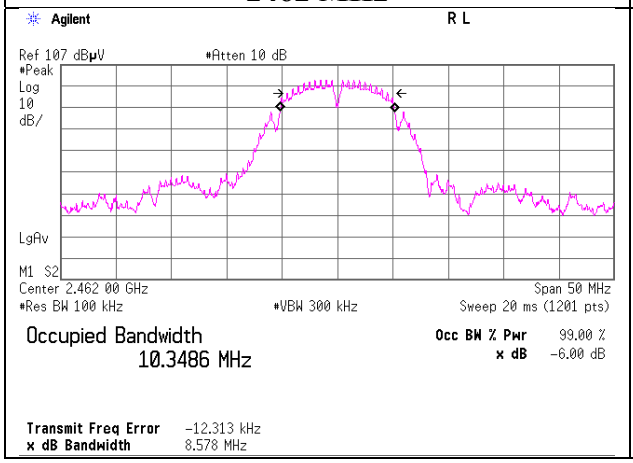
2412 MHz



2437 MHz

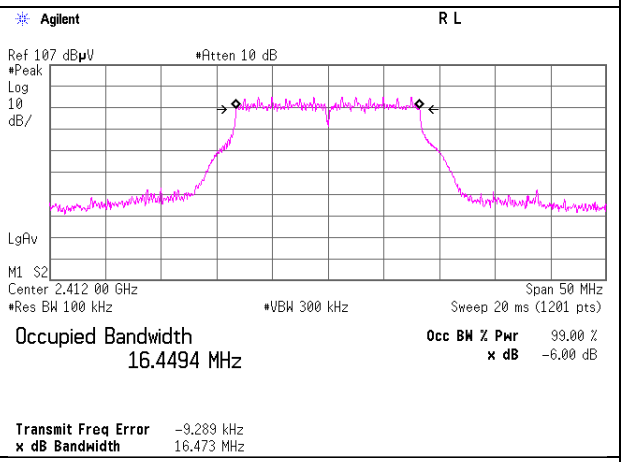


2462 MHz

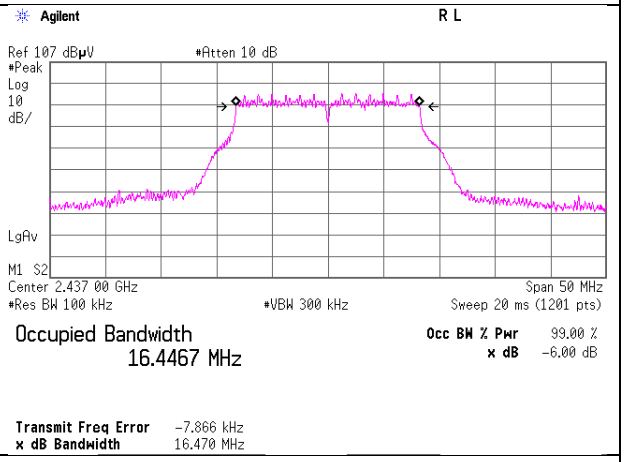


11g

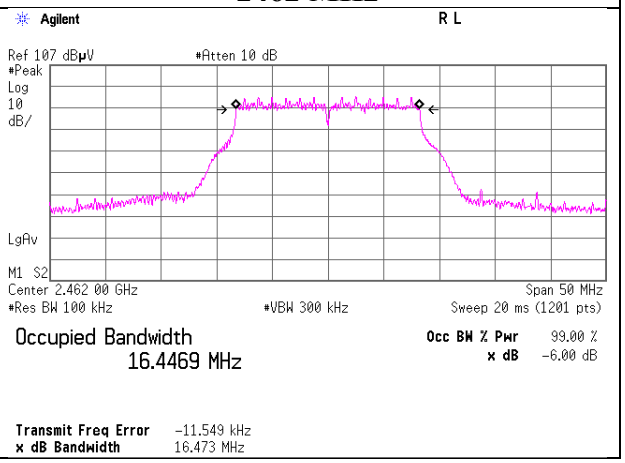
2412 MHz



2437 MHz



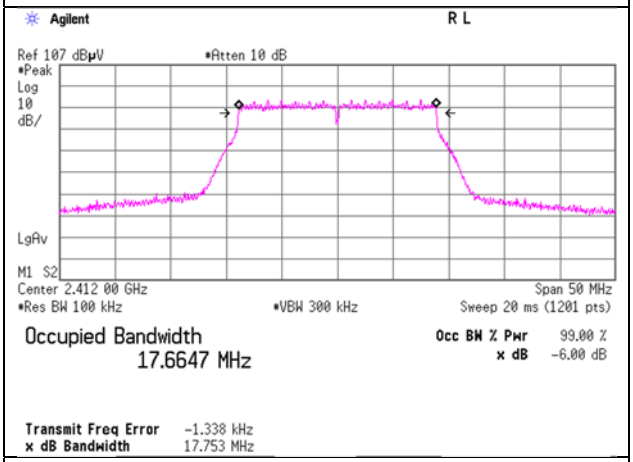
2462 MHz



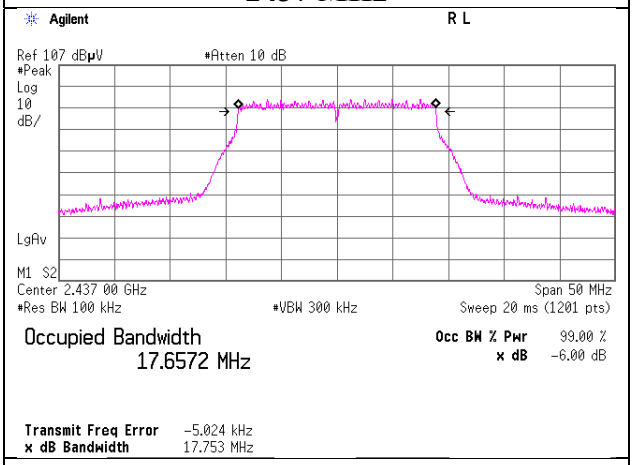
6dB Bandwidth

11n-20

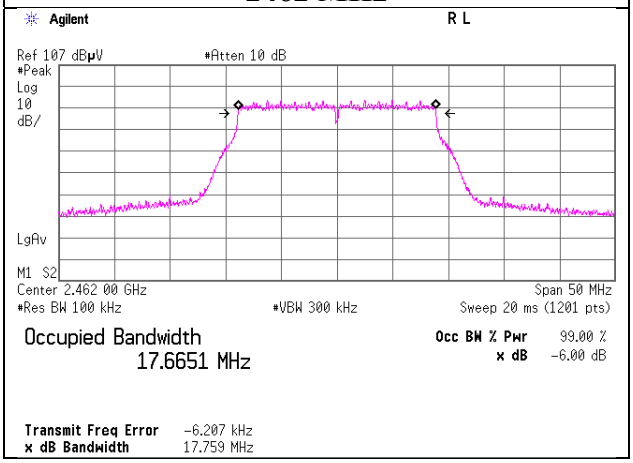
2412 MHz



2437 MHz



2462 MHz



Maximum Peak Output Power

Report No.	13294722S-B-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	April 1, 2020
Temperature / Humidity	21 deg. C / 40 % RH
Engineer	Yusuke Tanikawara
Mode	Tx 11b

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	5.06	1.66	9.63	16.35	43.15	30.00	1000	13.65	-1.60	14.75	29.85	36.02	4000	21.27
2437	5.11	1.66	9.63	16.40	43.65	30.00	1000	13.60	-1.60	14.80	30.20	36.02	4000	21.22
2462	4.39	1.66	9.63	15.68	36.98	30.00	1000	14.32	-1.60	14.08	25.59	36.02	4000	21.94

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + 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.

2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
1	5.11	*
2	4.71	
5.5	4.78	
11	5.02	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Report No.	13294722S-B-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	April 15, 2020
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Shiro Kobayashi
Mode	Tx 11g

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	8.64	1.66	9.63	19.93	98.40	30.00	1000	10.07	-1.60	18.33	68.08	36.02	4000	17.69
2437	8.37	1.66	9.63	19.66	92.47	30.00	1000	10.34	-1.60	18.06	63.97	36.02	4000	17.96
2462	8.32	1.66	9.63	19.61	91.41	30.00	1000	10.39	-1.60	18.01	63.24	36.02	4000	18.01

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + 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.

2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	4.88	
9	4.26	
12	6.26	
18	6.31	
24	6.62	
36	6.89	
48	8.37	*
54	6.37	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Report No.	13294722S-B-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	April 15, 2020
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Shiro Kobayashi
Mode	Tx 11n-20

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	8.02	1.66	9.63	19.31	85.31	30.00	1000	10.69	-1.60	17.71	59.02	36.02	4000	18.31
2437	8.29	1.66	9.63	19.58	90.78	30.00	1000	10.42	-1.60	17.98	62.81	36.02	4000	18.04
2462	7.80	1.66	9.63	19.09	81.10	30.00	1000	10.91	-1.60	17.49	56.10	36.02	4000	18.53

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + 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.

2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
0	3.62	
1	3.94	
2	4.11	
3	7.12	
4	6.59	
5	8.29	*
6	7.60	
7	7.40	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Average Output Power
(Reference data for RF Exposure)

Report No.	13294722S-B-R1	
Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	April 1, 2020	April 15, 2020
Temperature / Humidity	21 deg. C / 40 % RH	22 deg. C / 31 % RH
Engineer	Yusuke Tanikawara	Shiro Kobayashi
Mode	Tx	

11b **1 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	1.43	1.66	9.63	12.72	18.71	0.04	12.76	18.88
2437	1.33	1.66	9.63	12.62	18.28	0.04	12.66	18.45
2462	0.72	1.66	9.63	12.01	15.89	0.04	12.05	16.03

11g **6 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-6.35	1.66	9.63	4.94	3.12	0.28	5.22	3.33
2437	-6.39	1.66	9.63	4.90	3.09	0.28	5.18	3.30
2462	-7.02	1.66	9.63	4.27	2.67	0.28	4.55	2.85

11n-20 **MCS 0**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-8.24	1.66	9.63	3.05	2.02	0.31	3.36	2.17
2437	-8.42	1.66	9.63	2.87	1.94	0.31	3.18	2.08
2462	-10.03	1.66	9.63	1.26	1.34	0.31	1.57	1.44

Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + 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.

