RADIO TEST REPORT

Test Report No. 14581758S-A

Customer	**PIONEER CORPORATION**
Description of EUT	**RDS AV RECEIVER**
Model Number of EUT	**DMH-WT3800NEX**
FCC ID	**AJDK122**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied (Refer to SECTION 3)**
Issue Date	**November 24, 2022**
Remarks	**Wireless LAN (2.4 GHz band) and Bluetooth Low Energy part(s)**

Representative Test Engineer	**Approved By**
Takahiro Kawakami Engineer	Kazutaka Takeyama Leader

CERTIFICATE 1266.03

☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan, Inc.

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

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- The information provided from the customer for this report is identified in Section 1.
- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

REVISION HISTORY

Original Test Report No.: 14581758S-A

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14581758S-A	November 24, 2022	-

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer Information

Company Name	PIONEER CORPORATION
Address	25-1 Yamada, Kawagoe-shi, Saitama-ken 350-8555, Japan
Telephone Number	+81-49-228-7787
Contact Person	Shigeru Yoshida

The information provided from the customer is as follows;
- Customer, Description of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer Information
- SECTION 2: Equipment Under Test (EUT) other than the Receipt Date and Test Date
- SECTION 4: Operation of EUT during testing

* 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

Description	RDS AV RECEIVER
Model Number	DMH-WT3800NEX
Serial Number	Refer to SECTION 4.2
Condition	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	July 7, 2022 (Used for Antenna Terminal conducted test (WLAN) and Radiated Emission test) July 16, 2022 (Used for Antenna Terminal conducted test (BT LE))
Test Date	July 12 to September 7, 2022

2.2 Product Description

General Specification

Rating	DC 14.4 V (DC 10.8 V to 15.1 V)
Operating temperature	-10 deg. C to +60 deg. C

Radio Specification

WLAN (IEEE802.11b/11g/11n-20)

Equipment Type	Transceiver
Frequency of Operation	2412 MHz to 2462 MHz
Type of Modulation	DSSS, OFDM
Antenna Gain	-1.40 dBi

WLAN (IEEE802.11a/11n-20/11ac-20/11n-40/11ac-40/11ac-80)

Equipment Type	Transceiver	
Frequency of Operation	20 MHz Band:	5745 MHz
	40 MHz Band:	5755 MHz
	80 MHz Band:	5775 MHz
Type of Modulation	OFDM	
Antenna Gain	0.81 dBi	

Bluetooth (BR / EDR / Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	FHSS (GFSK, π/4 DQPSK, 8 DPSK)
Antenna Gain	-1.01 dBi

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart C The latest version on the first day of the testing period
Title	FCC 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 customer has declared that the EUT has complies with FCC Part 15 Subpart B as SDoC.

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	*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)	1.2 dB 2483.500 MHz, AV, Vert. Mode: Tx 11n-20 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: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.
* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.
*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)

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

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

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

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 to 30 MHz	2.9 dB	2.9 dB	3.0 dB	2.9 dB
Radiated emission	9 kHz to 30 MHz	3.2 dB	3.1 dB	3.1 dB	-
(Measurement distance: 3 m)	30 MHz to 200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz to 1 GHz	6.0 dB	6.1 dB	6.1 dB	-
	1 GHz to 6 GHz	4.7 dB	4.7 dB	4.7 dB	-
	6 GHz to 18 GHz	5.2 dB	5.3 dB	5.3 dB	-
	18 GHz to 40 GHz	5.4 dB	5.5 dB	5.5 dB	-
Radiated emission	1 GHz to 18 GHz	5.6 dB	5.6 dB	5.6 dB	-
(Measurement distance: 1 m)	18 GHz to 40 GHz	5.8 dB	5.8 dB	5.8 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	1.2 dB
Power Measurement above 1 GHz (Peak Detector) SPM-06	2.0 dB
Power Measurement above 1 GHz (Average Detector) SPM-07	1.2 dB
Power Measurement above 1 GHz (Peak Detector) SPM-07	1.3 dB
Power Measurement above 1 GHz (Average Detector) SPM-13	1.3 dB
Power Measurement above 1 GHz (Peak Detector) SPM-13	1.3 dB
Spurious emission (Conducted) below 1 GHz	0.93 dB
Conducted emissions Power Density Measurement 1 GHz to 3 GHz	0.92 dB
Conducted emissions Power Density Measurement 3 GHz to 18 GHz	2.3 dB
Spurious emission (Conducted) 18 GHz to 26.5 GHz	2.3 dB
Spurious emission (Conducted) 26.5 GHz to 40 GHz	2.3 dB
Bandwidth Measurement	0.012 %
Duty cycle and Time Measurement	0.27 %
Temperature_SCH-01	0.93 deg. C.
Humidity_SCH-01	4.1 %
Temperature_SCH-02	2.0 deg. C.
Humidity_SCH-02	6.6 %
Voltage	0.97 %

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 Japan
Telephone: +81-463-50-6400
A2LA Certificate Number: 1266.03
(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	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.

Mode	Remarks*
IEEE 802.11b (11b)	11 Mbps, PN9
IEEE 802.11g (11g)	12 Mbps, PN9
IEEE 802.11n-20 (11n-20)	MCS 3, PN9
Bluetooth Low Energy (BT LE)	Maximum Packet Size, PRBS9
*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 Setting: 11b: 14
11g: 14
11n-20: 1ch/11ch:11,other ch:13
BT LE: Fixed
Software: SOC: 0.020300
(Date: 2022.05 24, 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.

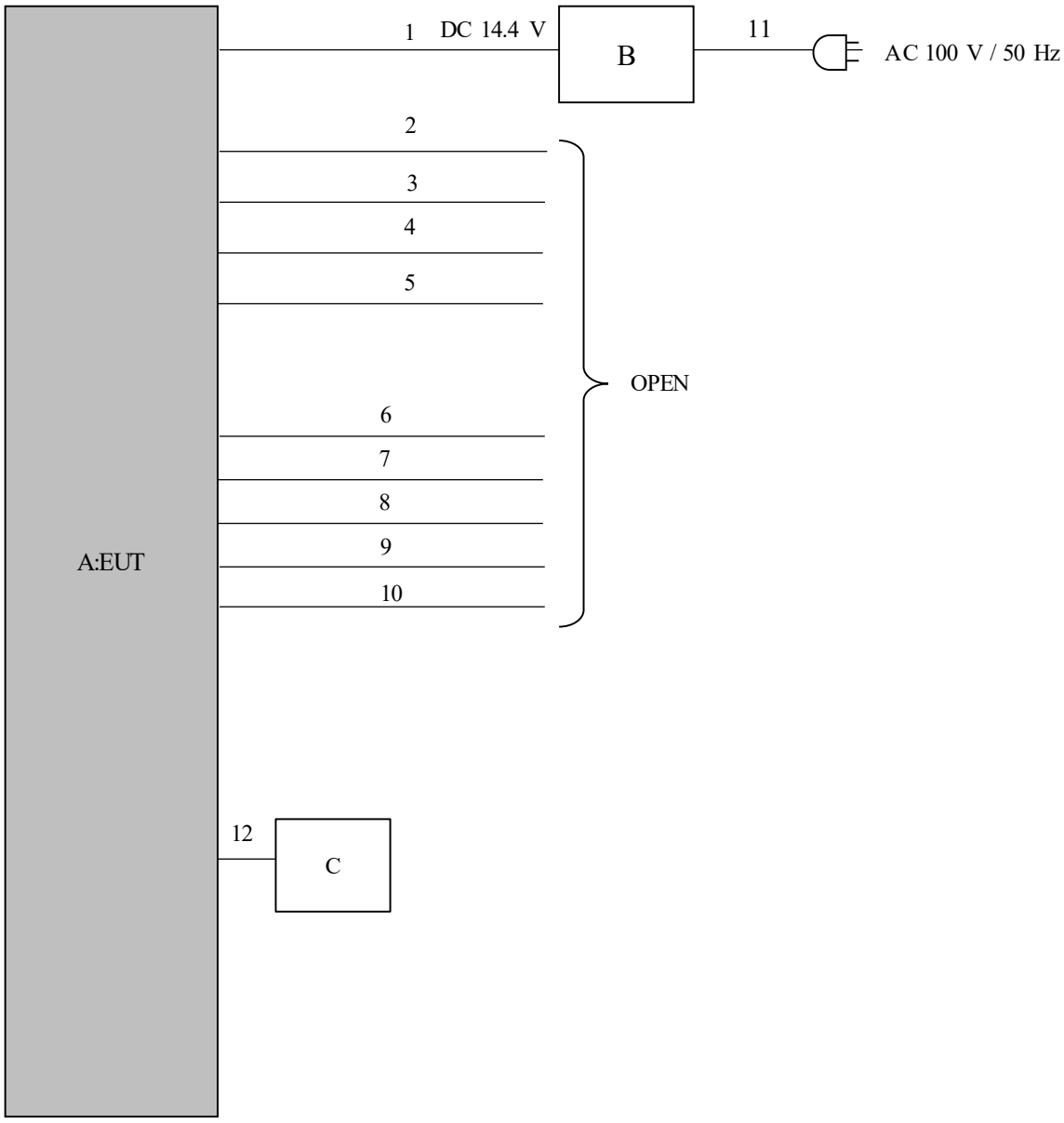
*The Details of Operating Mode(s)

Test Item	Operating Mode	Tested Frequency
Radiated Spurious Emission (Below 1 GHz)	Tx 11g *1)	2462 MHz
	Tx BT LE *2)	2402 MHz
Conducted Spurious Emission	Tx 11g *1)	2462 MHz
	Tx BT LE	2402 MHz 2440 MHz 2480 MHz
Radiated Spurious Emission (Above 1 GHz), 6dB Bandwidth, Maximum Peak Output Power, Power Density, 99% Occupied Bandwidth	Tx 11b Tx 11g Tx 11n-20	2412 MHz 2417 MHz *3) 2437 MHz 2457 MHz *3) 2462 MHz
	Tx BT LE	2402 MHz 2440 MHz 2480 MHz

*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.
*2) Spurious emissions for frequencies below 1 GHz were limited to the channel that had the highest power during the antenna terminal test, as preliminary testing indicated that changing the operating frequency had no significant impact on the emissions in those frequency bands.
*3) Only Radiated Spurious Emission bandedge test. (11n-20 only)

4.2 Configuration and Peripherals

[Antenna Terminal Conducted test]



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

Description of EUT and Support Equipment

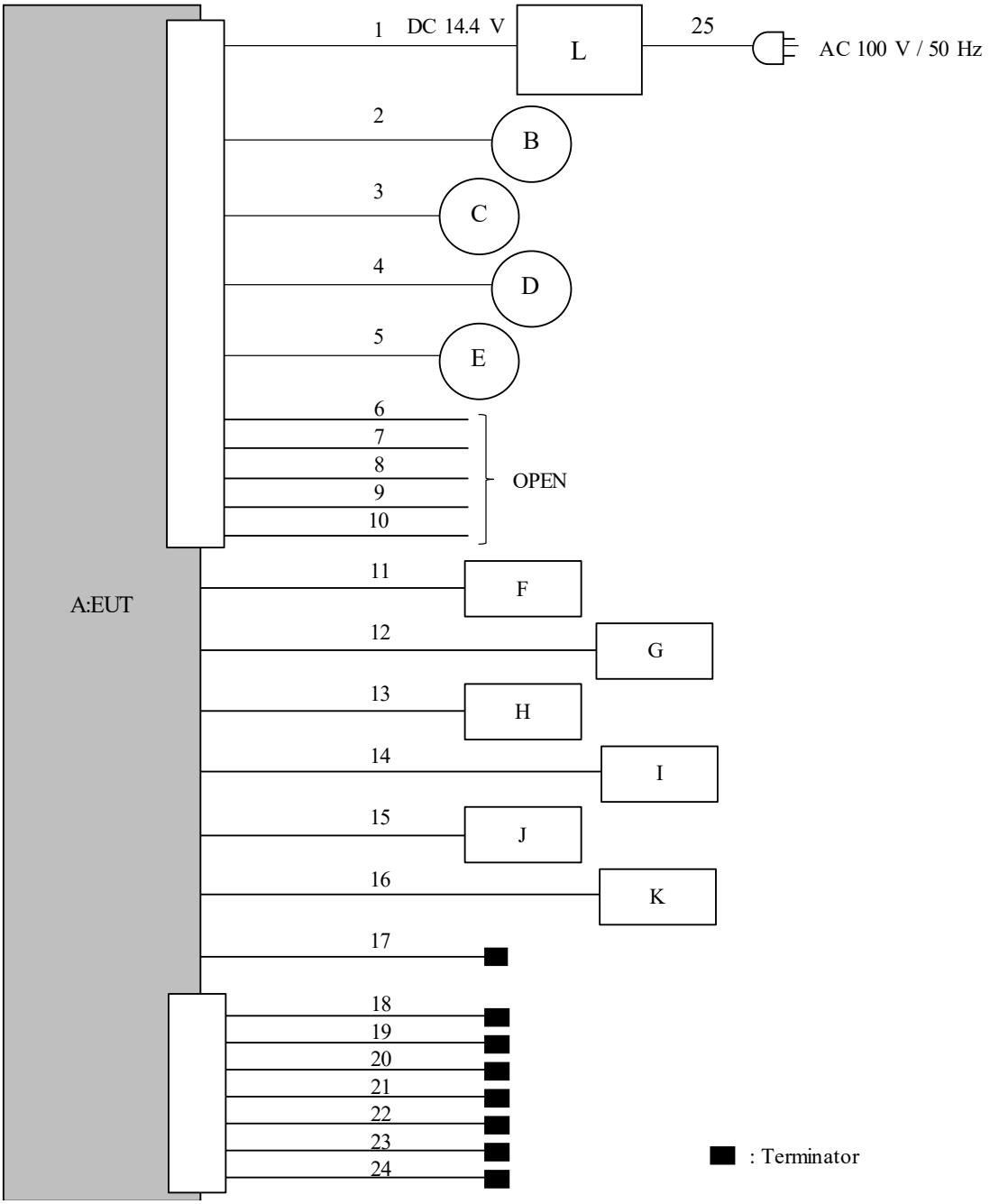
No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	RDS AV RECEIVER	DMH-WT3800NEX	BFTM000017UC *1) BFTM000037UC *2)	PIONEER	EUT
B	Power Supply (DC)	PAN35-10A *1) *2)	ML002085	KIKUSUI	-
C	Jig board *3)	-	-	-	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	0.2 + 0.1 + 1.5	Unshielded	Unshielded	-
2	Speaker	0.2	Unshielded	Unshielded	-
3	Speaker	0.2	Unshielded	Unshielded	-
4	Speaker	0.2	Unshielded	Unshielded	-
5	Speaker	0.2	Unshielded	Unshielded	-
6	ILLUMINATION	0.2	Unshielded	Unshielded	-
7	ANTENNA CONTROL	0.2	Unshielded	Unshielded	-
8	REVERSE	2.0	Unshielded	Unshielded	-
9	CARSPEED	2.0	Unshielded	Unshielded	-
10	PARKING BRAKE	2.0	Unshielded	Unshielded	-
11	AC	3.0	Unshielded	Unshielded	-
12	Signal *3)	0.15	Unshielded	Unshielded	-

*1) Used for Antenna Terminal conducted test (WLAN)
*2) Used for Antenna Terminal conducted test (BT LE)
*3) Attached for BFTM000017UC only

[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	RDS AV RECEIVER	DMH-WT3800NEX	BFTM000016UC	PIONEER	EUT
B	Speaker	TS-F1030	V44QAH2	PIONEER	-
C	Speaker	TS-F1030	V44QAH2	PIONEER	-
D	Speaker	TS-F1030	V44QBA1	PIONEER	-
E	Speaker	TS-F1030	V44QBA1	PIONEER	-
F	Steering SW (dummy load)	-	-	-	-
G	Sirius XM	SXV200	ZX8N0442	-	-
H	USB Memory	SDDDC2-064G-G46	-	SanDisk	-
I	Mic	CPM1127	-	ZHEJIANG YUESUI ELECTRON STOCK CO.,LTD.	-
J	GPS	CXF1333	-	MITSUMI ELECTRIC CO., LTD.	-
K	iData Link (dummy load)	-	-	-	-
L	Power Supply (DC)	PAN35-10A	BP002287	KIKUSUI	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	3.0	Unshielded	Unshielded	-
2	Speaker (FR)	1.3	Unshielded	Unshielded	-
3	Speaker (FL)	1.3	Unshielded	Unshielded	-
4	Speaker (RR)	1.3	Unshielded	Unshielded	-
5	Speaker (RL)	1.3	Unshielded	Unshielded	-
6	PARKING BRAKE	2.0	Unshielded	Unshielded	-
7	REVERSE	2.0	Unshielded	Unshielded	-
8	CARSPEED	2.0	Unshielded	Unshielded	-
9	Antenna Control	2.0	Unshielded	Unshielded	-
10	Signal	1.1	Unshielded	Unshielded	-
11	Signal	0.9	Unshielded	Unshielded	-
12	Sirius XM	0.6	Shielded	Shielded	-
13	USB	1.4	Shielded	Shielded	-
14	Mic	3.0	Unshielded	Unshielded	-
15	GPS	3.4	Shielded	Shielded	-
16	iData Link	1.0	Unshielded	Unshielded	-
17	FM	2.1	Shielded	Shielded	-
18	Rear Out	1.6	Unshielded	Unshielded	-
19	Front Out	1.6	Unshielded	Unshielded	-
20	Sub Woofer Out	1.6	Unshielded	Unshielded	-
21	Rear View Camera IN	1.7	Unshielded	Unshielded	-
22	Rear Monitor Out	1.7	Unshielded	Unshielded	-
23	AUX IN	1.7	Unshielded	Unshielded	-
24	Mute	1.5	Unshielded	Unshielded	-
25	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.

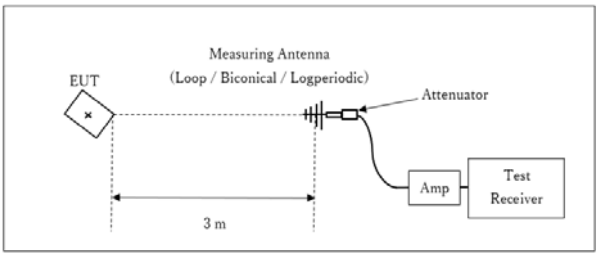
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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

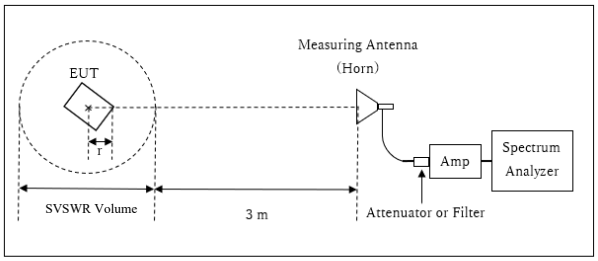
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

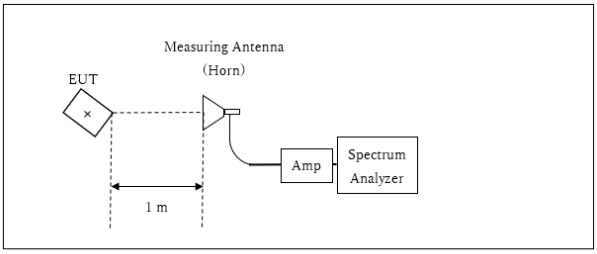


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.86 m / 3.0 m) = 2.19 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.86 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.14 m

10 GHz to 26.5 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 40 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)
Horizontal	40 deg.	0 deg.	40 deg.	0 deg.	0 deg.	0 deg.
Vertical	40 deg.	0 deg.	40 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 to 26.5 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
6 dB Bandwidth	50 MHz (WLAN) 3 MHz (BT LE)	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 30 MHz, 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

99 % Occupied Bandwidth and 6 dB Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room		
Date	July 19, 2022	July 29, 2022	September 7, 2022
Temperature / Humidity	25 deg. C / 47 % RH	25 deg. C / 45 % RH	24 deg. C / 49 % RH
Engineer	Shiro Kobayashi	Takahiro Kawakami	Takahiro Kawakami
Mode	Tx		

11b

Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2412	11580.9	8.948	> 0.5000
2437	11618.1	8.382	> 0.5000
2462	11585.3	8.224	> 0.5000

11g

Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2412	17550.3	16.448	> 0.5000
2437	17545.7	16.455	> 0.5000
2462	17594.8	16.442	> 0.5000

11n-20

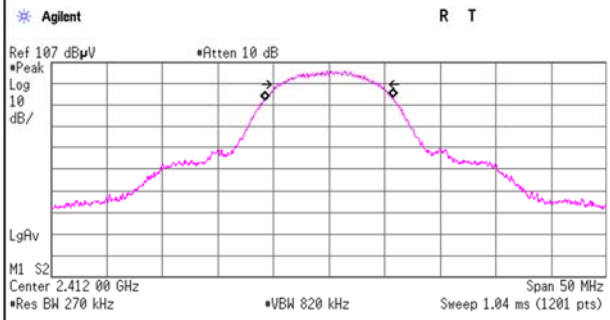
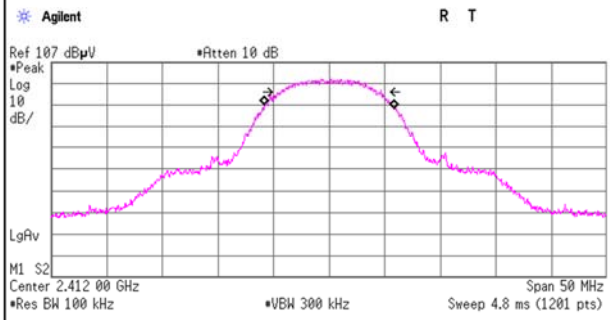
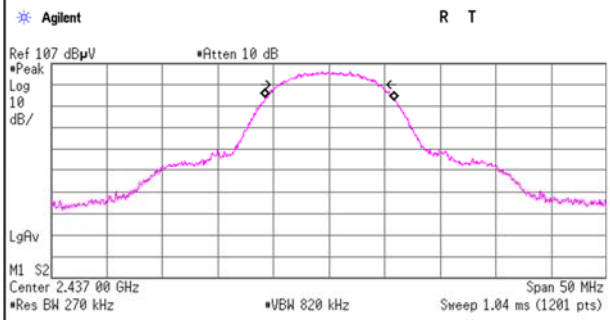
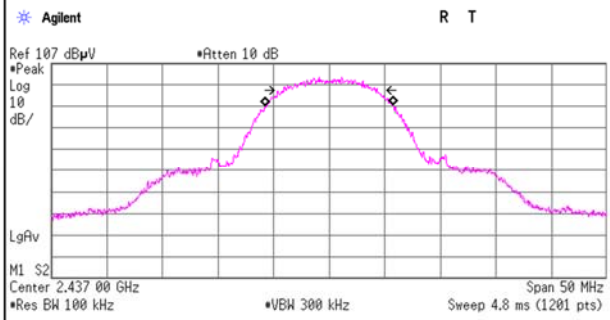
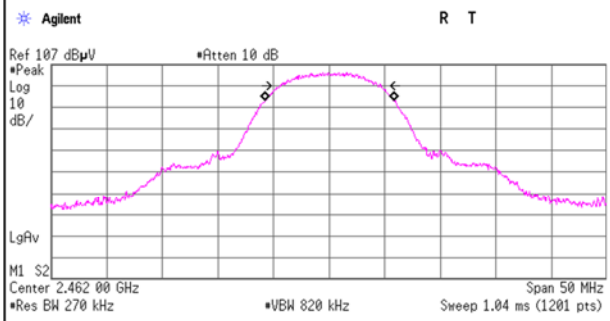
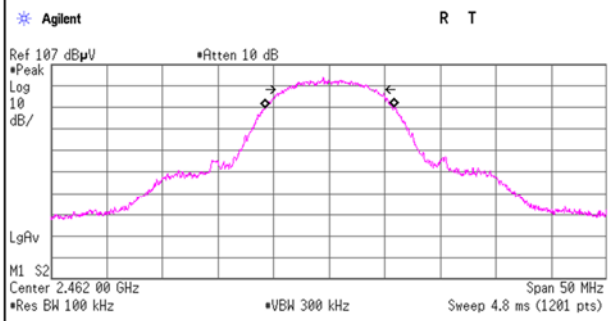
Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2412	18387.8	17.722	> 0.5000
2437	18416.4	17.722	> 0.5000
2462	18392.4	17.734	> 0.5000

BT LE 1 M-PHY

Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2402	1054.2	0.723	> 0.5000
2440	1053.6	0.720	> 0.5000
2480	1053.8	0.731	> 0.5000

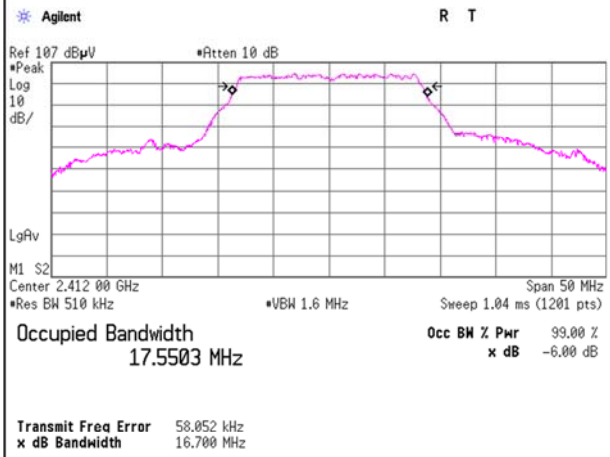
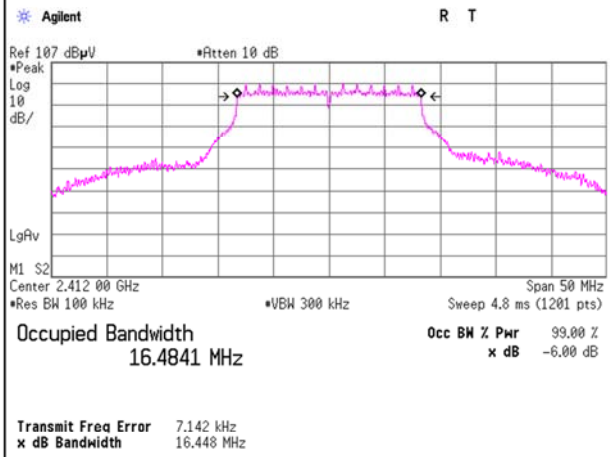
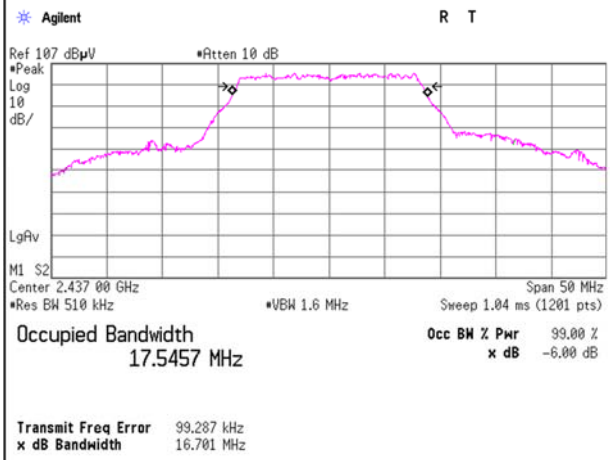
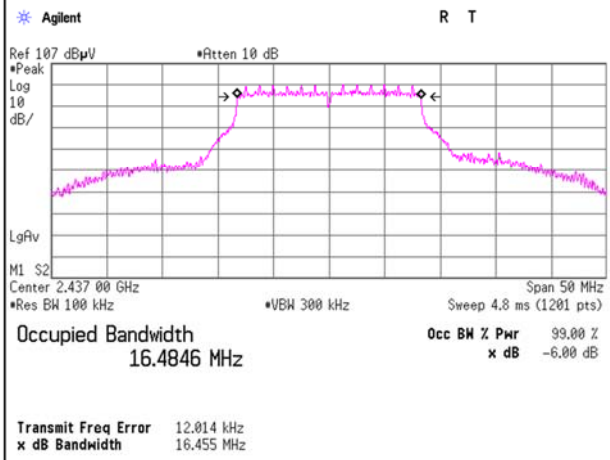
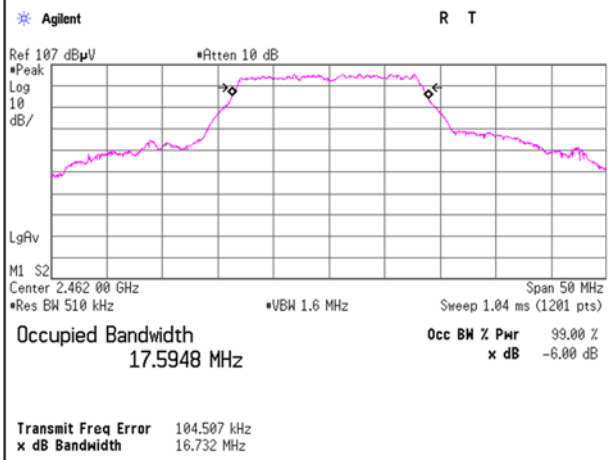
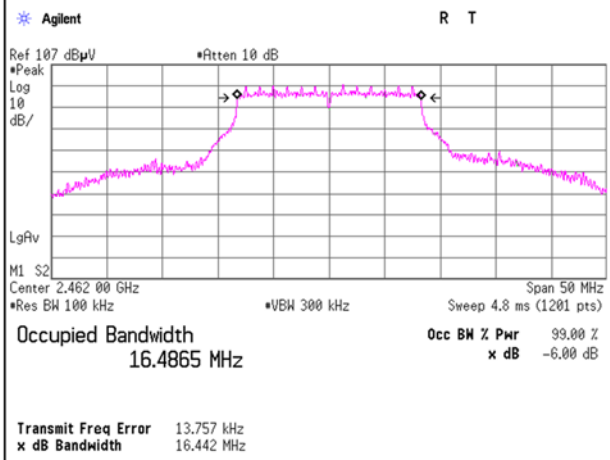
99 % Occupied Bandwidth and 6 dB Bandwidth

11b

99 % Occupied Bandwidth	6 dB Bandwidth
2412 MHz	**2412 MHz**
	
Occupied Bandwidth 11.5809 MHz; Occ BW % Pwr 99.00 %; x dB -6.00 dB; Transmit Freq Error 12.293 kHz; x dB Bandwidth 8.848 MHz	Occupied Bandwidth 11.6600 MHz; Occ BW % Pwr 99.00 %; x dB -6.00 dB; Transmit Freq Error 8.460 kHz; x dB Bandwidth 8.948 MHz
2437 MHz	**2437 MHz**
	
Occupied Bandwidth 11.6181 MHz; Occ BW % Pwr 99.00 %; x dB -6.00 dB; Transmit Freq Error 47.689 kHz; x dB Bandwidth 8.710 MHz	Occupied Bandwidth 11.5744 MHz; Occ BW % Pwr 99.00 %; x dB -6.00 dB; Transmit Freq Error -1.467 kHz; x dB Bandwidth 8.382 MHz
2462 MHz	**2462 MHz**
	
Occupied Bandwidth 11.5853 MHz; Occ BW % Pwr 99.00 %; x dB -6.00 dB; Transmit Freq Error 26.878 kHz; x dB Bandwidth 8.956 MHz	Occupied Bandwidth 11.5950 MHz; Occ BW % Pwr 99.00 %; x dB -6.00 dB; Transmit Freq Error 43.438 kHz; x dB Bandwidth 8.224 MHz