The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

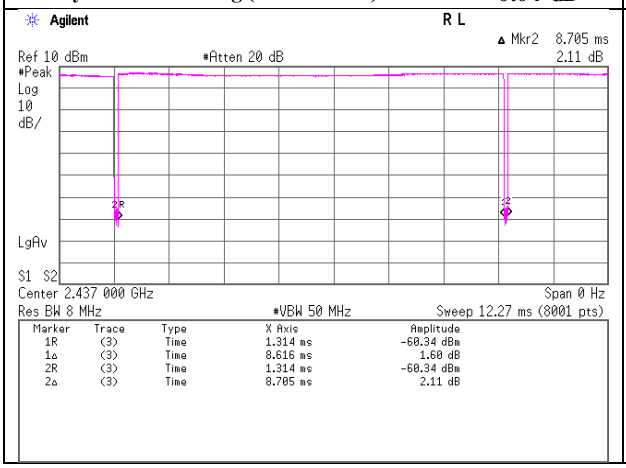
Burst rate confirmation

Report No.	13294722S-B-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	April 1, 2020
Temperature / Humidity	21 deg. C / 40 % RH
Engineer	Yusuke Tanikawara
Mode	Tx

Lowest Rate

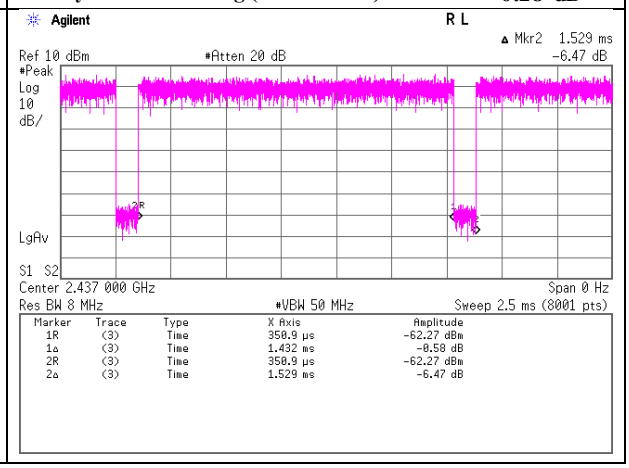
11b 1 Mbps

Tx on / (Tx on + Tx off) =	0.990
Tx on / (Tx on + Tx off) * 100 =	99.0 %
Duty factor = 10 * log (8.705 / 8.616) =	0.04 dB



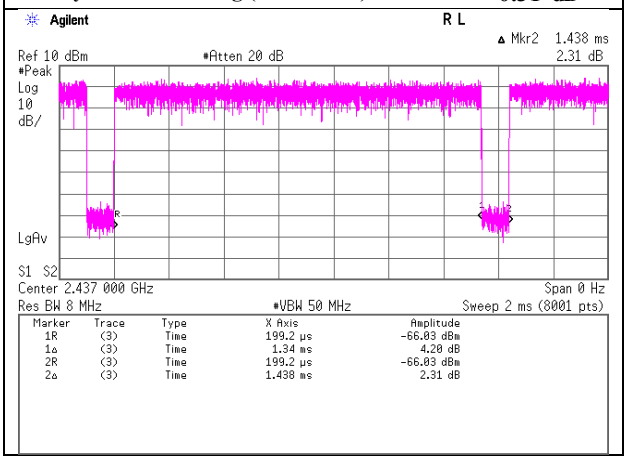
11g 6 Mbps

Tx on / (Tx on + Tx off) =	0.937
Tx on / (Tx on + Tx off) * 100 =	93.7 %
Duty factor = 10 * log (1.529 / 1.432) =	0.28 dB



11n-20 MCS 0

Tx on / (Tx on + Tx off) =	0.932
Tx on / (Tx on + Tx off) * 100 =	93.2 %
Duty factor = 10 * log (1.438 / 1.34) =	0.31 dB



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

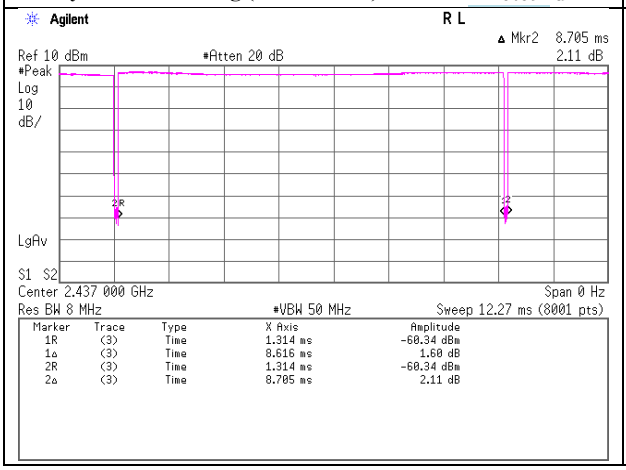
Burst rate confirmation

Report No.	13294722S-B-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	April 1, 2020
Temperature / Humidity	21 deg. C / 40 % RH
Engineer	Yusuke Tanikawara
Mode	Tx

Worst Rate

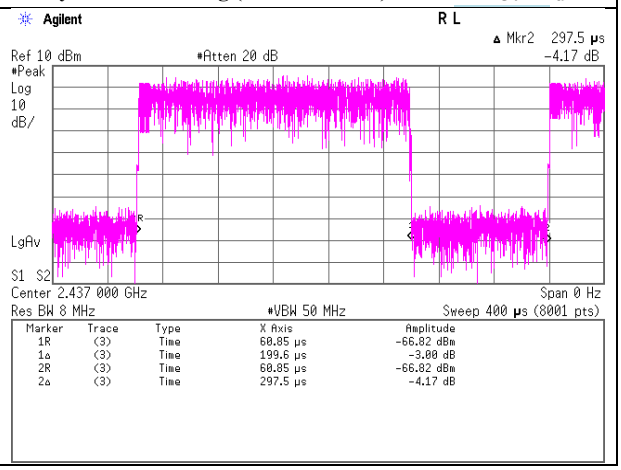
11b 1 Mbps

Tx on / (Tx on + Tx off) =	0.990
Tx on / (Tx on + Tx off) * 100 =	99.0 %
Duty factor = 10 * log (8.705 / 8.616) =	0.04 dB
Duty factor = 20 * log (8.705 / 8.616) =	0.09 dB



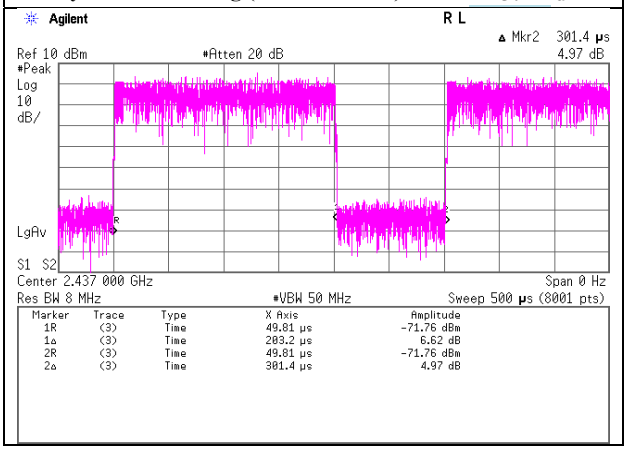
11g 48 Mbps

Tx on / (Tx on + Tx off) =	0.671
Tx on / (Tx on + Tx off) * 100 =	67.1 %
Duty factor = 10 * log (0.2975 / 0.1996) =	1.73 dB
Duty factor = 20 * log (0.2975 / 0.1996) =	3.47 dB



11n-20 MCS 5

Tx on / (Tx on + Tx off) =	0.674
Tx on / (Tx on + Tx off) * 100 =	67.4 %
Duty factor = 10 * log (0.3014 / 0.2032) =	1.71 dB
Duty factor = 20 * log (0.3014 / 0.2032) =	3.42 dB



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

Radiated Spurious Emission

Report No.	13294722S-B-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.1	No.1	No.1	No.1
Date	April 1, 2020	April 2, 2020	April 2, 2020	April 4, 2020
Temperature / Humidity	22 deg. C / 50 % RH	20 deg. C / 55 % RH	20 deg. C / 55 % RH	21 deg. C / 41 % RH
Engineer	Makoto Hosaka (1 GHz - 2.8 GHz)	Kazuya Noda (2.8 GHz - 13 GHz)	Makoto Hosaka (13 GHz - 18 GHz)	Toshinori Yamada (18 GHz - 40 GHz)
Mode	Tx 11b 2412 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2386.852	PK	49.11	28.32	14.37	39.59	2.17	54.38	73.9	19.5	285	166	
Hori.	2390.000	PK	48.78	28.31	14.38	39.59	2.17	54.05	73.9	19.8	285	166	
Hori.	4824.000	PK	45.33	31.61	6.85	39.75	2.17	46.21	73.9	27.6	105	212	
Hori.	7236.000	PK	45.98	37.17	8.48	39.55	2.17	54.25	73.9	19.6	166	144	
Hori.	9648.000	PK	45.68	38.68	10.00	39.62	2.17	56.91	73.9	16.9	150	0	Floor
Hori.	2386.852	AV	41.58	28.32	14.37	39.59	2.17	46.85	53.9	7.0	285	166	
Hori.	2390.000	AV	41.79	28.31	14.38	39.59	2.17	47.06	53.9	6.8	285	166	
Hori.	4824.000	AV	36.99	31.61	6.85	39.75	2.17	37.87	53.9	16.0	105	212	
Hori.	7236.000	AV	36.85	37.17	8.48	39.55	2.17	45.12	53.9	8.7	166	144	
Hori.	9648.000	AV	36.33	38.68	10.00	39.62	2.17	47.56	53.9	6.3	150	0	Floor
Vert.	2387.119	PK	50.73	28.32	14.38	39.59	2.17	56.01	73.9	17.8	227	181	
Vert.	2390.000	PK	50.61	28.31	14.38	39.59	2.17	55.88	73.9	18.0	227	181	
Vert.	4824.000	PK	45.85	31.61	6.85	39.75	2.17	46.73	73.9	27.1	176	170	
Vert.	7236.000	PK	45.43	37.17	8.48	39.55	2.17	53.70	73.9	20.2	139	130	
Vert.	9648.000	PK	46.47	38.68	10.00	39.62	2.17	57.70	73.9	16.2	150	0	Floor
Vert.	2387.119	AV	43.88	28.32	14.38	39.59	2.17	49.16	53.9	**4.7**	227	181	
Vert.	2390.000	AV	43.70	28.31	14.38	39.59	2.17	48.97	53.9	4.9	227	181	
Vert.	4824.000	AV	37.02	31.61	6.85	39.75	2.17	37.90	53.9	16.0	176	170	
Vert.	7236.000	AV	36.56	37.17	8.48	39.55	2.17	44.83	53.9	9.0	139	130	
Vert.	9648.000	AV	36.35	38.68	10.00	39.62	2.17	47.58	53.9	6.3	150	0	Floor