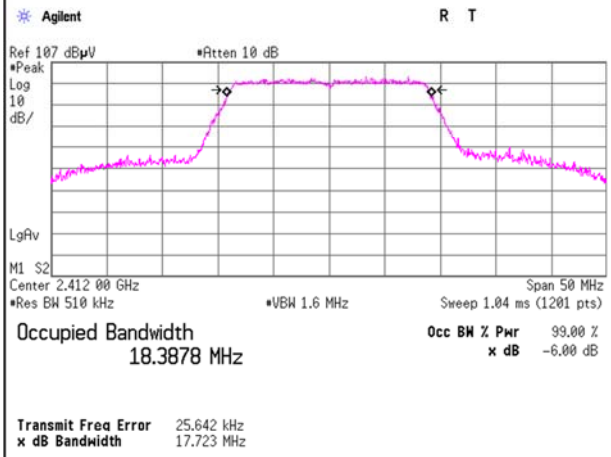
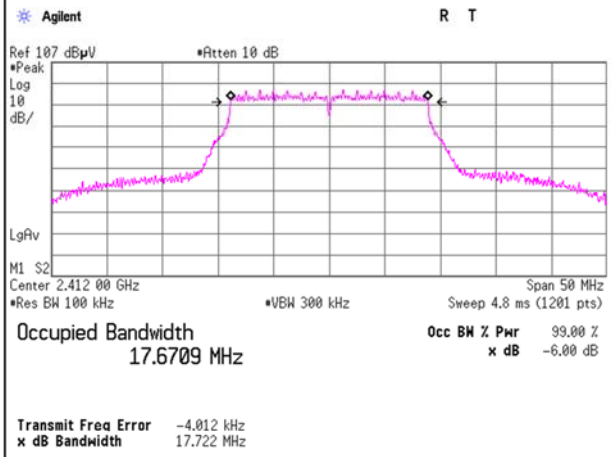
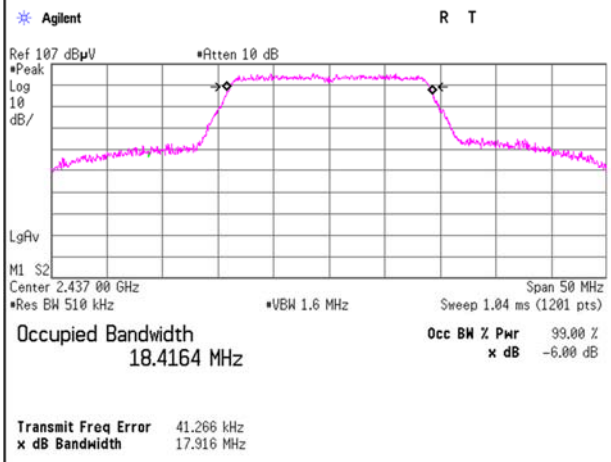
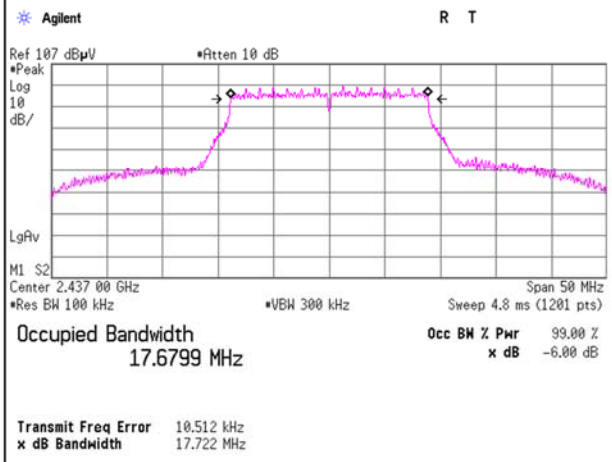
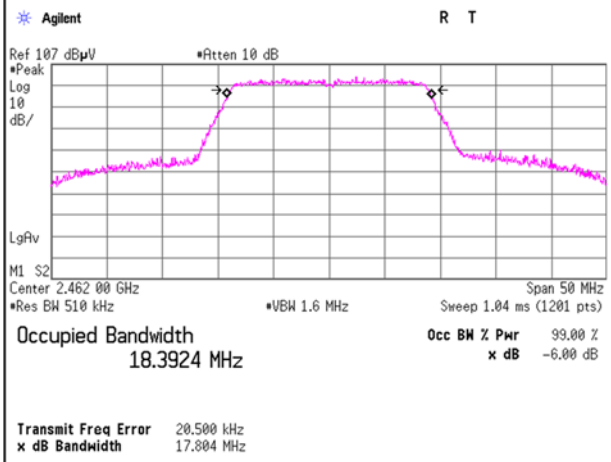
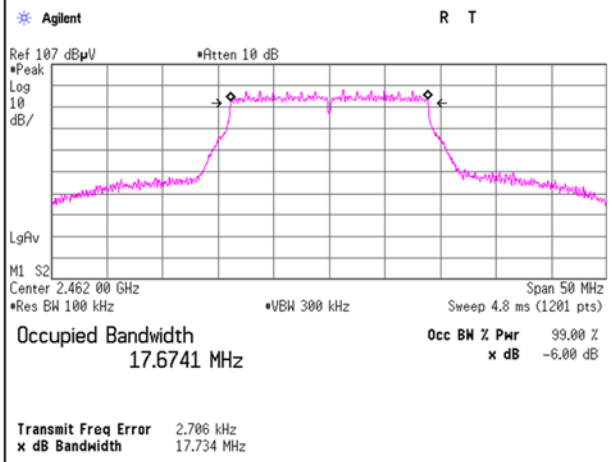
99 % Occupied Bandwidth and 6 dB Bandwidth

11g

99 % Occupied Bandwidth	6 dB Bandwidth
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

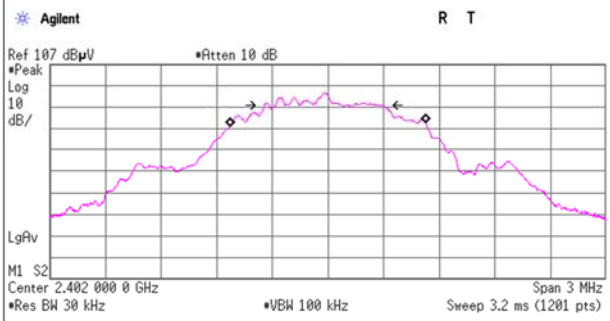
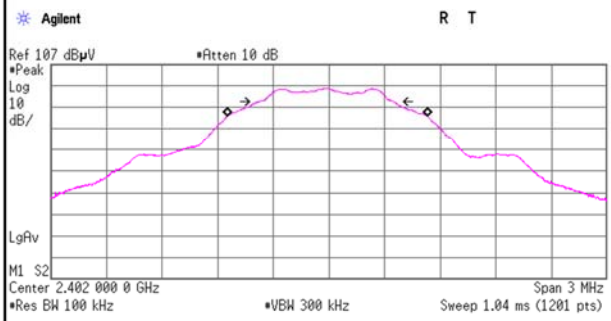
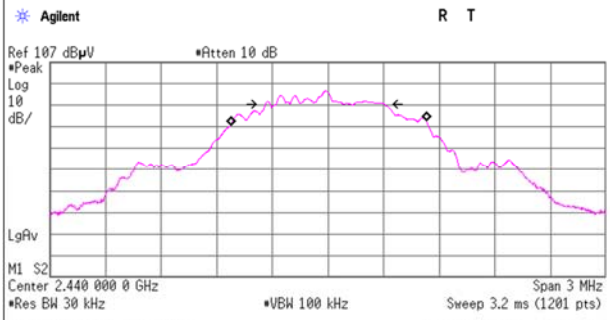
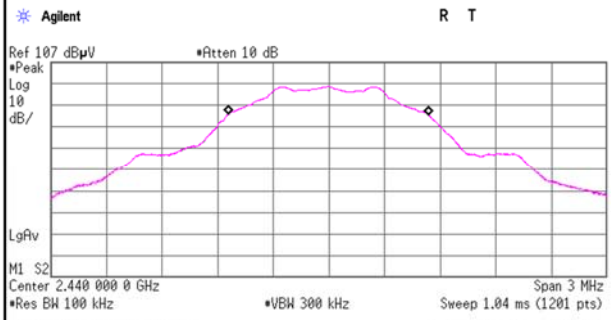
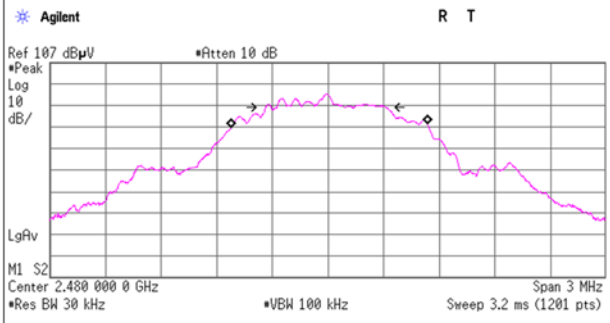
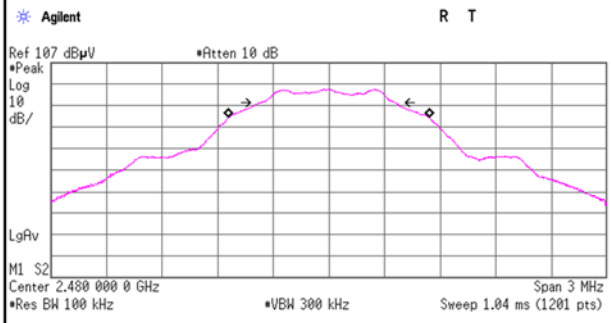
99 % Occupied Bandwidth and 6 dB Bandwidth

11n-20

99 % Occupied Bandwidth	6 dB Bandwidth
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

99 % Occupied Bandwidth and 6 dB Bandwidth

BT LE

99 % Occupied Bandwidth	6 dB Bandwidth
2402 MHz	**2402 MHz**
	
2440 MHz	**2440 MHz**
	
2480 MHz	**2480 MHz**
	

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	July 13, 2022	September 7, 2022
Temperature / Humidity	24 deg. C / 54 % RH	24 deg. C / 49 % RH
Engineer	Yusuke Tanikawara	Takahiro Kawakami
Mode	Tx	

11b

Maximum peak output power 11 Mbps (worst)

				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	4.03	1.58	9.91	15.52	35.65	30.00	1000	14.48	-1.40	14.12	25.82	36.02	4000	21.90
2437	4.53	1.59	9.91	16.03	40.09	30.00	1000	13.97	-1.40	14.63	29.04	36.02	4000	21.39
2462	4.60	1.59	9.91	16.10	40.74	30.00	1000	13.90	-1.40	14.70	29.51	36.02	4000	21.32

11g

Maximum peak output power 12 Mbps (worst)

				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	9.73	1.58	9.91	21.22	132.43	30.00	1000	8.78	-1.40	19.82	95.94	36.02	4000	16.20
2437	10.27	1.59	9.91	21.77	150.31	30.00	1000	8.23	-1.40	20.37	108.89	36.02	4000	15.65
2462	10.45	1.59	9.91	21.95	156.68	30.00	1000	8.05	-1.40	20.55	113.50	36.02	4000	15.47

11n-20

Maximum peak output power MCS 3 (worst)

				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	8.57	1.58	9.91	20.06	101.39	30.00	1000	9.94	-1.40	18.66	73.45	36.02	4000	17.36
2437	10.12	1.59	9.91	21.62	145.21	30.00	1000	8.38	-1.40	20.22	105.20	36.02	4000	15.80
2462	9.36	1.59	9.91	20.86	121.90	30.00	1000	9.14	-1.40	19.46	88.31	36.02	4000	16.56

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 13, 2022
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Yusuke Tanikawara
Mode	Tx

(Peak)

11b 2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
1	3.87	
2	4.26	
5.5	4.24	
11	4.53	*

*: Worst Rate

11g 2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	10.21	
9	10.11	
12	10.27	*
18	10.15	
24	9.65	
36	9.85	
48	10.04	
54	9.33	

*: Worst Rate

11n-20 2437 MHz

MCS	Reading [dBm]	Remark
0	10.03	
1	10.04	
2	10.08	
3	10.12	*
4	9.87	
5	9.98	
6	9.83	
7	9.79	

*: Worst Rate

Sample Calculation:
All comparisons were carried out on same frequency and measurement factors.

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	July 13, 2022	September 7, 2022
Temperature / Humidity	24 deg. C / 54 % RH	24 deg. C / 49 % RH
Engineer	Yusuke Tanikawara	Takahiro Kawakami
Mode	Tx	

11b

Average power 5.5 Mbps (worst)

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	1.06	1.58	9.91	12.55	17.99	0.23	12.78	18.97
2437	1.43	1.59	9.91	12.93	19.63	0.23	13.16	20.70
2462	1.69	1.59	9.91	13.19	20.84	0.23	13.42	21.98

11g

Average power 18 Mbps (worst)

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	0.19	1.58	9.91	11.68	14.72	0.76	12.44	17.54
2437	0.60	1.59	9.91	12.10	16.22	0.76	12.86	19.32
2462	0.72	1.59	9.91	12.22	16.67	0.76	12.98	19.86

11n-20

Average power MCS 3 (worst)

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	-2.76	1.58	9.91	8.73	7.46	1.00	9.73	9.40
2437	-0.34	1.59	9.91	11.16	13.06	1.00	12.16	16.44
2462	-2.12	1.59	9.91	9.38	8.67	1.00	10.38	10.91

Sample Calculation:

Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 13, 2022
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Yusuke Tanikawara
Mode	Tx

(Average)

11b 2437 MHz

Rate [Mbps]	Reading [dBm]	Duty Factor [dB]	Result [dBm]	Remark
1	0.87	0.04	0.91	
2	1.28	0.09	1.37	
5.5	1.43	0.23	1.66	*
11	1.12	0.43	1.55	

*: Worst Rate

11g 2437 MHz

Rate [Mbps]	Reading [dBm]	Duty Factor [dB]	Result [dBm]	Remark
6	1.06	0.28	1.34	
9	0.91	0.41	1.32	
12	0.80	0.53	1.33	
18	0.60	0.76	1.36	*
24	0.36	0.98	1.34	
36	-0.09	1.36	1.27	
48	-0.54	1.71	1.17	
54	-0.67	1.80	1.13	

*: Worst Rate

11n-20 2437 MHz

MCS	Reading [dBm]	Duty Factor [dB]	Result [dBm]	Remark
0	0.26	0.29	0.55	
1	0.01	0.56	0.57	
2	-0.18	0.81	0.63	
3	-0.34	1.00	0.66	*
4	-0.92	1.35	0.43	
5	-1.29	1.67	0.38	
6	-1.38	1.81	0.43	
7	-1.46	1.90	0.44	

*: Worst Rate

Sample Calculation:
All comparisons were carried out on same frequency and measurement factors.

Maximum Peak Output Power, Average Output Power (Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 13, 2022
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Yusuke Tanikawara
Mode	Tx

BT LE

Maximum peak output power

				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]
2402	-10.99	1.85	9.91	0.77	1.19	30.00	1000	29.24	-1.01	-0.24	0.95	36.02	4000	36.27
2440	-11.11	1.86	9.91	0.66	1.16	30.00	1000	29.35	-1.01	-0.35	0.92	36.02	4000	36.38
2480	-11.81	1.87	9.91	-0.04	0.99	30.00	1000	30.04	-1.01	-1.05	0.79	36.02	4000	37.07

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

BT LE

Average power

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-13.66	1.85	9.91	-1.91	0.64	2.01	0.11	1.02
2440	-13.79	1.86	9.91	-2.03	0.63	2.01	-0.01	1.00
2480	-14.70	1.87	9.91	-2.93	0.51	2.01	-0.91	0.81

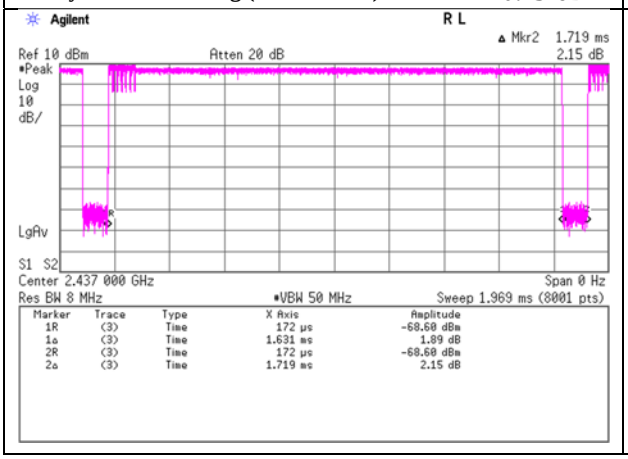
Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Result (Time average) + Duty factor

Burst rate confirmation (for Average Output Power)

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	July 12, 2022	July 16, 2022
Temperature / Humidity	26 deg. C / 35 % RH	25 deg. C / 51 % RH
Engineer	Miku Ikudome	Takahiro Kawakami
Mode	Tx	

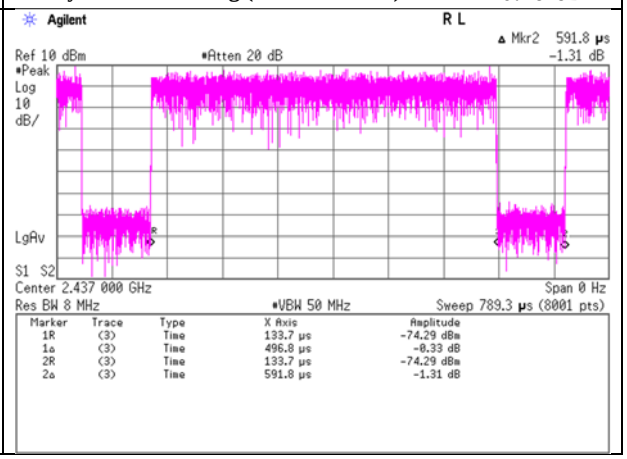
11b 5.5 Mbps

Tx on / (Tx on + Tx off) =	0.949
Tx on / (Tx on + Tx off) * 100 =	94.9 %
Duty factor = 10 * log (1.719 / 1.631) =	0.23 dB



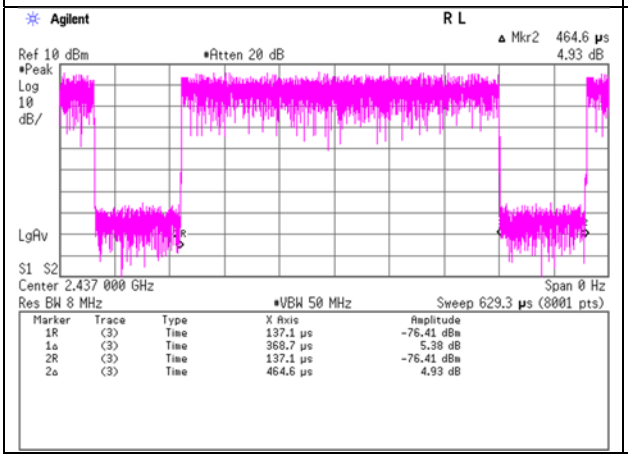
11g 18 Mbps

Tx on / (Tx on + Tx off) =	0.839
Tx on / (Tx on + Tx off) * 100 =	83.9 %
Duty factor = 10 * log (0.5918 / 0.4968) =	0.76 dB