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

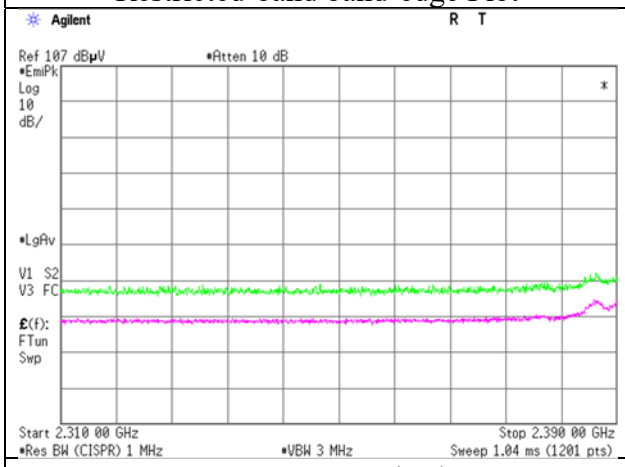
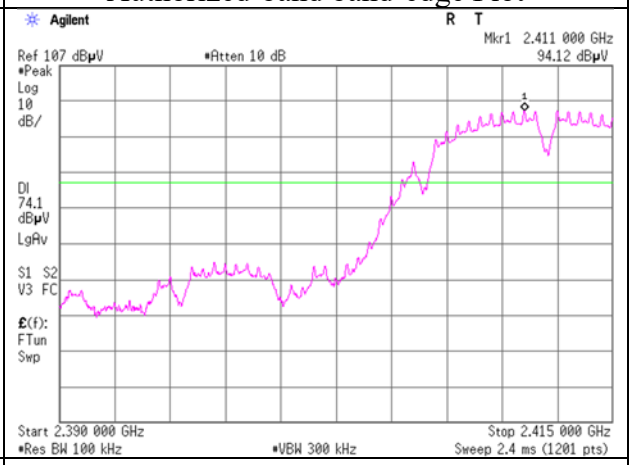
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

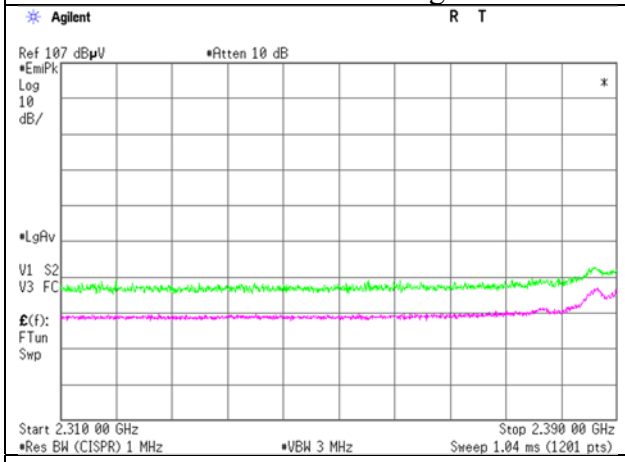
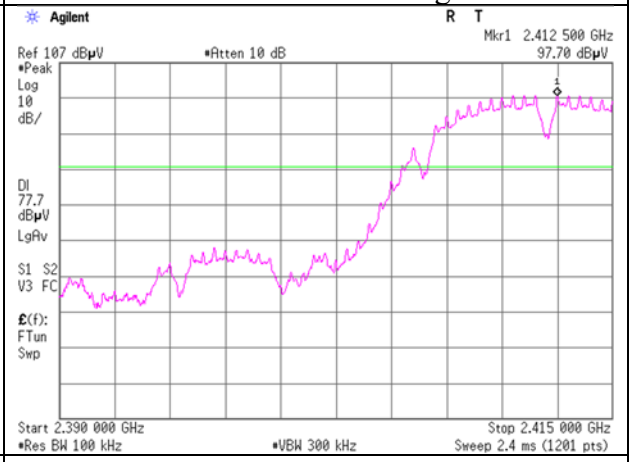
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	93.72	28.26	14.40	39.60	2.17	98.95	-	-	Carrier
Hori.	2398.265	PK	48.26	28.29	14.38	39.59	2.17	53.51	78.95	25.4	
Hori.	2400.000	PK	41.98	28.29	14.39	39.59	2.17	47.24	78.95	31.7	
Vert.	2412.000	PK	97.59	28.26	14.40	39.60	2.17	102.82	-	-	Carrier
Vert.	2398.303	PK	52.13	28.29	14.38	39.59	2.17	57.38	82.82	25.4	
Vert.	2400.000	PK	36.42	28.29	14.39	39.59	2.17	41.68	82.82	41.1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13294722S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.1
Date	April 1, 2020
Temperature / Humidity	22 deg. C / 50 % RH
Engineer	Makoto Hosaka
Mode	Tx 11b 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* 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.

Radiated Spurious Emission

Report No.	13294722S-B-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.1	No.1	No.1	No.1
Date	April 1, 2020	April 2, 2020	April 2, 2020	April 4, 2020
Temperature / Humidity	22 deg. C / 50 % RH	20 deg. C / 55 % RH	20 deg. C / 55 % RH	21 deg. C / 41 % RH
Engineer	Makoto Hosaka (1 GHz - 2.8 GHz)	Kazuya Noda (2.8 GHz - 13 GHz)	Makoto Hosaka (13 GHz - 18 GHz)	Toshinori Yamada (18 GHz - 40 GHz)
Mode	Tx 11b 2437 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	47.11	31.65	6.89	39.74	2.17	48.08	73.9	25.8	205	262	
Hori.	7311.000	PK	46.63	37.23	8.53	39.60	2.17	54.96	73.9	18.9	158	145	
Hori.	9748.000	PK	46.34	39.08	10.00	39.50	2.17	58.09	73.9	15.8	150	0	Floor
Hori.	4874.000	AV	36.03	31.65	6.89	39.74	2.17	37.00	53.9	16.9	205	262	
Hori.	7311.000	AV	35.69	37.23	8.53	39.60	2.17	44.02	53.9	9.8	158	145	
Hori.	9748.000	AV	35.62	39.08	10.00	39.50	2.17	47.37	53.9	6.5	150	0	Floor
Vert.	4499.987	PK	47.29	30.95	6.62	39.82	2.17	47.21	73.9	26.6	146	273	
Vert.	4874.000	PK	46.22	31.65	6.89	39.74	2.17	47.19	73.9	26.7	100	186	
Vert.	7311.000	PK	46.48	37.23	8.53	39.60	2.17	54.81	73.9	19.0	100	265	
Vert.	9748.000	PK	46.37	39.08	10.00	39.50	2.17	58.12	73.9	15.7	150	0	Floor
Vert.	4874.000	AV	36.82	31.65	6.89	39.74	2.17	37.79	53.9	16.1	100	186	
Vert.	7311.000	AV	35.85	37.23	8.53	39.60	2.17	44.18	53.9	9.7	100	265	
Vert.	9748.000	AV	35.82	39.08	10.00	39.50	2.17	47.57	53.9	**6.3**	150	0	Floor

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13294722S-B-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.1	No.1	No.1	No.1
Date	April 1, 2020	April 2, 2020	April 2, 2020	April 4, 2020
Temperature / Humidity	22 deg. C / 50 % RH	20 deg. C / 55 % RH	20 deg. C / 55 % RH	21 deg. C / 41 % RH
Engineer	Makoto Hosaka	Kazuya Noda	Makoto Hosaka	Toshinori Yamada
	(1 GHz - 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz - 18 GHz)	(18 GHz - 40 GHz)
Mode	Tx 11b 2462 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	48.64	28.16	14.48	39.62	2.17	53.83	73.9	20.0	283	163	
Hori.	4924.000	PK	46.75	31.73	6.92	39.73	2.17	47.84	73.9	26.0	196	262	
Hori.	7386.000	PK	46.13	37.32	8.58	39.64	2.17	54.56	73.9	19.3	158	129	
Hori.	9848.000	PK	46.28	39.22	10.02	39.37	2.17	58.32	73.9	15.5	150	0	Floor
Hori.	2483.500	AV	41.41	28.16	14.48	39.62	2.17	46.60	53.9	7.3	283	163	
Hori.	4924.000	AV	36.91	31.73	6.92	39.73	2.17	38.00	53.9	15.9	196	262	
Hori.	7386.000	AV	36.38	37.32	8.58	39.64	2.17	44.81	53.9	9.0	158	129	
Hori.	9848.000	AV	36.33	39.22	10.02	39.37	2.17	48.37	53.9	5.5	150	0	Floor
Vert.	2483.500	PK	51.23	28.16	14.48	39.62	2.17	56.42	73.9	17.4	255	180	
Vert.	4924.000	PK	46.16	31.73	6.92	39.73	2.17	47.25	73.9	26.6	170	156	
Vert.	7386.000	PK	46.32	37.32	8.58	39.64	2.17	54.75	73.9	19.1	150	191	
Vert.	9848.000	PK	46.25	39.22	10.02	39.37	2.17	58.29	73.9	15.6	150	0	Floor
Vert.	2483.500	AV	44.14	28.16	14.48	39.62	2.17	49.33	53.9	**4.5**	255	180	
Vert.	4924.000	AV	36.83	31.73	6.92	39.73	2.17	37.92	53.9	15.9	170	156	
Vert.	7386.000	AV	36.62	37.32	8.58	39.64	2.17	45.05	53.9	8.8	150	191	
Vert.	9848.000	AV	36.52	39.22	10.02	39.37	2.17	48.56	53.9	5.3	150	0	Floor

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB

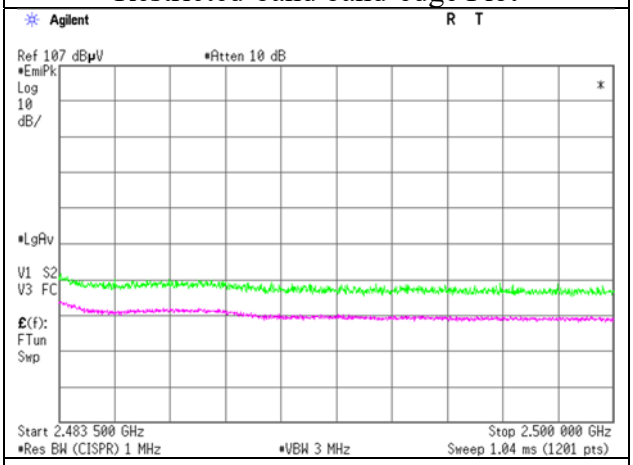
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13294722S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.1
Date	April 1, 2020
Temperature / Humidity	22 deg. C / 50 % RH
Engineer	Makoto Hosaka
Mode	Tx 11b 2462 MHz

Horizontal

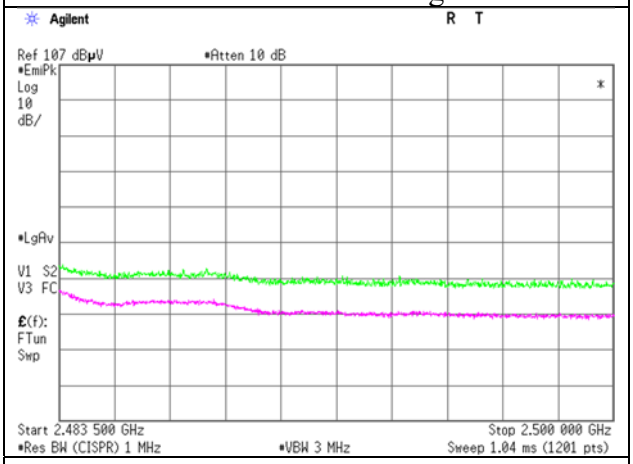
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* 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.

Radiated Spurious Emission

Report No.	13294722S-B-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.2	No.3
Date	April 16, 2020	April 17, 2020
Temperature / Humidity	24 deg. C / 41 % RH	22 deg. C / 30 % RH
Engineer	Takahiro Kawakami (1 GHz - 13 GHz)	Yusuke Tanikawara (13 GHz - 40 GHz)
Mode	Tx 11g 2412 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	49.10	28.51	14.01	41.66	2.17	52.13	73.9	21.7	110	300	
Hori.	4824.000	PK	47.80	31.71	6.36	42.93	2.17	45.11	73.9	28.7	150	0	Floor
Hori.	7236.000	PK	47.97	37.32	7.83	43.41	2.17	51.88	73.9	22.0	150	0	Floor
Hori.	9648.000	PK	47.78	38.93	9.06	43.10	2.17	54.84	73.9	19.0	150	0	Floor
Hori.	4824.000	AV	39.03	31.71	6.36	42.93	2.17	36.34	53.9	17.5	150	0	Floor
Hori.	7236.000	AV	39.33	37.32	7.83	43.41	2.17	43.24	53.9	10.6	150	0	Floor
Hori.	9648.000	AV	38.54	38.93	9.06	43.10	2.17	45.60	53.9	8.3	150	0	Floor
Vert.	2390.000	PK	49.63	28.51	14.01	41.66	2.17	52.66	73.9	21.2	219	167	
Vert.	4824.000	PK	48.62	31.71	6.36	42.93	2.17	45.93	73.9	27.9	150	0	Floor
Vert.	7236.000	PK	47.91	37.32	7.83	43.41	2.17	51.82	73.9	22.0	150	0	Floor
Vert.	9648.000	PK	47.89	38.93	9.06	43.10	2.17	54.95	73.9	18.9	150	0	Floor
Vert.	4824.000	AV	39.00	31.71	6.36	42.93	2.17	36.31	53.9	17.6	150	0	Floor
Vert.	7236.000	AV	39.21	37.32	7.83	43.41	2.17	43.12	53.9	10.7	150	0	Floor
Vert.	9648.000	AV	39.05	38.93	9.06	43.10	2.17	46.11	53.9	**7.7**	150	0	Floor

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	39.07	28.51	14.01	41.66	3.47	2.17	45.57	53.9	8.3	*1)
Vert.	2390.000	AV	39.31	28.51	14.01	41.66	3.47	2.17	45.81	53.9	8.0	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

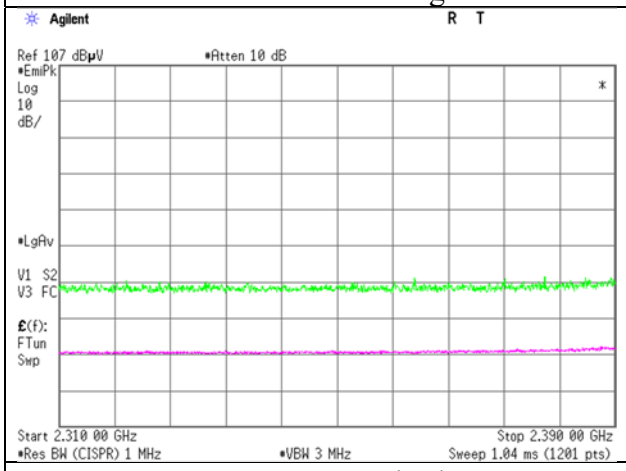
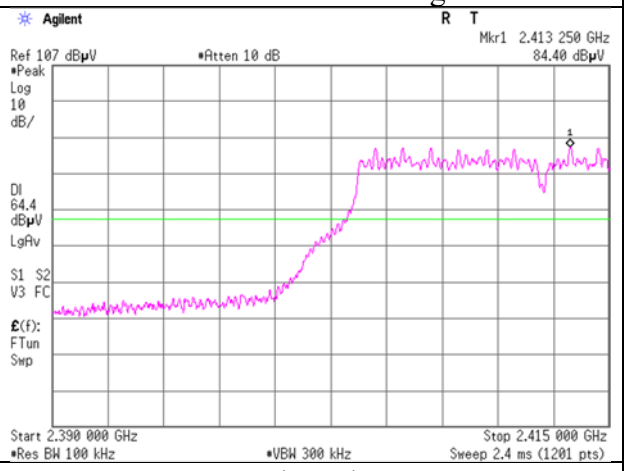
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

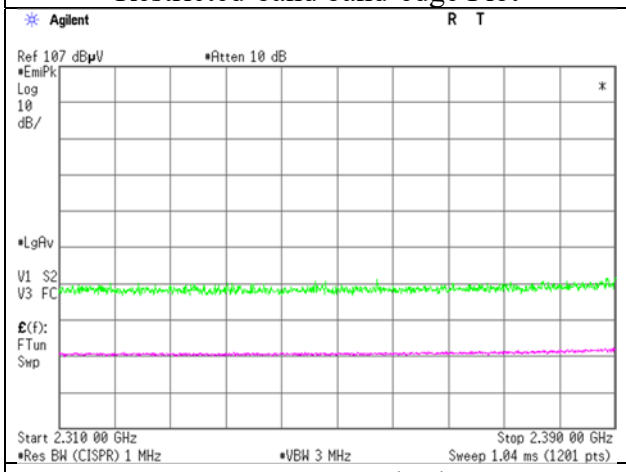
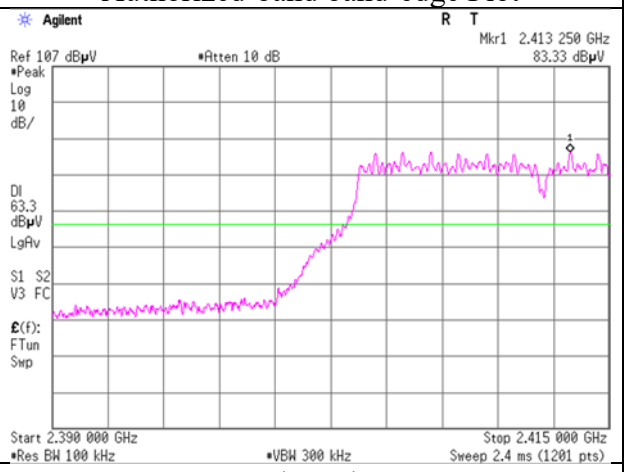
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	84.02	28.46	14.02	41.67	2.17	87.00	-	-	Carrier
Hori.	2400.000	PK	43.20	28.48	14.02	41.67	2.17	46.20	67.00	20.8	
Vert.	2412.000	PK	83.88	28.46	14.02	41.67	2.17	86.86	-	-	Carrier
Vert.	2400.000	PK	42.59	28.48	14.02	41.67	2.17	45.59	66.86	21.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13294722S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	April 16, 2020
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx 11g 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* 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.