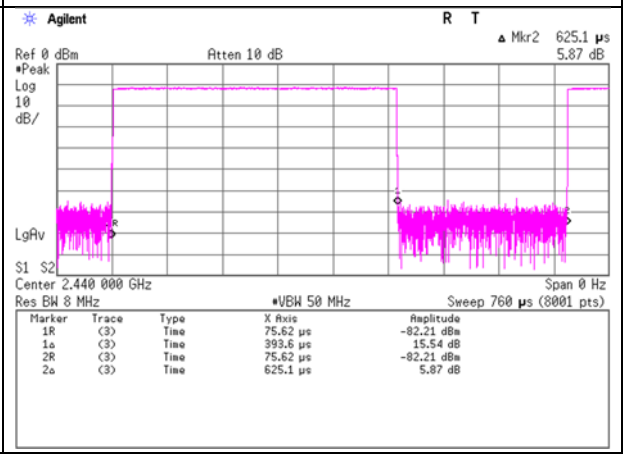
11n-20 MCS 3

Tx on / (Tx on + Tx off) =	0.794
Tx on / (Tx on + Tx off) * 100 =	79.4 %
Duty factor = 10 * log (0.4646 / 0.3687) =	1.00 dB



BT LE

Tx on / (Tx on + Tx off) =	0.630
Tx on / (Tx on + Tx off) * 100 =	63.0 %
Duty factor = 10 * log (0.6251 / 0.3936) =	2.01 dB



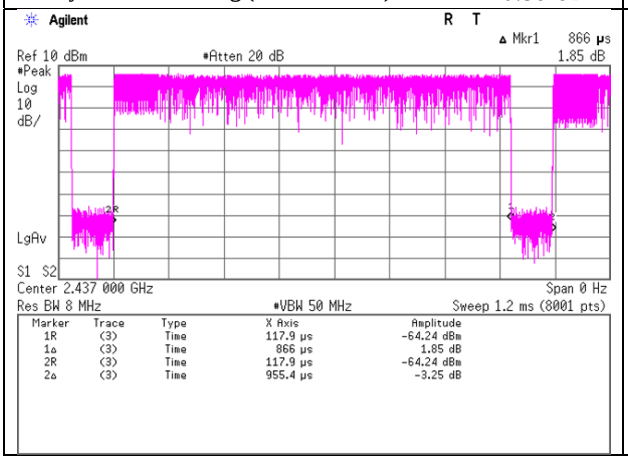
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation (for Radiated Spurious Emission)

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	July 12, 2022	July 16, 2022
Temperature / Humidity	26 deg. C / 35 % RH	25 deg. C / 51 % RH
Engineer	Miku Ikudome	Takahiro Kawakami
Mode	Tx	

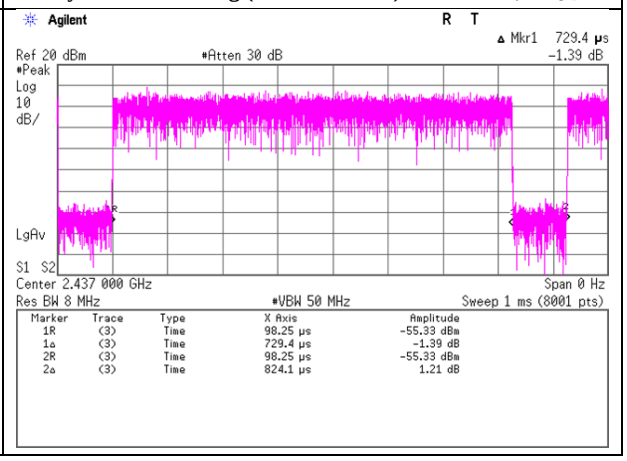
11b 11 Mbps

Tx on / (Tx on + Tx off) =	0.906
Tx on / (Tx on + Tx off) * 100 =	90.6 %
Duty factor = 20 * log (0.9554 / 0.866) =	0.86 dB



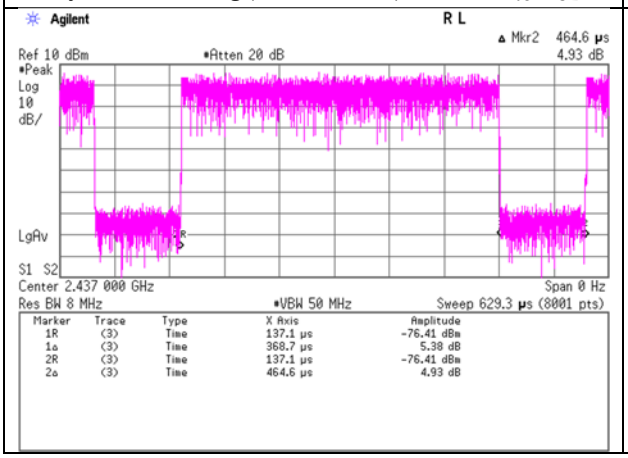
11g 12 Mbps

Tx on / (Tx on + Tx off) =	0.885
Tx on / (Tx on + Tx off) * 100 =	88.5 %
Duty factor = 20 * log (0.8241 / 0.7294) =	1.12 dB



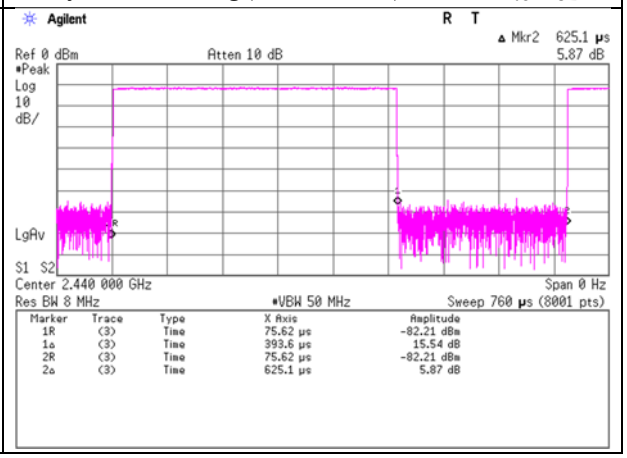
11n-20 MCS 3

Tx on / (Tx on + Tx off) =	0.794
Tx on / (Tx on + Tx off) * 100 =	79.4 %
Duty factor = 20 * log (0.4646 / 0.3687) =	2.01 dB



BT LE

Tx on / (Tx on + Tx off) =	0.630
Tx on / (Tx on + Tx off) * 100 =	63.0 %
Duty factor = 20 * log (0.6251 / 0.3936) =	4.02 dB



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

Radiated Spurious Emission

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	3	3	3
Date	July 15, 2022	July 18, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	24 deg.C, 56 %RH	23 deg.C, 59 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Akihiro Oda	Takahiro Kawakami	Takahiro Kawakami	Hiromasa Sato
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 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.	2390.000	PK	47.01	28.57	13.51	38.81	2.19	52.47	73.9	21.4	165	228	-
Hori.	3732.000	PK	52.29	29.66	6.68	42.22	2.19	48.60	73.9	25.3	263	251	-
Hori.	4481.110	PK	53.02	30.76	7.06	42.98	2.19	50.05	73.9	23.8	148	136	-
Hori.	4824.000	PK	49.55	31.57	7.27	42.86	2.19	47.72	73.9	26.1	150	0	-
Hori.	7236.000	PK	49.63	37.39	8.90	43.42	2.19	54.69	73.9	19.2	150	0	-
Hori.	9648.000	PK	49.85	38.98	10.19	43.16	2.19	58.05	73.9	15.8	150	0	-
Hori.	3732.000	AV	44.23	29.66	6.68	42.22	2.19	40.54	53.9	13.3	263	251	-
Hori.	4481.110	AV	43.60	30.76	7.06	42.98	2.19	40.63	53.9	13.2	148	136	-
Hori.	4824.000	AV	38.21	31.57	7.27	42.86	2.19	36.38	53.9	17.5	150	0	Floor noise
Hori.	7236.000	AV	38.12	37.39	8.90	43.42	2.19	43.18	53.9	10.7	150	0	Floor noise
Hori.	9648.000	AV	38.08	38.98	10.19	43.16	2.19	46.28	53.9	7.6	150	0	Floor noise
Vert.	2390.000	PK	49.97	28.57	13.51	38.81	2.19	55.43	73.9	18.4	221	209	-
Vert.	3732.320	PK	50.37	29.66	6.68	42.22	2.19	46.68	73.9	27.2	323	128	-
Vert.	4481.260	PK	52.26	30.76	7.06	42.98	2.19	49.29	73.9	24.6	249	207	-
Vert.	4824.000	PK	49.54	31.57	7.27	42.86	2.19	47.71	73.9	26.1	150	0	-
Vert.	7236.000	PK	49.63	37.39	8.90	43.42	2.19	54.69	73.9	19.2	150	0	-
Vert.	9648.000	PK	48.92	38.98	10.19	43.16	2.19	57.12	73.9	16.7	150	0	-
Vert.	3732.320	AV	41.53	29.66	6.68	42.22	2.19	37.84	53.9	16.0	323	128	-
Vert.	4481.260	AV	43.94	30.76	7.06	42.98	2.19	40.97	53.9	12.9	249	207	-
Vert.	4824.000	AV	37.84	31.57	7.27	42.86	2.19	36.01	53.9	17.8	150	0	Floor noise
Vert.	7236.000	AV	38.16	37.39	8.90	43.42	2.19	43.22	53.9	10.6	150	0	Floor noise
Vert.	9648.000	AV	38.12	38.98	10.19	43.16	2.19	46.32	53.9	**7.5**	150	0	Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 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	36.30	28.57	13.51	38.81	0.86	2.19	42.62	53.9	11.2	*1)
Vert.	2390.000	AV	38.46	28.57	13.51	38.81	0.86	2.19	44.78	53.9	9.1	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

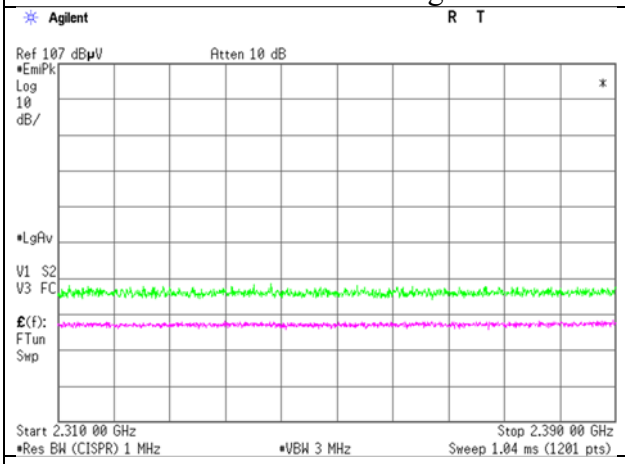
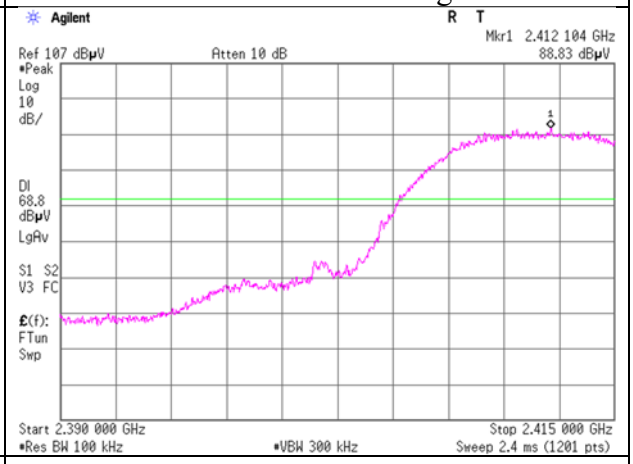
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

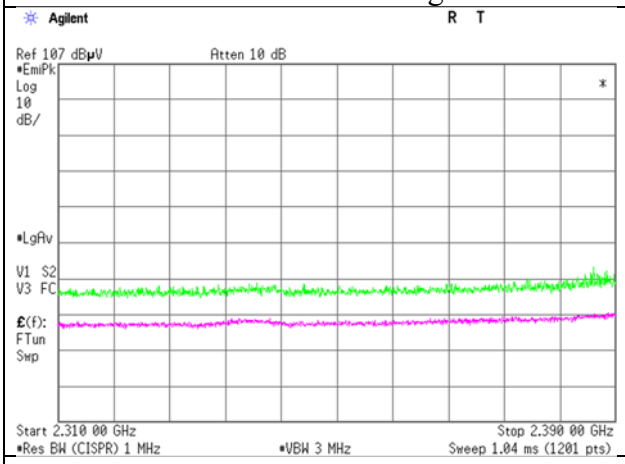
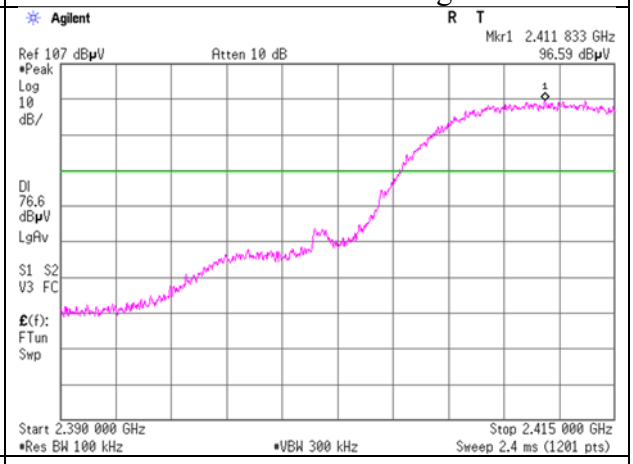
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	88.32	28.53	13.52	38.80	2.19	93.76	-	-	Carrier
Hori.	2400.000	PK	45.37	28.55	13.51	38.81	2.19	50.81	73.7	22.8	-
Hori.	2401.580	PK	50.67	28.55	13.52	38.81	2.19	56.12	73.7	17.5	-
Vert.	2412.000	PK	96.66	28.53	13.52	38.80	2.19	102.10	-	-	Carrier
Vert.	2400.000	PK	54.14	28.55	13.51	38.81	2.19	59.58	82.1	22.5	-
Vert.	2401.733	PK	59.82	28.55	13.52	38.81	2.19	65.27	82.1	16.8	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	July 15, 2022
Temperature / Humidity	24 deg.C, 56 %RH
Engineer	Akihiro Oda (1 GHz -2.8 GHz)
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

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	3	3	3
Date	July 15, 2022	July 18, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	24 deg.C, 56 %RH	23 deg.C, 59 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Akihiro Oda (1 GHz -2.8 GHz)	Takahiro Kawakami (2.8 GHz -10 GHz)	Takahiro Kawakami (10 GHz -18 GHz)	Hiromasa Sato (18 GHz -26.5 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.	3731.930	PK	53.20	29.66	6.68	42.22	2.19	49.51	73.9	24.3	179	206	-
Hori.	4482.707	PK	52.56	30.77	7.06	42.98	2.19	49.60	73.9	24.3	206	134	-
Hori.	4874.000	PK	48.41	31.63	7.30	42.84	2.19	46.69	73.9	27.2	150	0	-
Hori.	7311.000	PK	49.13	37.45	8.96	43.51	2.19	54.22	73.9	19.6	150	0	-
Hori.	9748.000	PK	48.95	39.17	10.22	43.04	2.19	57.49	73.9	16.4	150	0	-
Hori.	3731.930	AV	46.54	29.66	6.68	42.22	2.19	42.85	53.9	11.0	179	206	-
Hori.	4482.707	AV	42.95	30.77	7.06	42.98	2.19	39.99	53.9	13.9	206	134	-
Hori.	4874.000	AV	38.32	31.63	7.30	42.84	2.19	36.60	53.9	17.3	150	0	Floor noise
Hori.	7311.000	AV	38.68	37.45	8.96	43.51	2.19	43.77	53.9	10.1	150	0	Floor noise
Hori.	9748.000	AV	38.27	39.17	10.22	43.04	2.19	46.81	53.9	**7.0**	150	0	Floor noise
Vert.	3732.030	PK	50.59	29.66	6.68	42.22	2.19	46.90	73.9	27.0	287	124	-
Vert.	4481.160	PK	53.47	30.76	7.06	42.98	2.19	50.50	73.9	23.4	238	209	-
Vert.	4874.000	PK	48.92	31.63	7.30	42.84	2.19	47.20	73.9	26.7	150	0	-
Vert.	7311.000	PK	49.36	37.45	8.96	43.51	2.19	54.45	73.9	19.4	150	0	-
Vert.	9748.000	PK	49.44	39.17	10.22	43.04	2.19	57.98	73.9	15.9	150	0	-
Vert.	3732.030	AV	42.97	29.66	6.68	42.22	2.19	39.28	53.9	14.6	287	124	-
Vert.	4481.160	AV	44.58	30.76	7.06	42.98	2.19	41.61	53.9	12.2	238	209	-
Vert.	4874.000	AV	38.20	31.63	7.30	42.84	2.19	36.48	53.9	17.4	150	0	Floor noise
Vert.	7311.000	AV	38.79	37.45	8.96	43.51	2.19	43.88	53.9	10.0	150	0	Floor noise
Vert.	9748.000	AV	38.21	39.17	10.22	43.04	2.19	46.75	53.9	7.1	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	3	3	3
Date	July 15, 2022	July 18, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	24 deg.C, 56 %RH	23 deg.C, 59 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Akihiro Oda (1 GHz -2.8 GHz)	Takahiro Kawakami (2.8 GHz -10 GHz)	Takahiro Kawakami (10 GHz -18 GHz)	Hiromasa Sato (18 GHz -26.5 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	45.48	28.44	13.59	38.76	2.19	50.94	73.9	22.9	185	209	-
Hori.	3732.029	PK	52.74	29.66	6.68	42.22	2.19	49.05	73.9	24.8	176	203	-
Hori.	4482.110	PK	53.18	30.77	7.06	42.98	2.19	50.22	73.9	23.6	206	133	-
Hori.	4924.000	PK	47.59	31.71	7.32	42.81	2.19	46.00	73.9	27.9	150	0	-
Hori.	7386.000	PK	47.55	37.56	9.01	43.59	2.19	52.72	73.9	21.1	150	0	-
Hori.	9848.000	PK	48.10	39.15	10.27	42.91	2.19	56.80	73.9	17.1	150	0	-
Hori.	3732.029	AV	46.05	29.66	6.68	42.22	2.19	42.36	53.9	11.5	176	203	-
Hori.	4482.110	AV	44.03	30.77	7.06	42.98	2.19	41.07	53.9	12.8	206	133	-
Hori.	4924.000	AV	39.11	31.71	7.32	42.81	2.19	37.52	53.9	16.3	150	0	Floor noise
Hori.	7386.000	AV	38.47	37.56	9.01	43.59	2.19	43.64	53.9	10.2	150	0	Floor noise
Hori.	9848.000	AV	39.29	39.15	10.27	42.91	2.19	47.99	53.9	5.9	150	0	Floor noise
Vert.	2483.500	PK	47.25	28.44	13.59	38.76	2.19	52.71	73.9	21.1	232	221	-
Vert.	3732.036	PK	50.61	29.66	6.68	42.22	2.19	46.92	73.9	26.9	290	124	-
Vert.	4481.617	PK	53.00	30.76	7.06	42.98	2.19	50.03	73.9	23.8	235	206	-
Vert.	4924.000	PK	47.93	31.71	7.32	42.81	2.19	46.34	73.9	27.5	150	0	-
Vert.	7386.000	PK	48.23	37.56	9.01	43.59	2.19	53.40	73.9	20.5	150	0	-
Vert.	9848.000	PK	49.01	39.15	10.27	42.91	2.19	57.71	73.9	16.1	150	0	-
Vert.	3732.036	AV	43.43	29.66	6.68	42.22	2.19	39.74	53.9	14.1	290	124	-
Vert.	4481.617	AV	45.60	30.76	7.06	42.98	2.19	42.63	53.9	11.2	235	206	-
Vert.	4924.000	AV	38.86	31.71	7.32	42.81	2.19	37.27	53.9	16.6	150	0	Floor noise
Vert.	7386.000	AV	38.00	37.56	9.01	43.59	2.19	43.17	53.9	10.7	150	0	Floor noise
Vert.	9848.000	AV	39.35	39.15	10.27	42.91	2.19	48.05	53.9	**5.8**	150	0	Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 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	36.46	28.44	13.59	38.76	0.86	2.19	42.78	53.9	11.1	*1)
Vert.	2483.500	AV	37.57	28.44	13.59	38.76	0.86	2.19	43.89	53.9	10.0	*1)

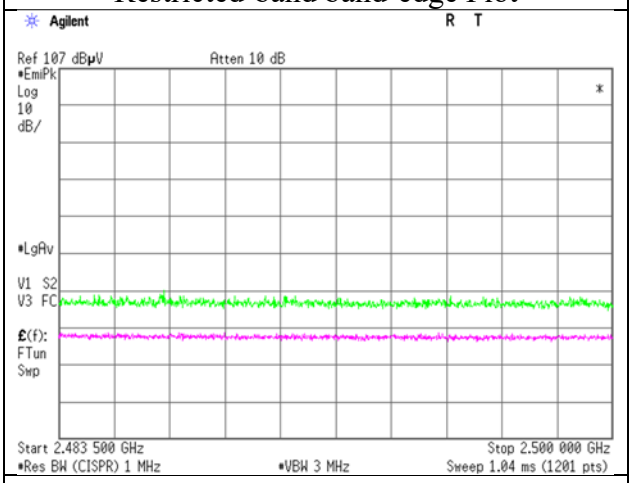
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	July 15, 2022
Temperature / Humidity	24 deg.C, 56 %RH
Engineer	Akihiro Oda (1 GHz -2.8 GHz)
Mode	Tx 11b 2462 MHz

Horizontal

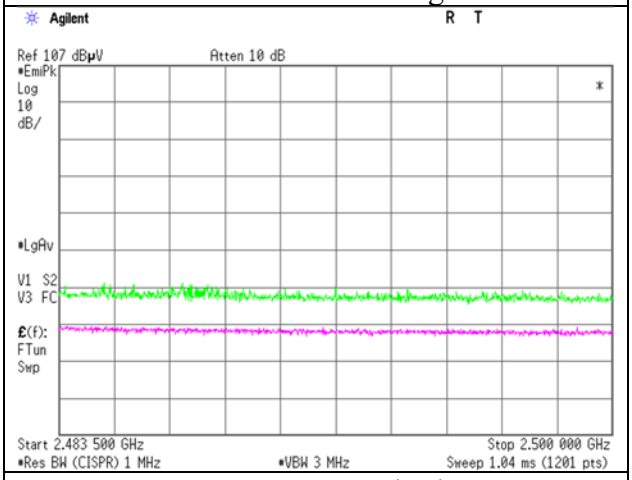
Restricted-band band-edge Plot



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

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	3	3	3
Date	July 15, 2022	July 18, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	24 deg.C, 56 %RH	23 deg.C, 59 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Akihiro Oda (1 GHz -2.8 GHz)	Takahiro Kawakami (2.8 GHz -10 GHz)	Takahiro Kawakami (10 GHz -18 GHz)	Hiromasa Sato (18 GHz -26.5 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	50.57	28.57	13.51	38.81	2.19	56.03	73.9	17.8	159	154	-
Hori.	3732.068	PK	51.87	29.66	6.68	42.22	2.19	48.18	73.9	25.7	186	205	-
Hori.	4480.344	PK	53.24	30.76	7.06	42.97	2.19	50.28	73.9	23.6	207	131	-
Hori.	4824.000	PK	49.58	31.57	7.27	42.86	2.19	47.75	73.9	26.1	150	0	-
Hori.	7236.000	PK	49.40	37.39	8.90	43.42	2.19	54.46	73.9	19.4	150	0	-
Hori.	9648.000	PK	49.30	38.98	10.19	43.16	2.19	57.50	73.9	16.4	150	0	-
Hori.	3732.068	AV	46.08	29.66	6.68	42.22	2.19	42.39	53.9	11.5	186	205	-
Hori.	4480.344	AV	43.36	30.76	7.06	42.97	2.19	40.40	53.9	13.5	207	131	-
Hori.	4824.000	AV	38.18	31.57	7.27	42.86	2.19	36.35	53.9	17.5	150	0	Floor noise
Hori.	7236.000	AV	38.57	37.39	8.90	43.42	2.19	43.63	53.9	10.2	150	0	Floor noise
Hori.	9648.000	AV	38.49	38.98	10.19	43.16	2.19	46.69	53.9	7.2	150	0	Floor noise
Vert.	2390.000	PK	56.41	28.57	13.51	38.81	2.19	61.87	73.9	12.0	213	195	-
Vert.	3732.024	PK	50.80	29.66	6.68	42.22	2.19	47.11	73.9	26.7	281	124	-
Vert.	4482.526	PK	54.10	30.77	7.06	42.98	2.19	51.14	73.9	22.7	235	207	-
Vert.	4824.000	PK	49.53	31.57	7.27	42.86	2.19	47.70	73.9	26.2	150	0	-
Vert.	7236.000	PK	50.06	37.39	8.90	43.42	2.19	55.12	73.9	18.7	150	0	-
Vert.	9648.000	PK	49.71	38.98	10.19	43.16	2.19	57.91	73.9	15.9	150	0	-
Vert.	3732.024	AV	42.83	29.66	6.68	42.22	2.19	39.14	53.9	14.7	281	124	-
Vert.	4482.526	AV	44.13	30.77	7.06	42.98	2.19	41.17	53.9	12.7	235	207	-
Vert.	4824.000	AV	38.12	31.57	7.27	42.86	2.19	36.29	53.9	17.6	150	0	Floor noise
Vert.	7236.000	AV	38.59	37.39	8.90	43.42	2.19	43.65	53.9	10.2	150	0	Floor noise
Vert.	9648.000	AV	38.58	38.98	10.19	43.16	2.19	46.78	53.9	7.1	150	0	Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 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	38.95	28.57	13.51	38.81	1.12	2.19	45.53	53.9	8.3	*1)
Vert.	2390.000	AV	44.44	28.57	13.51	38.81	1.12	2.19	51.02	53.9	**2.8**	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

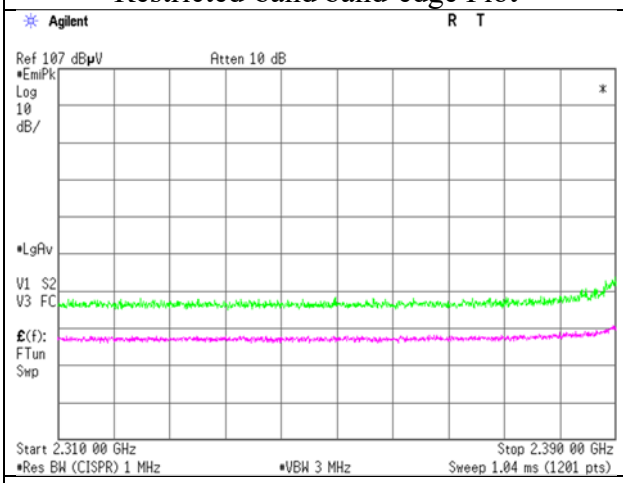
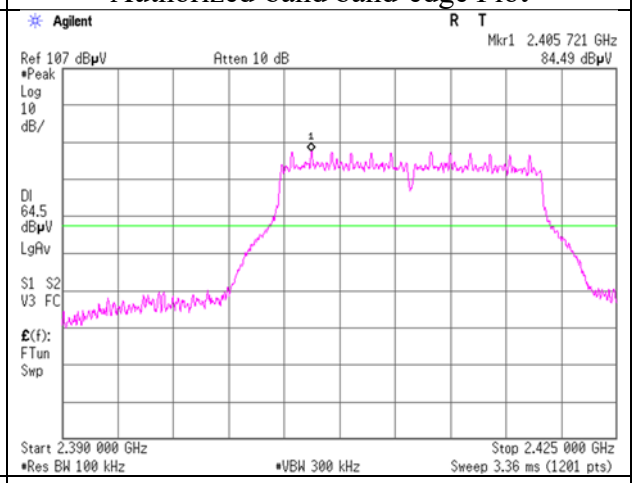
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

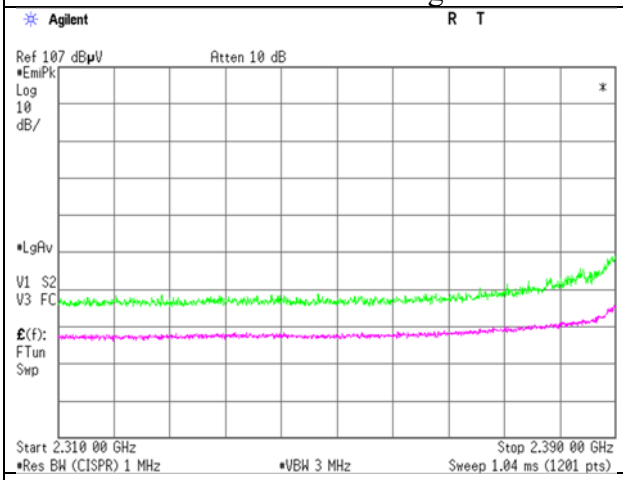
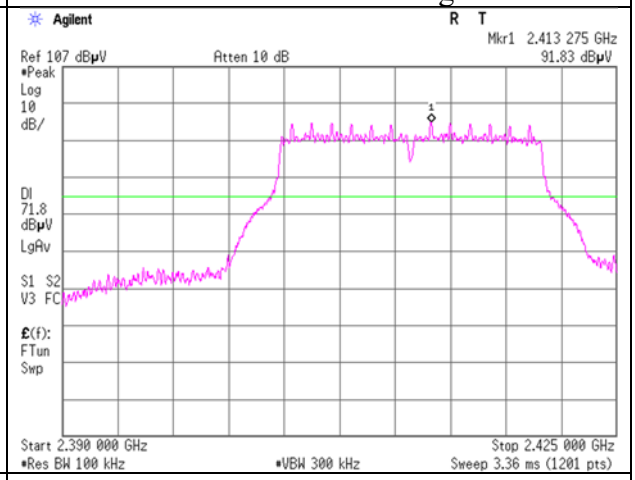
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	84.35	28.53	13.52	38.80	2.19	89.79	-	-	Carrier
Hori.	2400.000	PK	44.78	28.55	13.51	38.81	2.19	50.22	69.7	19.4	-
Vert.	2412.000	PK	91.64	28.53	13.52	38.80	2.19	97.08	-	-	Carrier
Vert.	2400.000	PK	51.16	28.55	13.51	38.81	2.19	56.60	77.0	20.4	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	July 15, 2022
Temperature / Humidity	24 deg.C, 56 %RH
Engineer	Akihiro Oda (1 GHz -2.8 GHz)
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