Radiated Spurious Emission

Report No.	13294722S-B-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.2	No.3
Date	April 16, 2020	April 17, 2020
Temperature / Humidity	24 deg. C / 41 % RH	22 deg. C / 30 % RH
Engineer	Takahiro Kawakami (1 GHz - 13 GHz)	Yusuke Tanikawara (13 GHz - 40 GHz)
Mode	Tx 11g 2437 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	47.92	31.73	6.39	42.93	2.17	45.28	73.9	28.6	150	0	Floor
Hori.	7311.000	PK	48.68	37.40	7.86	43.48	2.17	52.63	73.9	21.2	150	0	Floor
Hori.	9748.000	PK	47.94	39.32	9.10	42.98	2.17	55.55	73.9	18.3	150	0	Floor
Hori.	4874.000	AV	38.78	31.73	6.39	42.93	2.17	36.14	53.9	17.7	150	0	Floor
Hori.	7311.000	AV	39.32	37.40	7.86	43.48	2.17	43.27	53.9	10.6	150	0	Floor
Hori.	9748.000	AV	38.82	39.32	9.10	42.98	2.17	46.43	53.9	7.4	150	0	Floor
Vert.	4874.000	PK	48.13	31.73	6.39	42.93	2.17	45.49	73.9	28.4	150	0	Floor
Vert.	7311.000	PK	48.22	37.40	7.86	43.48	2.17	52.17	73.9	21.7	150	0	Floor
Vert.	9748.000	PK	47.55	39.32	9.10	42.98	2.17	55.16	73.9	18.7	150	0	Floor
Vert.	4874.000	AV	38.83	31.73	6.39	42.93	2.17	36.19	53.9	17.7	150	0	Floor
Vert.	7311.000	AV	39.30	37.40	7.86	43.48	2.17	43.25	53.9	10.6	150	0	Floor
Vert.	9748.000	AV	39.03	39.32	9.10	42.98	2.17	46.64	53.9	**7.2**	150	0	Floor

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13294722S-B-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.2	No.3
Date	April 16, 2020	April 17, 2020
Temperature / Humidity	24 deg. C / 41 % RH	22 deg. C / 30 % RH
Engineer	Takahiro Kawakami (1 GHz - 13 GHz)	Yusuke Tanikawara (13 GHz - 40 GHz)
Mode	Tx 11g 2462 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	48.58	28.35	14.10	41.69	2.17	51.51	73.9	22.3	159	67	
Hori.	4924.000	PK	48.03	31.85	6.43	42.94	2.17	45.54	73.9	28.3	150	0	Floor
Hori.	7386.000	PK	48.42	37.51	7.93	43.55	2.17	52.48	73.9	21.4	150	0	Floor
Hori.	9848.000	PK	48.70	39.50	9.15	42.87	2.17	56.65	73.9	17.2	150	0	Floor
Hori.	4924.000	AV	38.96	31.85	6.43	42.94	2.17	36.47	53.9	17.4	150	0	Floor
Hori.	7386.000	AV	39.38	37.51	7.93	43.55	2.17	43.44	53.9	10.4	150	0	Floor
Hori.	9848.000	AV	39.32	39.50	9.15	42.87	2.17	47.27	53.9	**6.6**	150	0	Floor
Vert.	2483.500	PK	49.45	28.35	14.10	41.69	2.17	52.38	73.9	21.5	165	179	
Vert.	4924.000	PK	47.46	31.85	6.43	42.94	2.17	44.97	73.9	28.9	150	0	Floor
Vert.	7386.000	PK	48.00	37.51	7.93	43.55	2.17	52.06	73.9	21.8	150	0	Floor
Vert.	9848.000	PK	48.26	39.50	9.15	42.87	2.17	56.21	73.9	17.6	150	0	Floor
Vert.	4924.000	AV	39.17	31.85	6.43	42.94	2.17	36.68	53.9	17.2	150	0	Floor
Vert.	7386.000	AV	39.30	37.51	7.93	43.55	2.17	43.36	53.9	10.5	150	0	Floor
Vert.	9848.000	AV	39.26	39.50	9.15	42.87	2.17	47.21	53.9	**6.6**	150	0	Floor

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	38.77	28.35	14.10	41.69	3.47	2.17	45.17	53.9	8.7	*1)
Vert.	2483.500	AV	39.05	28.35	14.10	41.69	3.47	2.17	45.45	53.9	8.4	*1)

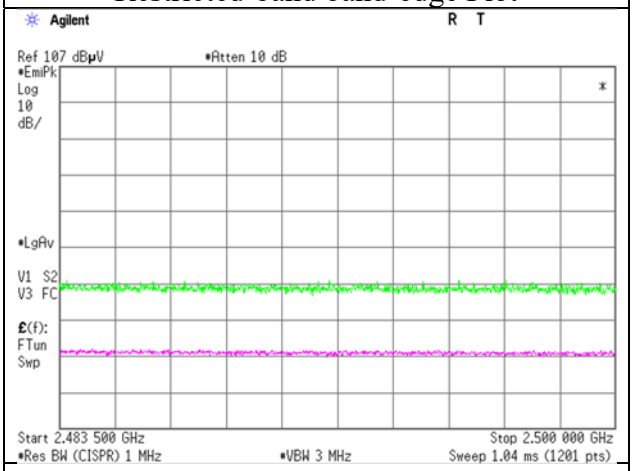
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13294722S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	April 16, 2020
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx 11g 2462 MHz

Horizontal

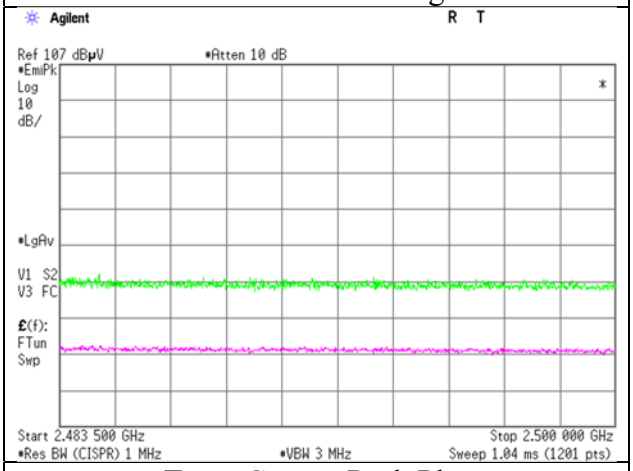
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* 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.

Radiated Spurious Emission

Report No.	13294722S-B-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.3
Date	April 15, 2020	April 16, 2020	April 17, 2020
Temperature / Humidity	22 deg. C / 39 % RH	24 deg. C / 41 % RH	22 deg. C / 30 % RH
Engineer	Takahiro Kawakami (30 MHz - 1 GHz)	Takahiro Kawakami (1 GHz - 13 GHz)	Yusuke Tanikawara (13 GHz - 40 GHz)
Mode	Tx 11n-20 2412 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	184.321	QP	38.90	16.13	8.93	31.77	0.00	32.19	43.5	11.3	174	29	
Hori.	368.638	QP	44.70	15.05	7.36	31.63	0.00	35.48	46.0	10.5	100	80	
Hori.	480.001	QP	41.10	17.24	7.99	31.61	0.00	34.72	46.0	11.2	100	357	
Hori.	503.807	QP	41.20	17.73	8.08	31.60	0.00	35.41	46.0	10.5	100	79	
Hori.	516.094	QP	43.20	17.68	8.14	31.62	0.00	37.40	46.0	8.6	100	70	
Hori.	528.400	QP	41.70	17.58	8.20	31.64	0.00	35.84	46.0	10.1	100	102	
Hori.	2390.000	PK	49.77	28.51	14.01	41.66	2.17	52.80	73.9	21.1	100	0	
Hori.	4824.000	PK	48.36	31.71	6.36	42.93	2.17	45.67	73.9	28.2	150	0	Floor
Hori.	7236.000	PK	48.48	37.32	7.83	43.41	2.17	52.39	73.9	21.5	150	0	Floor
Hori.	9648.000	PK	48.16	38.93	9.06	43.10	2.17	55.22	73.9	18.6	150	0	Floor
Hori.	4824.000	AV	39.03	31.71	6.36	42.93	2.17	36.34	53.9	17.5	150	0	Floor
Hori.	7236.000	AV	39.34	37.32	7.83	43.41	2.17	43.25	53.9	10.6	150	0	Floor
Hori.	9648.000	AV	38.65	38.93	9.06	43.10	2.17	45.71	53.9	8.1	150	0	Floor
Vert.	148.500	QP	37.80	14.77	8.70	31.80	0.00	29.47	43.5	14.0	100	116	
Vert.	368.637	QP	43.00	15.05	7.36	31.63	0.00	33.78	46.0	12.2	100	214	
Vert.	2390.000	PK	50.65	28.51	14.01	41.66	2.17	53.68	73.9	20.2	155	247	
Vert.	4824.000	PK	47.99	31.71	6.36	42.93	2.17	45.30	73.9	28.6	150	0	Floor
Vert.	7236.000	PK	48.63	37.32	7.83	43.41	2.17	52.54	73.9	21.3	150	0	Floor
Vert.	9648.000	PK	47.65	38.93	9.06	43.10	2.17	54.71	73.9	19.1	150	0	Floor
Vert.	4824.000	AV	39.19	31.71	6.36	42.93	2.17	36.50	53.9	17.4	150	0	Floor
Vert.	7236.000	AV	39.01	37.32	7.83	43.41	2.17	42.92	53.9	10.9	150	0	Floor
Vert.	9648.000	AV	38.79	38.93	9.06	43.10	2.17	45.85	53.9	**8.0**	150	0	Floor

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	38.77	28.51	14.01	41.66	3.42	2.17	45.22	53.9	8.6	*1)
Vert.	2390.000	AV	38.71	28.51	14.01	41.66	3.42	2.17	45.16	53.9	8.7	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

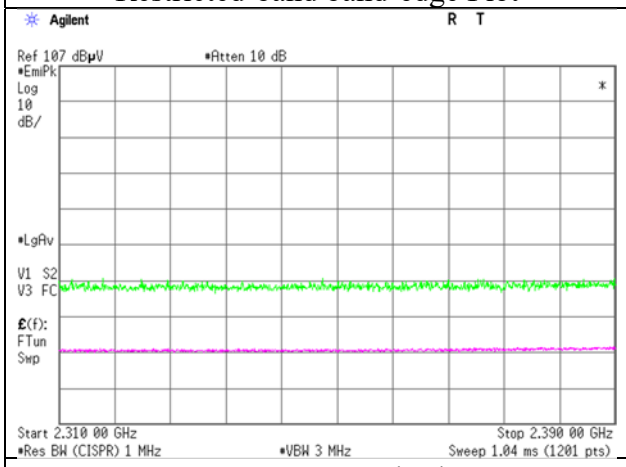
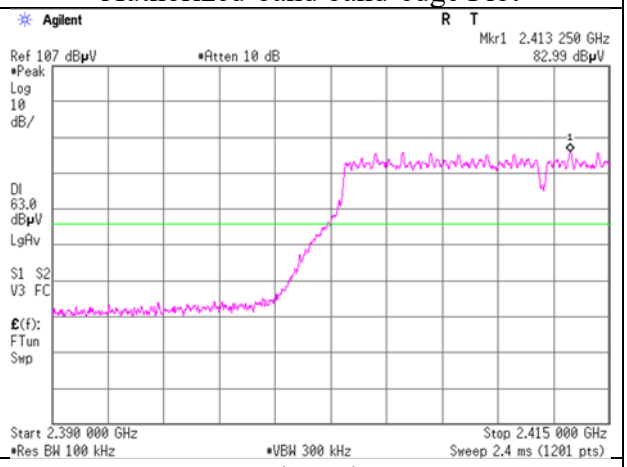
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

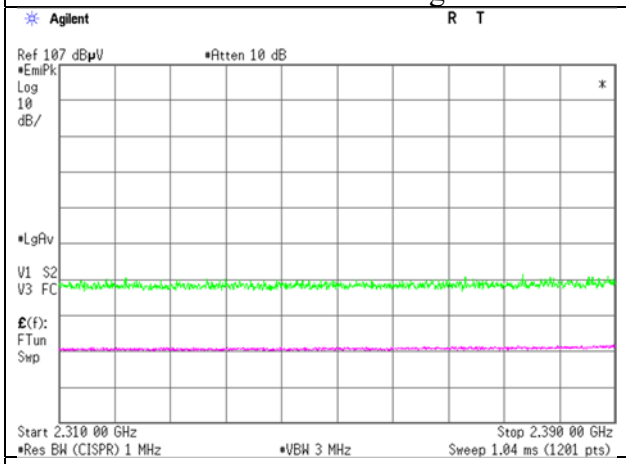
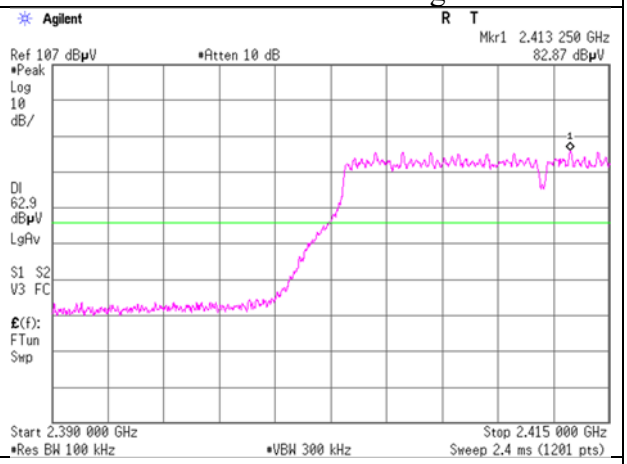
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	82.48	28.46	14.02	41.67	2.17	85.46	-	-	Carrier
Hori.	2400.000	PK	43.97	28.48	14.02	41.67	2.17	46.97	65.46	18.4	
Vert.	2412.000	PK	82.43	28.46	14.02	41.67	2.17	85.41	-	-	Carrier
Vert.	2400.000	PK	42.95	28.48	14.02	41.67	2.17	45.95	65.41	19.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13294722S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	April 16, 2020
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx 11n-20 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* 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.

Radiated Spurious Emission

Report No.	13294722S-B-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.2	No.3
Date	April 16, 2020	April 17, 2020
Temperature / Humidity	24 deg. C / 41 % RH	22 deg. C / 30 % RH
Engineer	Takahiro Kawakami (1 GHz - 13 GHz)	Yusuke Tanikawara (13 GHz - 40 GHz)
Mode	Tx 11n-20 2437 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	48.38	31.73	6.39	42.93	2.17	45.74	73.9	28.1	150	0	Floor
Hori.	7311.000	PK	49.06	37.40	7.86	43.48	2.17	53.01	73.9	20.8	150	0	Floor
Hori.	9748.000	PK	48.61	39.32	9.10	42.98	2.17	56.22	73.9	17.6	150	0	Floor
Hori.	4874.000	AV	38.99	31.73	6.39	42.93	2.17	36.35	53.9	17.5	150	0	Floor
Hori.	7311.000	AV	39.23	37.40	7.86	43.48	2.17	43.18	53.9	10.7	150	0	Floor
Hori.	9748.000	AV	39.08	39.32	9.10	42.98	2.17	46.69	53.9	**7.2**	150	0	Floor
Vert.	4874.000	PK	50.24	31.73	6.39	42.93	2.17	47.60	73.9	26.3	150	0	Floor
Vert.	7311.000	PK	48.52	37.40	7.86	43.48	2.17	52.47	73.9	21.4	150	0	Floor
Vert.	9748.000	PK	47.79	39.32	9.10	42.98	2.17	55.40	73.9	18.5	150	0	Floor
Vert.	4874.000	AV	39.01	31.73	6.39	42.93	2.17	36.37	53.9	17.5	150	0	Floor
Vert.	7311.000	AV	39.36	37.40	7.86	43.48	2.17	43.31	53.9	10.5	150	0	Floor
Vert.	9748.000	AV	38.68	39.32	9.10	42.98	2.17	46.29	53.9	7.6	150	0	Floor

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13294722S-B-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.2	No.3
Date	April 16, 2020	April 17, 2020
Temperature / Humidity	24 deg. C / 41 % RH	22 deg. C / 30 % RH
Engineer	Takahiro Kawakami (1 GHz - 13 GHz)	Yusuke Tanikawara (13 GHz - 40 GHz)
Mode	Tx 11n-20 2462 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.06	28.35	14.10	41.69	2.17	51.99	73.9	21.9	128	102	
Hori.	4924.000	PK	48.07	31.85	6.43	42.94	2.17	45.58	73.9	28.3	150	0	Floor
Hori.	7386.000	PK	48.09	37.51	7.93	43.55	2.17	52.15	73.9	21.7	150	0	Floor
Hori.	9848.000	PK	48.53	39.50	9.15	42.87	2.17	56.48	73.9	17.4	150	0	Floor
Hori.	4924.000	AV	38.79	31.85	6.43	42.94	2.17	36.30	53.9	17.6	150	0	Floor
Hori.	7386.000	AV	39.04	37.51	7.93	43.55	2.17	43.10	53.9	10.8	150	0	Floor
Hori.	9848.000	AV	39.06	39.50	9.15	42.87	2.17	47.01	53.9	6.8	150	0	Floor
Vert.	2483.500	PK	49.28	28.35	14.10	41.69	2.17	52.21	73.9	21.6	177	172	
Vert.	4924.000	PK	47.43	31.85	6.43	42.94	2.17	44.94	73.9	28.9	150	0	Floor
Vert.	7386.000	PK	47.88	37.51	7.93	43.55	2.17	51.94	73.9	21.9	150	0	Floor
Vert.	9848.000	PK	47.67	39.50	9.15	42.87	2.17	55.62	73.9	18.2	150	0	Floor
Vert.	4924.000	AV	39.02	31.85	6.43	42.94	2.17	36.53	53.9	17.3	150	0	Floor
Vert.	7386.000	AV	39.20	37.51	7.93	43.55	2.17	43.26	53.9	10.6	150	0	Floor
Vert.	9848.000	AV	39.33	39.50	9.15	42.87	2.17	47.28	53.9	**6.6**	150	0	Floor

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	38.91	28.35	14.10	41.69	3.42	2.17	45.26	53.9	8.6	*1)
Vert.	2483.500	AV	38.89	28.35	14.10	41.69	3.42	2.17	45.24	53.9	8.6	*1)

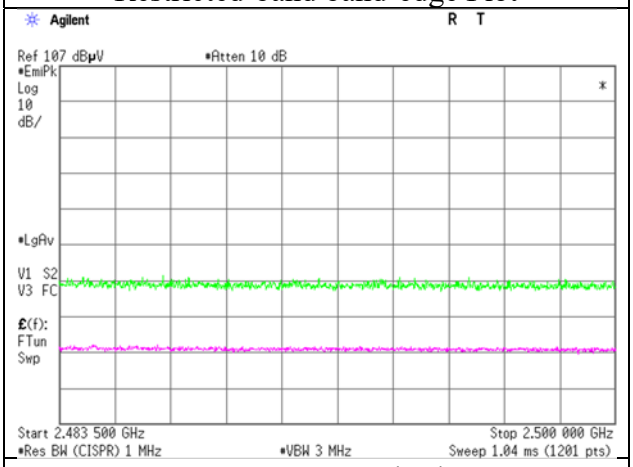
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.85 m / 3.0 m) = 2.17 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13294722S-B-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	April 16, 2020
Temperature / Humidity	24 deg. C / 41 % RH
Engineer	Takahiro Kawakami
Mode	Tx 11n-20 2462 MHz

Horizontal

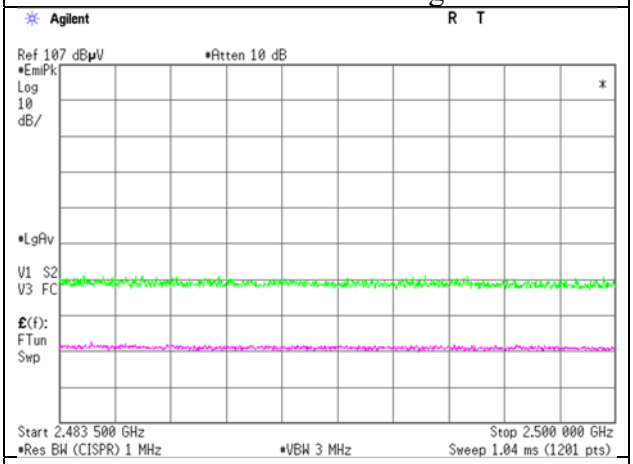
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