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	3	3	3
Date	July 15, 2022	July 18, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	24 deg.C, 56 %RH	23 deg.C, 59 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Akihiro Oda (1 GHz -2.8 GHz)	Takahiro Kawakami (2.8 GHz -10 GHz)	Takahiro Kawakami (10 GHz -18 GHz)	Hiromasa Sato (18 GHz -26.5 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.	3732.026	PK	52.73	29.66	6.68	42.22	2.19	49.04	73.9	24.8	186	206	-
Hori.	4482.180	PK	53.54	30.77	7.06	42.98	2.19	50.58	73.9	23.3	204	136	-
Hori.	4874.000	PK	48.31	31.63	7.30	42.84	2.19	46.59	73.9	27.3	150	0	-
Hori.	7311.000	PK	48.88	37.45	8.96	43.51	2.19	53.97	73.9	19.9	150	0	-
Hori.	9748.000	PK	49.00	39.17	10.22	43.04	2.19	57.54	73.9	16.3	150	0	-
Hori.	3732.026	AV	45.78	29.66	6.68	42.22	2.19	42.09	53.9	11.8	186	206	-
Hori.	4482.180	AV	44.67	30.77	7.06	42.98	2.19	41.71	53.9	12.1	204	136	-
Hori.	4874.000	AV	38.89	31.63	7.30	42.84	2.19	37.17	53.9	16.7	150	0	Floor noise
Hori.	7311.000	AV	39.43	37.45	8.96	43.51	2.19	44.52	53.9	9.3	150	0	Floor noise
Hori.	9748.000	AV	38.82	39.17	10.22	43.04	2.19	47.36	53.9	6.5	150	0	Floor noise
Vert.	3732.036	PK	50.41	29.66	6.68	42.22	2.19	46.72	73.9	27.1	291	125	-
Vert.	4480.772	PK	53.32	30.76	7.06	42.98	2.19	50.35	73.9	23.5	239	209	-
Vert.	4874.000	PK	48.70	31.63	7.30	42.84	2.19	46.98	73.9	26.9	150	0	-
Vert.	7311.000	PK	49.10	37.45	8.96	43.51	2.19	54.19	73.9	19.7	150	0	-
Vert.	9748.000	PK	48.77	39.17	10.22	43.04	2.19	57.31	73.9	16.5	150	0	-
Vert.	3732.036	AV	42.95	29.66	6.68	42.22	2.19	39.26	53.9	14.6	291	125	-
Vert.	4480.772	AV	44.87	30.76	7.06	42.98	2.19	41.90	53.9	12.0	239	209	-
Vert.	4874.000	AV	39.06	31.63	7.30	42.84	2.19	37.34	53.9	16.5	150	0	Floor noise
Vert.	7311.000	AV	39.21	37.45	8.96	43.51	2.19	44.30	53.9	9.6	150	0	Floor noise
Vert.	9748.000	AV	39.03	39.17	10.22	43.04	2.19	47.57	53.9	**6.3**	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	3	2	3	3	3
Date	September 5, 2022	July 15, 2022	July 18, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	24 deg.C, 38 %RH	24 deg.C, 56 %RH	23 deg.C, 59 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Yosuke Murakami (30 MHz -1 GHz)	Akihiro Oda (1 GHz -2.8 GHz)	Takahiro Kawakami (2.8 GHz -10 GHz)	Takahiro Kawakami (10 GHz -18 GHz)	Hiromasa Sato (18 GHz -26.5 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.	147.455	QP	45.40	14.70	7.74	32.07	0.00	35.77	43.5	7.7	223	89	-
Hori.	165.886	QP	36.90	15.40	7.87	32.05	0.00	28.12	43.5	15.3	189	280	-
Hori.	540.002	QP	36.30	17.72	9.68	31.94	0.00	31.76	46.0	14.2	100	211	-
Hori.	705.668	QP	31.30	19.93	10.32	31.83	0.00	29.72	46.0	16.2	141	156	-
Hori.	900.004	QP	34.60	22.06	10.95	30.96	0.00	36.65	46.0	9.3	116	152	-
Hori.	933.004	QP	38.70	21.97	11.06	30.77	0.00	40.96	46.0	5.0	100	152	-
Hori.	2483.500	PK	52.14	28.44	13.59	38.76	2.19	57.60	73.9	16.3	192	207	-
Hori.	2484.435	PK	54.21	28.44	13.59	38.76	2.19	59.67	73.9	14.2	192	207	-
Hori.	3732.051	PK	51.67	29.66	6.68	42.22	2.19	47.98	73.9	25.9	175	203	-
Hori.	4480.930	PK	53.03	30.76	7.06	42.98	2.19	50.06	73.9	23.8	206	135	-
Hori.	4924.000	PK	48.79	31.71	7.32	42.81	2.19	47.20	73.9	26.7	150	0	-
Hori.	7386.000	PK	47.95	37.56	9.01	43.59	2.19	53.12	73.9	20.7	150	0	-
Hori.	9848.000	PK	48.03	39.15	10.27	42.91	2.19	56.73	73.9	17.1	150	0	-
Hori.	3732.051	AV	45.51	29.66	6.68	42.22	2.19	41.82	53.9	12.0	175	203	-
Hori.	4480.930	AV	43.32	30.76	7.06	42.98	2.19	40.35	53.9	13.5	206	135	-
Hori.	4924.000	AV	38.69	31.71	7.32	42.81	2.19	37.10	53.9	16.8	150	0	Floor noise
Hori.	7386.000	AV	37.89	37.56	9.01	43.59	2.19	43.06	53.9	10.8	150	0	Floor noise
Hori.	9848.000	AV	37.84	39.15	10.27	42.91	2.19	46.54	53.9	7.3	150	0	Floor noise
Vert.	147.455	QP	37.30	14.70	7.74	32.07	0.00	27.67	43.5	15.8	100	23	-
Vert.	650.003	QP	30.40	19.18	10.09	31.88	0.00	27.79	46.0	18.2	100	168	-
Vert.	705.650	QP	32.10	19.93	10.32	31.83	0.00	30.52	46.0	15.4	100	338	-
Vert.	900.004	QP	32.40	22.06	10.95	30.96	0.00	34.45	46.0	11.5	100	49	-
Vert.	933.004	QP	42.00	21.97	11.06	30.77	0.00	44.26	46.0	**1.7**	100	357	-
Vert.	2483.500	PK	55.75	28.44	13.59	38.76	2.19	61.21	73.9	12.6	196	201	-
Vert.	2484.412	PK	56.52	28.44	13.59	38.76	2.19	61.98	73.9	11.9	196	201	-
Vert.	3732.027	PK	50.50	29.66	6.68	42.22	2.19	46.81	73.9	27.0	288	128	-
Vert.	4482.862	PK	53.21	30.77	7.06	42.98	2.19	50.25	73.9	23.6	234	205	-
Vert.	4924.000	PK	49.07	31.71	7.32	42.81	2.19	47.48	73.9	26.4	150	0	-
Vert.	7386.000	PK	47.96	37.56	9.01	43.59	2.19	53.13	73.9	20.7	150	0	-
Vert.	9848.000	PK	48.27	39.15	10.27	42.91	2.19	56.97	73.9	16.9	150	0	-
Vert.	3732.027	AV	42.84	29.66	6.68	42.22	2.19	39.15	53.9	14.7	288	128	-
Vert.	4482.862	AV	45.03	30.77	7.06	42.98	2.19	42.07	53.9	11.8	234	205	-
Vert.	4924.000	AV	38.30	31.71	7.32	42.81	2.19	36.71	53.9	17.1	150	0	Floor noise
Vert.	7386.000	AV	37.97	37.56	9.01	43.59	2.19	43.14	53.9	10.7	150	0	Floor noise
Vert.	9848.000	AV	37.79	39.15	10.27	42.91	2.19	46.49	53.9	7.4	150	0	Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 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	40.86	28.44	13.59	38.76	1.12	2.19	47.44	53.9	6.4	*1)
Hori.	2484.435	AV	40.99	28.44	13.59	38.76	1.12	2.19	47.57	53.9	6.3	-
Vert.	2483.500	AV	42.79	28.44	13.59	38.76	1.12	2.19	49.37	53.9	4.5	*1)
Vert.	2484.412	AV	41.46	28.44	13.59	38.76	1.12	2.19	48.04	53.9	5.8	-

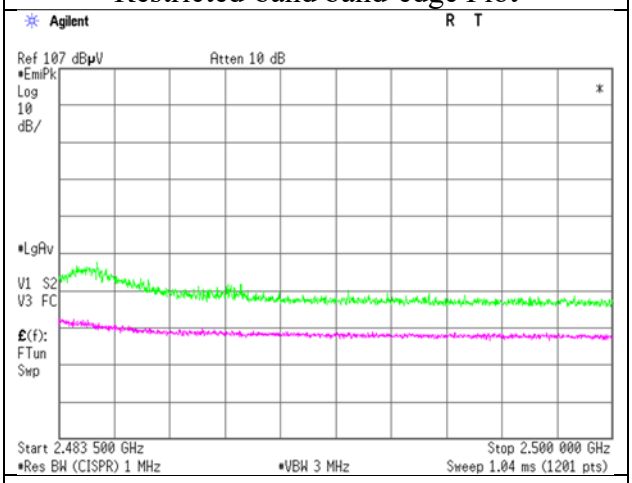
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	July 15, 2022
Temperature / Humidity	24 deg.C, 56 %RH
Engineer	Akihiro Oda (1 GHz -2.8 GHz)
Mode	Tx 11g 2462 MHz

Horizontal

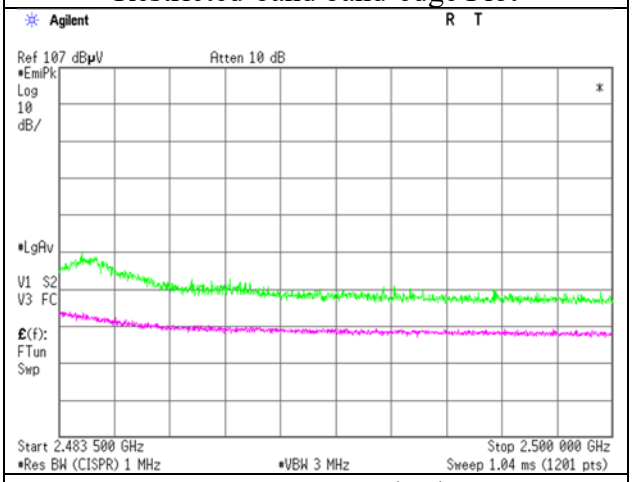
Restricted-band band-edge Plot



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

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	September 2, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	22 deg.C, 50 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Takahiro Kawakami (1 GHz -10 GHz)	Takahiro Kawakami (10 GHz -18 GHz)	Hiromasa Sato (18 GHz -26.5 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.	2390.000	PK	56.15	28.18	14.56	41.63	2.19	59.45	73.9	14.4	154	180	-
Hori.	3731.959	PK	53.34	29.66	6.68	42.22	2.19	49.65	73.9	24.2	208	223	-
Hori.	4479.424	PK	52.91	30.76	7.06	42.97	2.19	49.95	73.9	23.9	188	134	-
Hori.	4824.000	PK	49.15	31.57	7.27	42.86	2.19	47.32	73.9	26.5	150	0	-
Hori.	7236.000	PK	49.70	37.39	8.90	43.42	2.19	54.76	73.9	19.1	150	0	-
Hori.	9648.000	PK	49.31	38.98	10.19	43.16	2.19	57.51	73.9	16.3	150	0	-
Hori.	3731.959	AV	47.01	29.66	6.68	42.22	2.19	43.32	53.9	10.5	208	223	-
Hori.	4479.424	AV	44.16	30.76	7.06	42.97	2.19	41.20	53.9	12.7	188	134	-
Hori.	4824.000	AV	39.14	31.57	7.27	42.86	2.19	37.31	53.9	16.5	150	0	Floor noise
Hori.	7236.000	AV	39.64	37.39	8.90	43.42	2.19	44.70	53.9	9.2	150	0	Floor noise
Hori.	9648.000	AV	39.87	38.98	10.19	43.16	2.19	48.07	53.9	5.8	150	0	Floor noise
Vert.	2390.000	PK	63.05	28.18	14.56	41.63	2.19	66.35	73.9	7.5	329	205	-
Vert.	3732.031	PK	53.87	29.66	6.68	42.22	2.19	50.18	73.9	23.7	154	135	-
Vert.	4479.535	PK	52.37	30.76	7.06	42.97	2.19	49.41	73.9	24.4	154	134	-
Vert.	4824.000	PK	48.20	31.57	7.27	42.86	2.19	46.37	73.9	27.5	150	0	-
Vert.	7236.000	PK	48.53	37.39	8.90	43.42	2.19	53.59	73.9	20.3	150	0	-
Vert.	9648.000	PK	48.43	38.98	10.19	43.16	2.19	56.63	73.9	17.2	150	0	-
Vert.	3732.031	AV	44.73	29.66	6.68	42.22	2.19	41.04	53.9	12.8	154	135	-
Vert.	4479.535	AV	44.69	30.76	7.06	42.97	2.19	41.73	53.9	12.1	154	134	-
Vert.	4824.000	AV	39.05	31.57	7.27	42.86	2.19	37.22	53.9	16.6	150	0	Floor noise
Vert.	7236.000	AV	39.07	37.39	8.90	43.42	2.19	44.13	53.9	9.7	150	0	Floor noise
Vert.	9648.000	AV	39.37	38.98	10.19	43.16	2.19	47.57	53.9	6.3	150	0	Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 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	41.45	28.18	14.56	41.63	2.01	2.19	46.76	53.9	7.1	*1)
Vert.	2390.000	AV	45.72	28.18	14.56	41.63	2.01	2.19	51.03	53.9	**2.8**	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

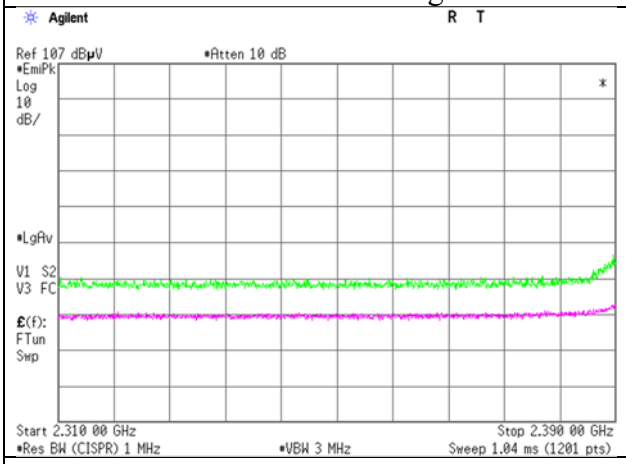
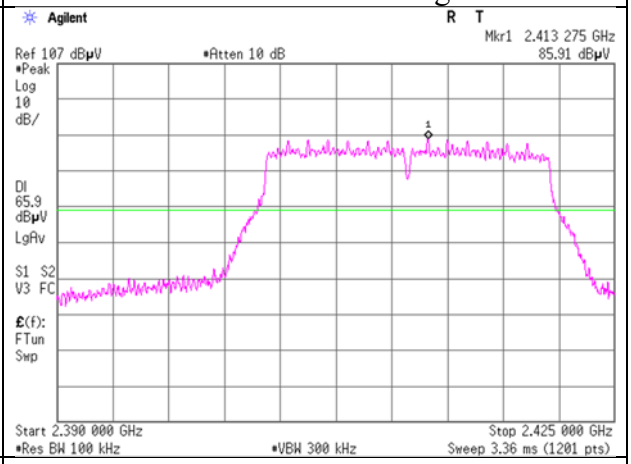
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

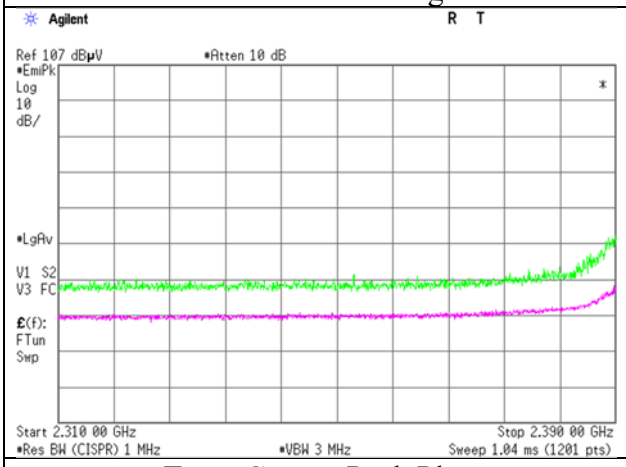
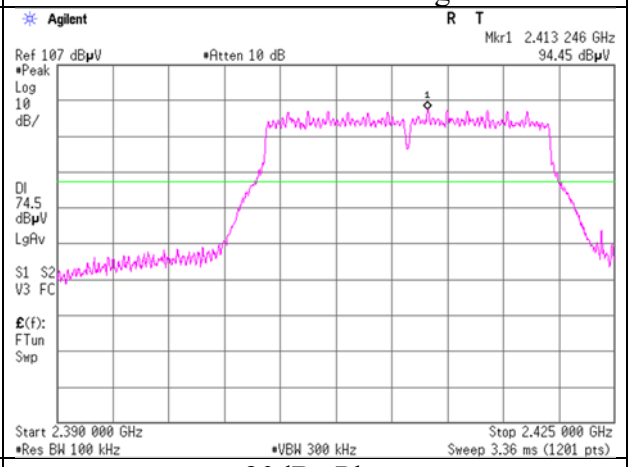
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	85.65	28.15	14.59	41.64	2.19	88.94	-	-	Carrier
Hori.	2400.000	PK	47.55	28.17	14.58	41.64	2.19	50.85	68.9	18.0	-
Vert.	2412.000	PK	94.18	28.15	14.59	41.64	2.19	97.47	-	-	Carrier
Vert.	2400.000	PK	54.71	28.17	14.58	41.64	2.19	58.01	77.4	19.3	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	September 2, 2022
Temperature / Humidity	22 deg.C, 50 %RH
Engineer	Takahiro Kawakami (1 GHz -2.8 GHz)
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

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	September 2, 2022
Temperature / Humidity	22 deg.C, 50 %RH
Engineer	Takahiro Kawakami (1 GHz -2.8 GHz)
Mode	Tx 11n-20 2417 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	59.60	28.18	14.56	41.63	2.19	62.90	73.9	11.0	192	184	-
Vert.	2390.000	PK	67.49	28.18	14.56	41.63	2.19	70.79	73.9	3.1	241	206	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 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	40.26	28.18	14.56	41.63	2.01	2.19	45.57	53.9	8.3	*1)
Vert.	2390.000	AV	45.61	28.18	14.56	41.63	2.01	2.19	50.92	53.9	**2.9**	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

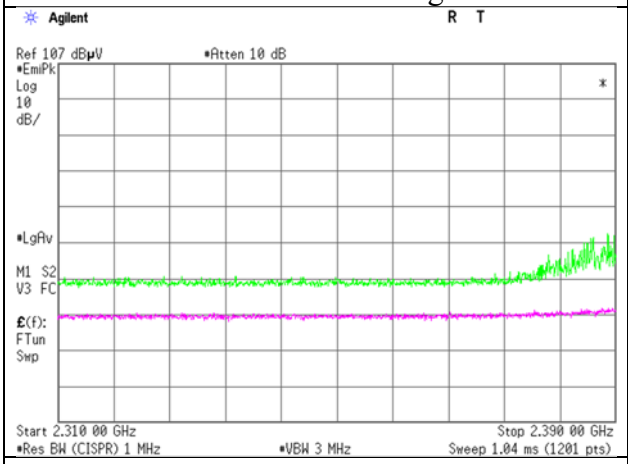
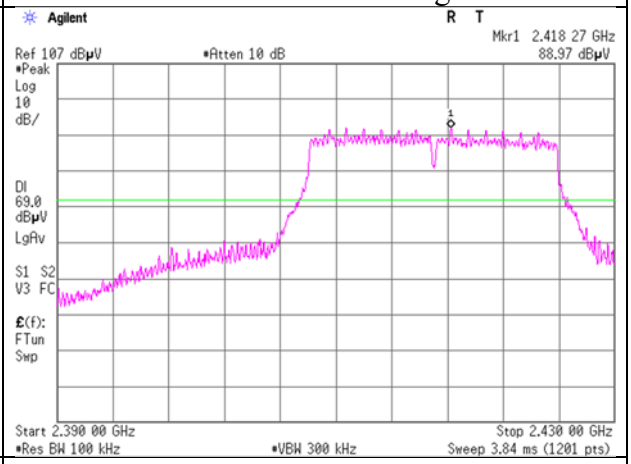
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