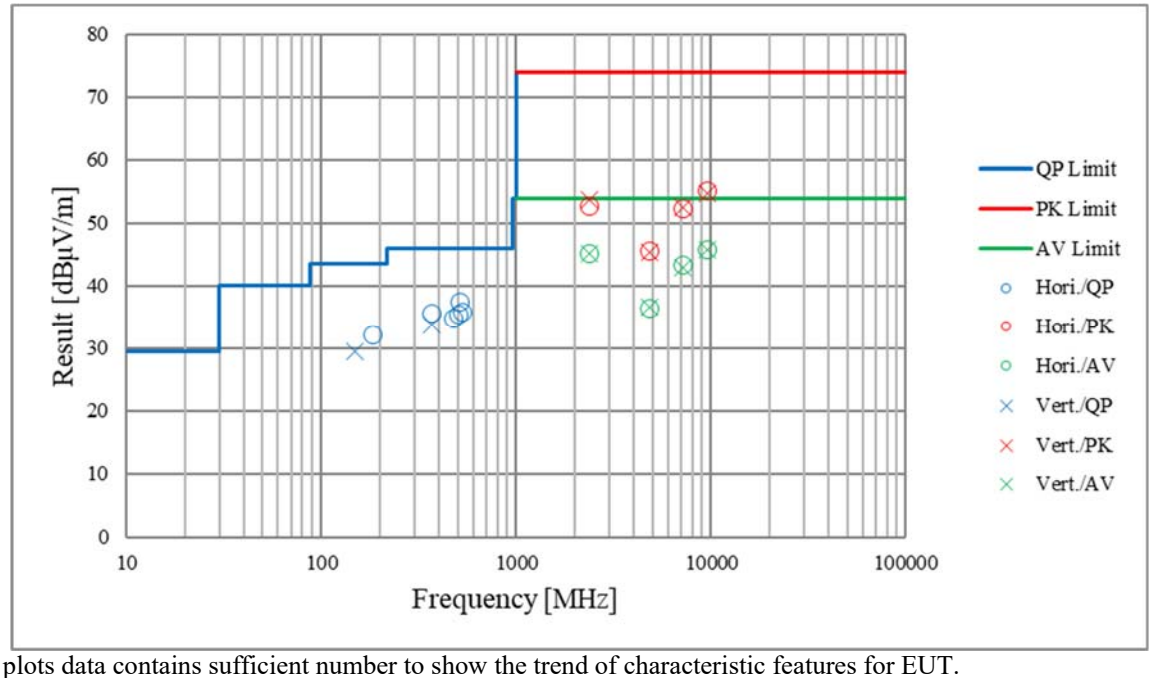


Trace Green : Peak Plot
Trace Purple : Average Plot

* 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.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13294722S-B-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.3
Date	April 15, 2020	April 16, 2020	April 17, 2020
Temperature / Humidity	22 deg. C / 39 % RH	24 deg. C / 41 % RH	22 deg. C / 30 % RH
Engineer	Takahiro Kawakami (30 MHz - 1 GHz)	Takahiro Kawakami (1 GHz - 13 GHz)	Yusuke Tanikawara (13 GHz - 40 GHz)
Mode	Tx 11n-20 2412 MHz		

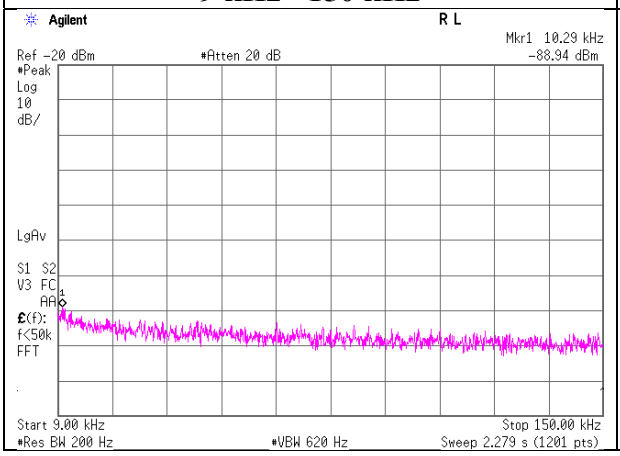


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

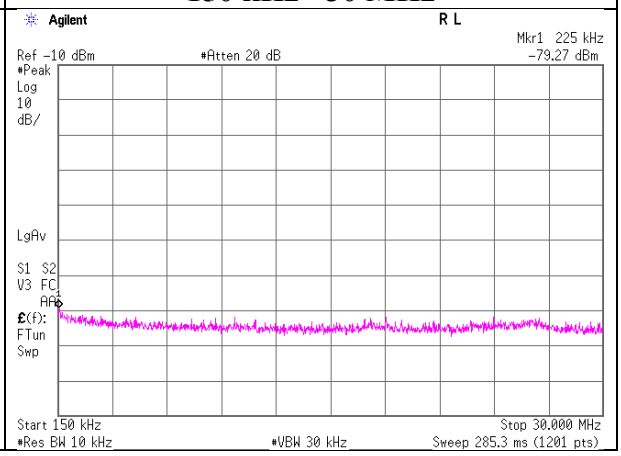
Conducted Spurious Emission

Report No.	13294722S-B-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	April 15, 2020
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Shiro Kobayashi
Mode	Tx 11n-20 2412 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
10.29	-88.9	0.00	9.5	2.0	1	-77.4	300	6.0	-16.1	47.3	63.4	-
225.00	-79.3	0.01	9.5	2.0	1	-67.7	300	6.0	-6.5	20.5	27.0	-

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

*2.0 dBi was applied to the test result based on ANSI C63.10 since antenna gain was less than 2.0 dBi.

Power Density

Report No.	13294722S-B-R1	
Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	April 7, 2020	April 15, 2020
Temperature / Humidity	24 deg. C / 30 % RH	22 deg. C / 31 % RH
Engineer	Hiromasa Sato	Shiro Kobayashi
Mode	Tx	

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-20.94	1.66	9.63	-9.65	8.00	17.65
2437	-20.33	1.66	9.63	-9.04	8.00	17.04
2462	-21.61	1.66	9.63	-10.32	8.00	18.32

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-30.80	1.66	9.63	-19.51	8.00	27.51
2437	-30.31	1.66	9.63	-19.02	8.00	27.02
2462	-30.99	1.66	9.63	-19.70	8.00	27.70

11n-20

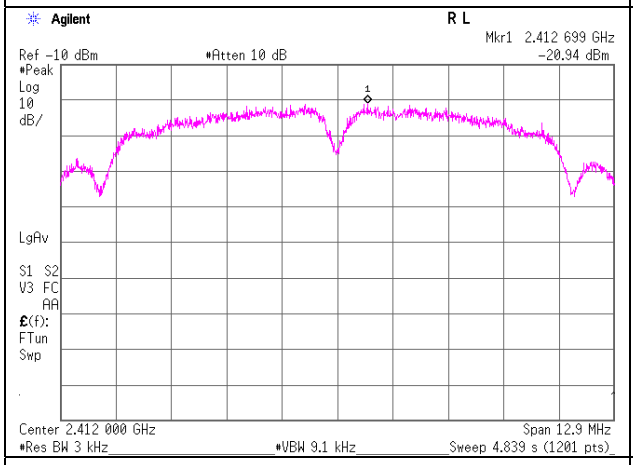
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-30.69	1.66	9.63	-19.40	8.00	27.40
2437	-30.96	1.66	9.63	-19.67	8.00	27.67
2462	-30.58	1.66	9.63	-19.29	8.00	27.29

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

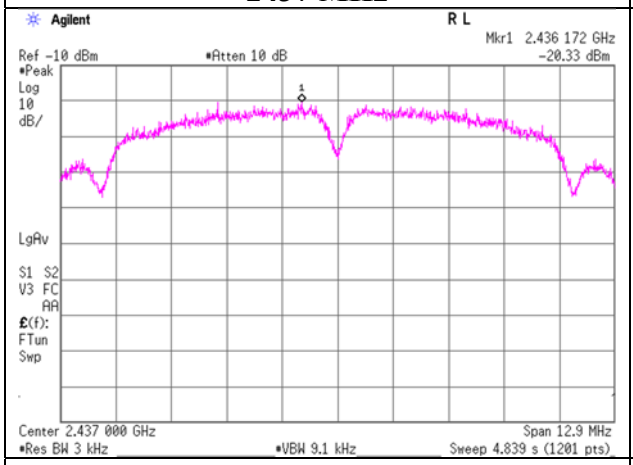
Power Density

11b

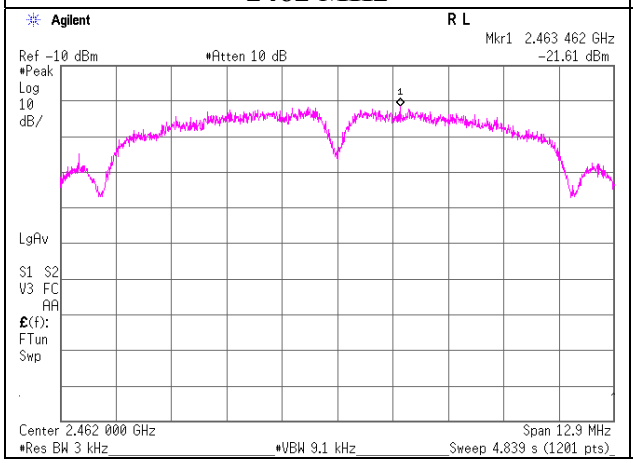
2412 MHz



2437 MHz

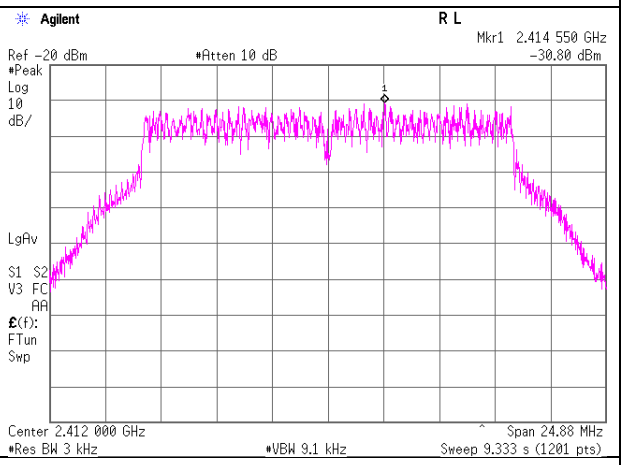


2462 MHz

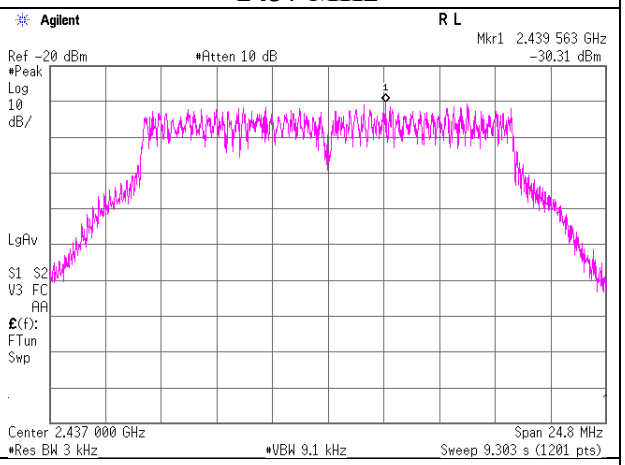


11g

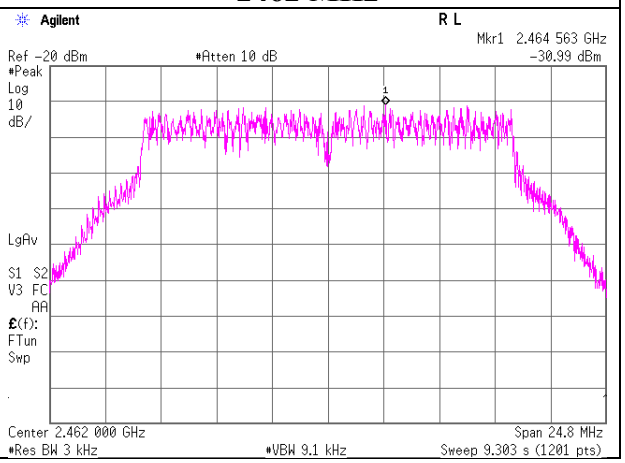
2412 MHz



2437 MHz



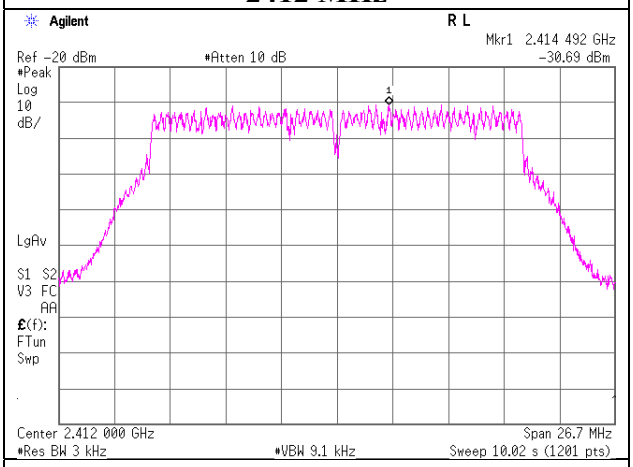
2462 MHz



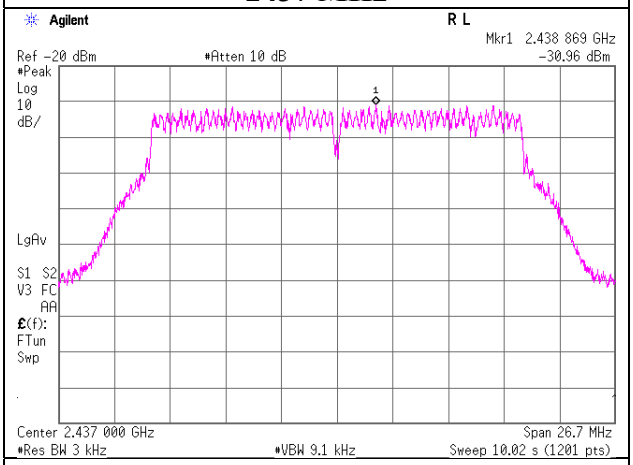
Power Density

11n - 20

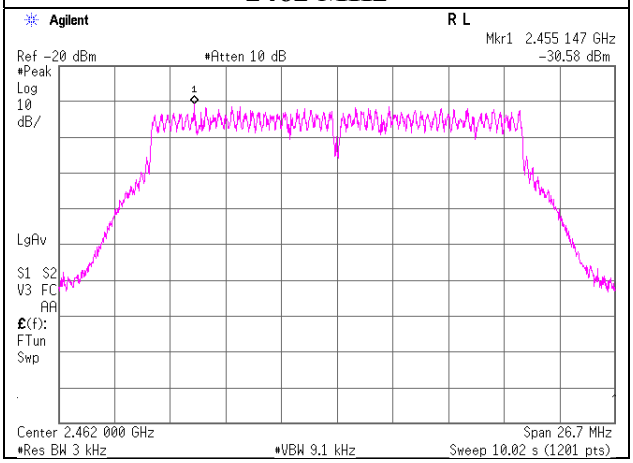
2412 MHz



2437 MHz



2462 MHz



APPENDIX 2: Test instruments

Test equipment

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
AT	KTS-07	145111	Digital Tester	SANWA	PC500	7019232	2019/10/01	12
AT	SAT10-09	145132	Attenuator	Weinschel Corp.	54A-10	W5692	2019/11/05	12
AT	SCC-G63	196946	Coaxial Cable	HUBER+SUNER	SUCOFLEX 102	803411/2	2020/03/10	12
AT	SOS-27	191845	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
AT	SPM-07	146247	Power Meter	Keysight Technologies Inc	8990B	MY5100272	2019/07/16	12
AT	SPSS-04	146310	Power sensor	Keysight Technologies Inc	N1923A	MY5326009	2019/07/16	12
AT	STM-G10	171617	Terminator	Weinschel - API Technologies Corp	M1459A	92420	2019/07/04	12
AT	STS-05	146212	Digital Hitester	Hioki	3805-50	80997828	2019/10/01	12
AT,RE	SSA-03	145801	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250152	2019/08/08	12
RE	COTS-SEMI-5	170932	EMI Software	TSJ	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
RE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
RE	KJM-09	145929	Measure	KOMELON	KMC-36	-	-	-
RE	KSA-08	145089	Spectrum Analyzer	Keysight Technologies Inc	E4446A	MY46180525	2019/11/05	12
RE	SAEC-01(NSA)	145597	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	2020/04/08	12
RE	SAEC-01(SVSWR)	145561	Semi-Anechoic Chamber	TDK	SAEC-01(SVSWR)	1	2019/05/07	12
RE	SAEC-02(NSA)	145563	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	2020/03/20	12
RE	SAEC-02(SVSWR)	145598	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	2019/05/09	12
RE	SAEC-03(SVSWR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2019/05/03	12
RE	SAF-02	145004	Pre Amplifier	SONOMA	310N	290212	2020/02/19	12
RE	SAF-04	145127	Pre Amplifier	Toyo Corporation	TPA0118-36	2072554	2019/06/04	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2020/02/20	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2020/03/03	12
RE	SAF-10	145129	Pre Amplifier	Toyo Corporation	HAP26-40W	10	2020/03/03	12
RE	SAT10-06	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2019/11/06	12
RE	SAT3-11	150921	Attenuator	JFW	50HF-003N	-	2020/01/30	12
RE	SAT6-14	167095	Attenuator	JFW	50HF-006N	-	2020/02/21	12
RE	SBA-02	145022	Biconical Antenna	Schwarzbeck Mess - Elektronik	BBA9106	91032665	2020/04/04	12
RE	SCC-B1/B3/B5/B7/B8/B13/SRSE-02	144975	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	2020/04/17	12
RE	SCC-B2/B4/B6/B7/B8/B13/SRSE-02	144976	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	2020/04/17	12
RE	SCC-G05	145039	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	2020/01/31	12

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2020/03/04	12
RE	SCC-G40	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	2020/01/08	12
RE	SCC-G41	151617	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S006	2020/01/08	12
RE	SCC-G43	156380	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104_E	SN MY 13406/4E	2019/07/03	12
RE	SCC-G50	178573	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104_E	MY13407/4E	2020/03/09	12
RE	SCC-G51	178572	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800288 /4A	2020/03/09	12
RE	SCC-G56	179539	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	803289/4	2019/05/16	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2019/05/16	12
RE	SCC-G58	183047	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800287/4A	2019/07/23	12
RE	SFL-18	145305	Highpass Filter	MICRO-TRONICS	HPM50111	119	2020/04/03	12
RE	SHA-01	145383	Horn Antenna	Schwarzbeck Mess - Elektronik	BBHA9120D	9120D-725	2019/05/09	12
RE	SHA-02	145384	Horn Antenna	Schwarzbeck Mess - Elektronik	BBHA9120D	9120D-726	2019/06/26	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck Mess - Elektronik	BBHA9120D	9120D-739	2019/06/26	12
RE	SHA-04	145512	Horn Antenna	ETS LINDGREN	3160-09	00094868	2019/06/26	12
RE	SHA-06	145514	Horn Antenna	ETS LINDGREN	3160-10	00092383	2019/06/26	12
RE	SJM-09	145336	Measure	PROMART	SEN1935	-	-	-
RE	SLA-06	145528	Logperiodic Antenna	Schwarzbeck Mess - Elektronik	VUSLP9111B	195	2020/04/04	12
RE	SOS-20	191837	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
RE	SOS-21	191838	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
RE	SOS-23	191840	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
RE	STR-07	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2019/09/13	12
RE	STR-08	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2019/11/22	12
RE	STS-01	145792	Digital Hitester	Hioki	3805-50	80997812	2019/10/01	12
RE	STS-02	145793	Digital Hitester	Hioki	3805-50	80997819	2020/04/09	12
RE	STS-03	146210	Digital Hitester	Hioki	3805-50	80997823	2019/10/01	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