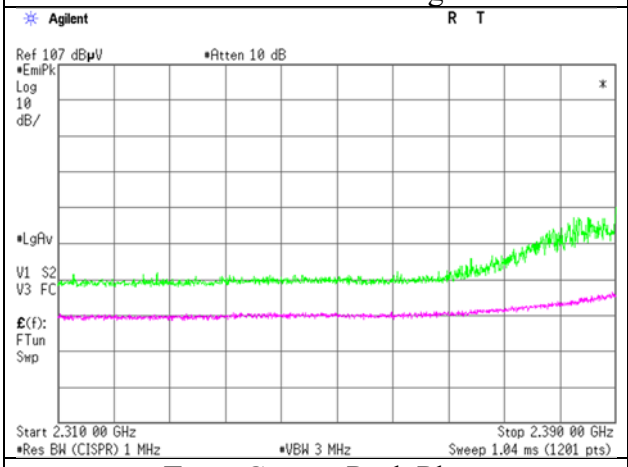
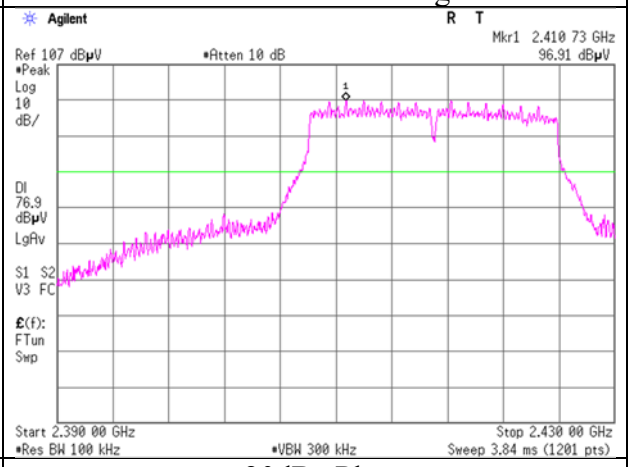
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2417.000	PK	88.66	28.14	14.59	41.65	2.19	91.93	-	-	Carrier
Hori.	2400.000	PK	52.81	28.17	14.58	41.64	2.19	56.11	71.9	15.7	-
Vert.	2417.000	PK	96.62	28.14	14.59	41.65	2.19	99.89	-	-	Carrier
Vert.	2400.000	PK	59.80	28.17	14.58	41.64	2.19	63.10	79.8	16.7	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	September 2, 2022
Temperature / Humidity	22 deg.C, 50 %RH
Engineer	Takahiro Kawakami (1 GHz -2.8 GHz)
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

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	3	3	3
Date	July 15, 2022	July 18, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	24 deg.C, 56 %RH	23 deg.C, 59 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Akihiro Oda (1 GHz -2.8 GHz)	Takahiro Kawakami (2.8 GHz -10 GHz)	Takahiro Kawakami (10 GHz -18 GHz)	Hiromasa Sato (18 GHz -26.5 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.	3731.953	PK	52.30	29.66	6.68	42.22	2.19	48.61	73.9	25.2	191	206	-
Hori.	4481.733	PK	53.23	30.77	7.06	42.98	2.19	50.27	73.9	23.6	204	132	-
Hori.	4874.000	PK	48.28	31.63	7.30	42.84	2.19	46.56	73.9	27.3	150	0	-
Hori.	7311.000	PK	49.32	37.45	8.96	43.51	2.19	54.41	73.9	19.4	150	0	-
Hori.	9748.000	PK	48.69	39.17	10.22	43.04	2.19	57.23	73.9	16.6	150	0	-
Hori.	3731.953	AV	45.78	29.66	6.68	42.22	2.19	42.09	53.9	11.8	191	206	-
Hori.	4481.733	AV	44.01	30.77	7.06	42.98	2.19	41.05	53.9	12.8	204	132	-
Hori.	4874.000	AV	38.05	31.63	7.30	42.84	2.19	36.33	53.9	17.5	150	0	Floor noise
Hori.	7311.000	AV	38.47	37.45	8.96	43.51	2.19	43.56	53.9	10.3	150	0	Floor noise
Hori.	9748.000	AV	38.23	39.17	10.22	43.04	2.19	46.77	53.9	7.1	150	0	Floor noise
Vert.	3732.024	PK	51.95	29.66	6.68	42.22	2.19	48.26	73.9	25.6	292	126	-
Vert.	4480.809	PK	53.02	30.76	7.06	42.98	2.19	50.05	73.9	23.8	229	208	-
Vert.	4874.000	PK	49.17	31.63	7.30	42.84	2.19	47.45	73.9	26.4	150	0	-
Vert.	7311.000	PK	49.19	37.45	8.96	43.51	2.19	54.28	73.9	19.6	150	0	-
Vert.	9748.000	PK	49.32	39.17	10.22	43.04	2.19	57.86	73.9	16.0	150	0	-
Vert.	3732.024	AV	42.70	29.66	6.68	42.22	2.19	39.01	53.9	14.8	292	126	-
Vert.	4480.809	AV	44.81	30.76	7.06	42.98	2.19	41.84	53.9	12.0	229	208	-
Vert.	4874.000	AV	38.17	31.63	7.30	42.84	2.19	36.45	53.9	17.4	150	0	Floor noise
Vert.	7311.000	AV	38.88	37.45	8.96	43.51	2.19	43.97	53.9	9.9	150	0	Floor noise
Vert.	9748.000	AV	38.28	39.17	10.22	43.04	2.19	46.82	53.9	**7.0**	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	September 2, 2022
Temperature / Humidity	22 deg.C, 50 %RH
Engineer	Takahiro Kawakami (1 GHz -2.8 GHz)
Mode	Tx 11n-20 2457 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	58.58	28.08	14.68	41.68	2.19	61.85	73.9	12.0	148	209	-
Vert.	2483.500	PK	62.23	28.08	14.68	41.68	2.19	65.50	73.9	8.4	226	173	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 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	40.84	28.08	14.68	41.68	2.01	2.19	46.12	53.9	7.7	*1)
Vert.	2483.500	AV	43.25	28.08	14.68	41.68	2.01	2.19	48.53	53.9	5.3	*1)

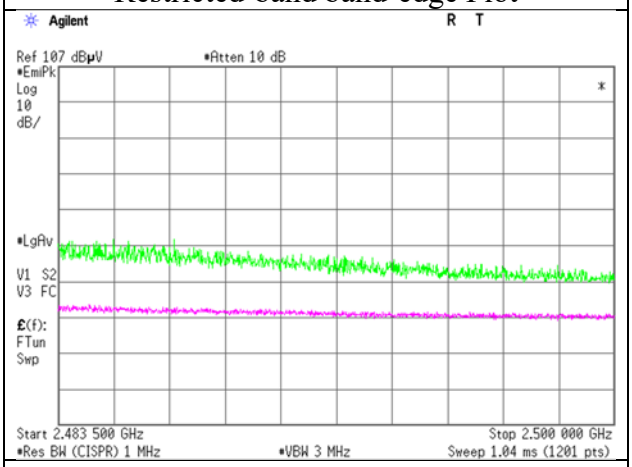
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	September 2, 2022
Temperature / Humidity	22 deg.C, 50 %RH
Engineer	Takahiro Kawakami (1 GHz -2.8 GHz)
Mode	Tx 11n-20 2457 MHz

Horizontal

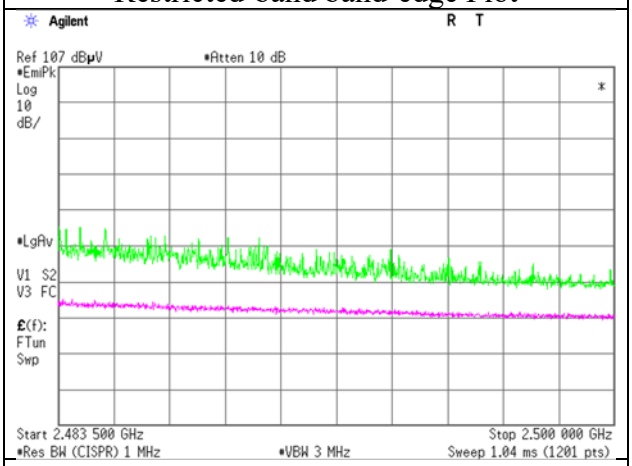
Restricted-band band-edge Plot



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

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	September 2, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	22 deg.C, 50 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Takahiro Kawakami (1 GHz -10 GHz)	Takahiro Kawakami (10 GHz -18 GHz)	Hiromasa Sato (18 GHz -26.5 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	58.83	28.08	14.68	41.68	2.19	62.10	73.9	11.8	245	215	-
Hori.	3731.948	PK	53.28	29.66	6.68	42.22	2.19	49.59	73.9	24.3	198	230	-
Hori.	4480.145	PK	52.16	30.76	7.06	42.97	2.19	49.20	73.9	24.7	187	132	-
Hori.	4924.000	PK	48.70	31.71	7.32	42.81	2.19	47.11	73.9	26.7	150	0	-
Hori.	7386.000	PK	47.93	37.56	9.01	43.59	2.19	53.10	73.9	20.8	150	0	-
Hori.	9848.000	PK	48.01	39.15	10.27	42.91	2.19	56.71	73.9	17.1	150	0	-
Hori.	3731.948	AV	45.79	29.66	6.68	42.22	2.19	42.10	53.9	11.8	198	230	-
Hori.	4480.145	AV	44.20	30.76	7.06	42.97	2.19	41.24	53.9	12.6	187	132	-
Hori.	4924.000	AV	38.88	31.71	7.32	42.81	2.19	37.29	53.9	16.6	150	0	Floor noise
Hori.	7386.000	AV	38.74	37.56	9.01	43.59	2.19	43.91	53.9	9.9	150	0	Floor noise
Hori.	9848.000	AV	39.54	39.15	10.27	42.91	2.19	48.24	53.9	5.6	150	0	Floor noise
Vert.	2483.500	PK	63.08	28.08	14.68	41.68	2.19	66.35	73.9	7.5	149	166	-
Vert.	3732.010	PK	52.35	29.66	6.68	42.22	2.19	48.66	73.9	25.2	285	52	-
Vert.	4480.002	PK	53.01	30.76	7.06	42.97	2.19	50.05	73.9	23.8	216	207	-
Vert.	4924.000	PK	48.71	31.71	7.32	42.81	2.19	47.12	73.9	26.7	150	0	-
Vert.	7386.000	PK	48.73	37.56	9.01	43.59	2.19	53.90	73.9	20.0	150	0	-
Vert.	9848.000	PK	48.47	39.15	10.27	42.91	2.19	57.17	73.9	16.7	150	0	-
Vert.	3732.010	AV	45.27	29.66	6.68	42.22	2.19	41.58	53.9	12.3	285	52	-
Vert.	4480.002	AV	44.49	30.76	7.06	42.97	2.19	41.53	53.9	12.3	216	207	-
Vert.	4924.000	AV	39.00	31.71	7.32	42.81	2.19	37.41	53.9	16.4	150	0	Floor noise
Vert.	7386.000	AV	39.00	37.56	9.01	43.59	2.19	44.17	53.9	9.7	150	0	Floor noise
Vert.	9848.000	AV	39.41	39.15	10.27	42.91	2.19	48.11	53.9	5.7	150	0	Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 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	40.73	28.08	14.68	41.68	2.01	2.19	46.01	53.9	7.8	*1)
Vert.	2483.500	AV	47.38	28.08	14.68	41.68	2.01	2.19	52.66	53.9	**1.2**	*1)

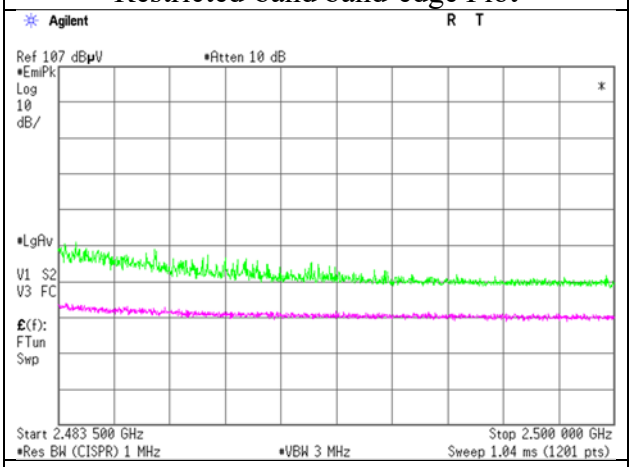
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	September 2, 2022
Temperature / Humidity	22 deg.C, 50 %RH
Engineer	Takahiro Kawakami (1 GHz -2.8 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

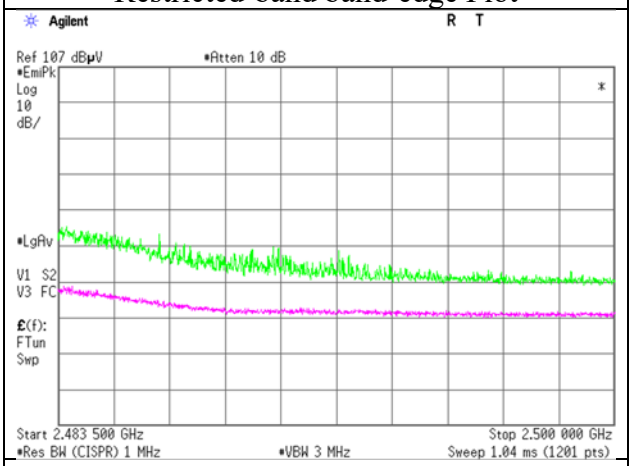
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

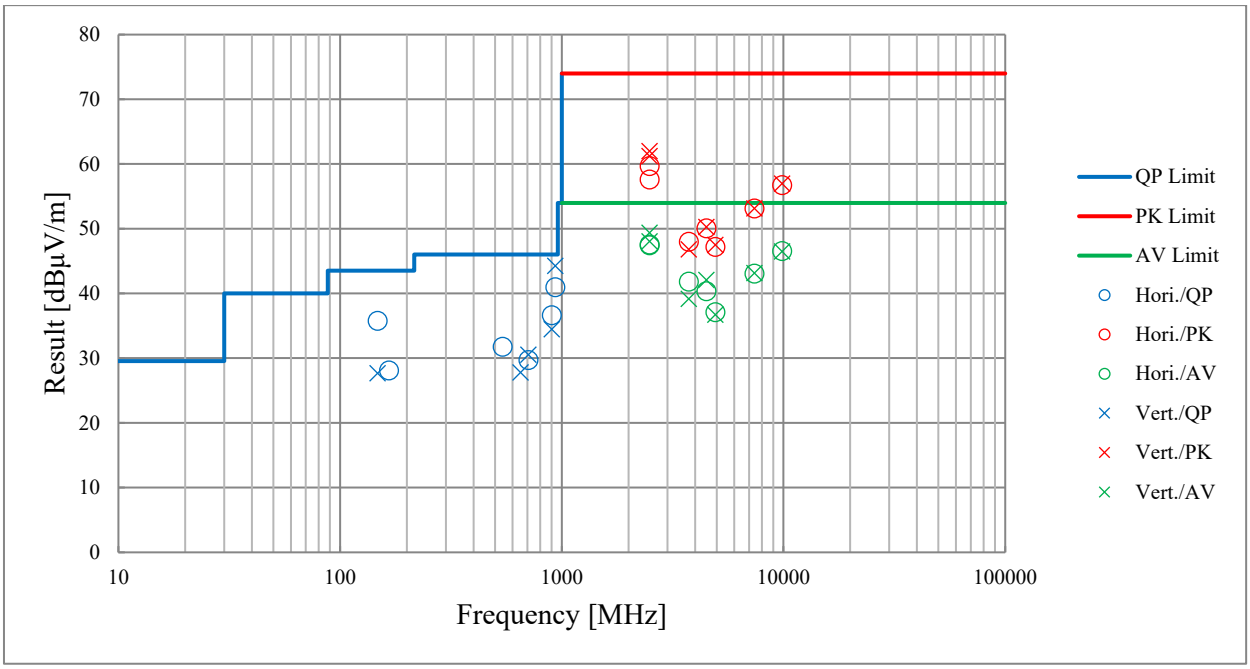


Trace Green : Peak Plot
Trace Purple : Average Plot

* 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 mode for Maximum Peak Output Power)

Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	3	2	3	3	3
Date	September 5, 2022	July 15, 2022	July 18, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	24 deg.C, 38 %RH	24 deg.C, 56 %RH	23 deg.C, 59 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Yosuke Murakami (30 MHz -1 GHz)	Akihiro Oda (1 GHz -2.8 GHz)	Takahiro Kawakami (2.8 GHz -10 GHz)	Takahiro Kawakami (10 GHz -18 GHz)	Hiromasa Sato (18 GHz -26.5 GHz)
Mode	Tx 11g 2462 MHz				



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

Radiated Spurious Emission

Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	3	2	2	3	3
Date	September 5, 2022	July 15, 2022	July 17, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	24 deg.C, 38 %RH	24 deg.C, 56 %RH	22 deg.C, 67 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Yosuke Murakami (30 MHz -1 GHz)	Akihiro Oda (1 GHz -2.8 GHz)	Hiromasa Sato (2.8 GHz -10 GHz)	Takahiro Kawakami (10 GHz -18 GHz)	Hiromasa Sato (18 GHz -26.5 GHz)
Mode	Tx BT LE 2402 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.	147.455	QP	45.20	14.70	7.74	32.07	0.00	35.57	43.5	7.9	222	86	-
Hori.	165.887	QP	36.30	15.40	7.87	32.05	0.00	27.52	43.5	15.9	191	269	-
Hori.	294.908	QP	38.90	13.61	8.57	31.95	0.00	29.13	46.0	16.8	117	289	-
Hori.	340.989	QP	38.90	14.84	8.81	31.92	0.00	30.63	46.0	15.3	100	317	-
Hori.	350.002	QP	37.50	15.03	8.86	31.91	0.00	29.48	46.0	16.5	100	323	-
Hori.	933.007	QP	38.10	21.97	11.06	30.77	0.00	40.36	46.0	5.6	105	149	-
Hori.	2390.000	PK	44.74	28.57	13.51	38.81	2.19	50.20	73.9	23.7	125	126	-
Hori.	3732.013	PK	47.98	30.00	6.23	38.29	2.19	48.11	73.9	25.7	194	103	-
Hori.	4481.163	PK	47.12	31.12	6.58	38.47	2.19	48.54	73.9	25.3	204	156	-
Hori.	4804.000	PK	43.64	31.90	6.76	38.64	2.19	45.85	73.9	28.0	150	0	-
Hori.	7206.000	PK	44.88	37.57	8.33	39.24	2.19	53.73	73.9	20.1	150	0	-
Hori.	9608.000	PK	44.29	38.87	9.56	39.81	2.19	55.10	73.9	18.8	150	0	-
Hori.	3732.013	AV	42.08	30.00	6.23	38.29	2.19	42.21	53.9	11.6	194	103	-
Hori.	4481.163	AV	40.21	31.12	6.58	38.47	2.19	41.63	53.9	12.2	204	156	-
Hori.	4804.000	AV	35.50	31.90	6.76	38.64	2.19	37.71	53.9	16.1	150	0	Floor noise
Hori.	7206.000	AV	36.24	37.57	8.33	39.24	2.19	45.09	53.9	8.8	150	0	Floor noise
Hori.	9608.000	AV	36.77	38.87	9.56	39.81	2.19	47.58	53.9	6.3	150	0	Floor noise
Vert.	147.455	QP	37.20	14.70	7.74	32.07	0.00	27.57	43.5	15.9	100	23	-
Vert.	728.053	QP	30.00	20.19	10.39	31.76	0.00	28.82	46.0	17.1	100	0	-
Vert.	933.007	QP	41.10	21.97	11.06	30.77	0.00	43.36	46.0	**2.6**	100	355	-
Vert.	2390.000	PK	43.83	28.57	13.51	38.81	2.19	49.29	73.9	24.6	145	205	-
Vert.	3732.013	PK	47.44	30.00	6.23	38.29	2.19	47.57	73.9	26.3	159	171	-
Vert.	4481.163	PK	48.87	31.12	6.58	38.47	2.19	50.29	73.9	23.6	134	166	-
Vert.	4804.000	PK	43.33	31.90	6.76	38.64	2.19	45.54	73.9	28.3	150	0	-
Vert.	7206.000	PK	43.70	37.57	8.33	39.24	2.19	52.55	73.9	21.3	150	0	-
Vert.	9608.000	PK	44.95	38.87	9.56	39.81	2.19	55.76	73.9	18.1	150	0	-
Vert.	3732.013	AV	41.27	30.00	6.23	38.29	2.19	41.40	53.9	12.5	159	171	-
Vert.	4481.163	AV	41.76	31.12	6.58	38.47	2.19	43.18	53.9	10.7	134	166	-
Vert.	4804.000	AV	35.78	31.90	6.76	38.64	2.19	37.99	53.9	15.9	150	0	Floor noise
Vert.	7206.000	AV	36.62	37.57	8.33	39.24	2.19	45.47	53.9	8.4	150	0	Floor noise
Vert.	9608.000	AV	37.05	38.87	9.56	39.81	2.19	47.86	53.9	6.0	150	0	Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 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	34.85	28.57	13.51	38.81	4.02	2.19	44.33	53.9	9.5	*1)
Vert.	2390.000	AV	35.62	28.57	13.51	38.81	4.02	2.19	45.10	53.9	8.8	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

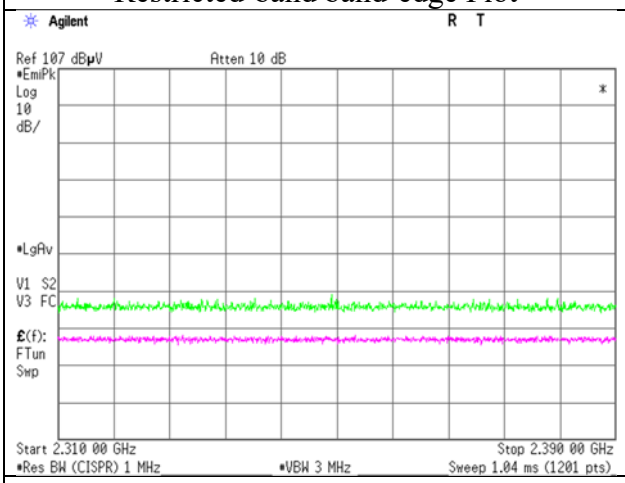
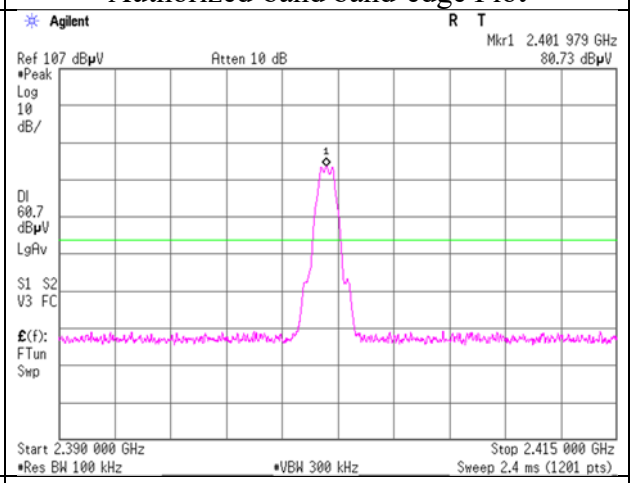
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

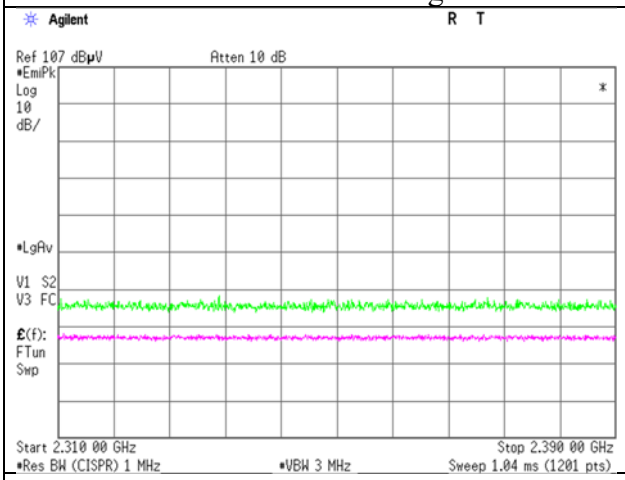
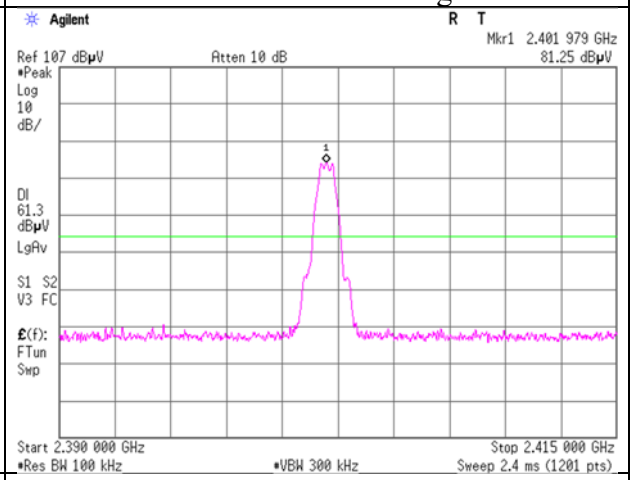
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	80.35	28.55	13.52	38.80	2.19	85.81	-	-	Carrier
Hori.	2400.000	PK	37.49	28.55	13.51	38.81	2.19	42.93	65.8	22.8	-
Vert.	2402.000	PK	80.89	28.55	13.52	38.80	2.19	86.35	-	-	Carrier
Vert.	2400.000	PK	34.54	28.55	13.51	38.81	2.19	39.98	66.3	26.3	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	July 15, 2022
Temperature / Humidity	24 deg.C, 56 %RH
Engineer	Akihiro Oda (1 GHz -2.8 GHz)
Mode	Tx BT LE 2402 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

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	3	3
Date	July 15, 2022	July 17, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	24 deg.C, 56 %RH	22 deg.C, 67 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Akihiro Oda (1 GHz -2.8 GHz)	Hiromasa Sato (2.8 GHz -10 GHz)	Takahiro Kawakami (10 GHz -18 GHz)	Hiromasa Sato (18 GHz -26.5 GHz)
Mode	Tx BT LE 2440 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.	3732.013	PK	47.54	30.00	6.23	38.29	2.19	47.67	73.9	26.2	187	113	-
Hori.	4481.163	PK	46.23	31.12	6.58	38.47	2.19	47.65	73.9	26.2	187	144	-
Hori.	4880.000	PK	43.81	31.92	6.81	38.68	2.19	46.05	73.9	27.8	150	0	-
Hori.	7320.000	PK	44.73	37.66	8.43	39.28	2.19	53.73	73.9	20.1	150	0	-
Hori.	9760.000	PK	44.04	39.28	9.65	39.84	2.19	55.32	73.9	18.5	150	0	-
Hori.	3732.013	AV	41.77	30.00	6.23	38.29	2.19	41.90	53.9	12.0	187	113	-
Hori.	4481.163	AV	40.16	31.12	6.58	38.47	2.19	41.58	53.9	12.3	187	144	-
Hori.	4880.000	AV	35.40	31.92	6.81	38.68	2.19	37.64	53.9	16.2	150	0	Floor noise
Hori.	7320.000	AV	36.11	37.66	8.43	39.28	2.19	45.11	53.9	8.7	150	0	Floor noise
Hori.	9760.000	AV	35.83	39.28	9.65	39.84	2.19	47.11	53.9	6.7	150	0	Floor noise
Vert.	3732.013	PK	47.63	30.00	6.23	38.29	2.19	47.76	73.9	26.1	163	159	-
Vert.	4481.163	PK	48.68	31.12	6.58	38.47	2.19	50.10	73.9	23.8	141	160	-
Vert.	4880.000	PK	43.57	31.92	6.81	38.68	2.19	45.81	73.9	28.0	150	0	-
Vert.	7320.000	PK	43.31	37.66	8.43	39.28	2.19	52.31	73.9	21.5	150	0	-
Vert.	9760.000	PK	44.70	39.28	9.65	39.84	2.19	55.98	73.9	17.9	150	0	-
Vert.	3732.013	AV	41.31	30.00	6.23	38.29	2.19	41.44	53.9	12.4	163	159	-
Vert.	4481.163	AV	41.24	31.12	6.58	38.47	2.19	42.66	53.9	11.2	141	160	-
Vert.	4880.000	AV	35.83	31.92	6.81	38.68	2.19	38.07	53.9	15.8	150	0	Floor noise
Vert.	7320.000	AV	36.22	37.66	8.43	39.28	2.19	45.22	53.9	8.6	150	0	Floor noise
Vert.	9760.000	AV	36.59	39.28	9.65	39.84	2.19	47.87	53.9	**6.0**	150	0	Floor noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	2	3	3
Date	July 15, 2022	July 17, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	24 deg.C, 56 %RH	22 deg.C, 67 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Akihiro Oda	Hiromasa Sato	Takahiro Kawakami	Hiromasa Sato
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx BT LE 2480 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	45.04	28.44	13.59	38.76	2.19	50.50	73.9	23.4	110	122	-
Hori.	3732.013	PK	47.29	30.00	6.23	38.29	2.19	47.42	73.9	26.4	161	113	-
Hori.	4481.163	PK	46.53	31.12	6.58	38.47	2.19	47.95	73.9	25.9	187	144	-
Hori.	4960.000	PK	44.00	32.10	6.86	38.72	2.19	46.43	73.9	27.4	150	0	-
Hori.	7440.000	PK	44.21	37.82	8.51	39.33	2.19	53.40	73.9	20.5	150	0	-
Hori.	9920.000	PK	44.52	39.36	9.75	39.88	2.19	55.94	73.9	17.9	150	0	-
Hori.	3732.013	AV	41.46	30.00	6.23	38.29	2.19	41.59	53.9	12.3	161	113	-
Hori.	4481.163	AV	40.38	31.12	6.58	38.47	2.19	41.80	53.9	12.1	187	144	-
Hori.	4960.000	AV	35.33	32.10	6.86	38.72	2.19	37.76	53.9	16.1	150	0	Floor noise
Hori.	7440.000	AV	35.81	37.82	8.51	39.33	2.19	45.00	53.9	8.9	150	0	Floor noise
Hori.	9920.000	AV	35.24	39.36	9.75	39.88	2.19	46.66	53.9	7.2	150	0	Floor noise
Vert.	2483.500	PK	44.36	28.44	13.59	38.76	2.19	49.82	73.9	24.0	112	13	-
Vert.	3732.013	PK	47.30	30.00	6.23	38.29	2.19	47.43	73.9	26.4	153	161	-
Vert.	4481.163	PK	48.51	31.12	6.58	38.47	2.19	49.93	73.9	23.9	137	165	-
Vert.	4960.000	PK	43.28	32.10	6.86	38.72	2.19	45.71	73.9	28.1	150	0	-
Vert.	7440.000	PK	43.71	37.82	8.51	39.33	2.19	52.90	73.9	21.0	150	0	-
Vert.	9920.000	PK	44.35	39.36	9.75	39.88	2.19	55.77	73.9	18.1	150	0	-
Vert.	3732.013	AV	41.12	30.00	6.23	38.29	2.19	41.25	53.9	12.6	153	161	-
Vert.	4481.163	AV	41.28	31.12	6.58	38.47	2.19	42.70	53.9	11.2	137	165	-
Vert.	4960.000	AV	35.49	32.10	6.86	38.72	2.19	37.92	53.9	15.9	150	0	Floor noise
Vert.	7440.000	AV	36.03	37.82	8.51	39.33	2.19	45.22	53.9	8.6	150	0	Floor noise
Vert.	9920.000	AV	36.33	39.36	9.75	39.88	2.19	47.75	53.9	**6.1**	150	0	Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 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	35.73	28.44	13.59	38.76	4.02	2.19	45.21	53.9	8.6	*1)
Vert.	2483.500	AV	35.59	28.44	13.59	38.76	4.02	2.19	45.07	53.9	8.8	*1)

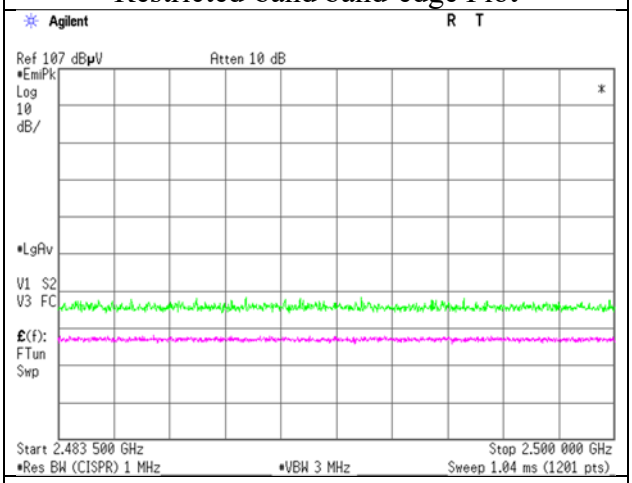
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.86 m / 3.0 m) = 2.19 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	July 15, 2022
Temperature / Humidity	24 deg.C, 56 %RH
Engineer	Akihiro Oda (1 GHz -2.8 GHz)
Mode	Tx BT LE 2480 MHz

Horizontal

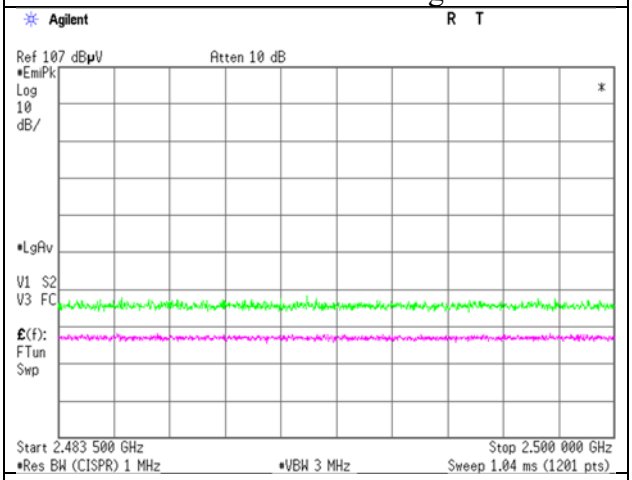
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

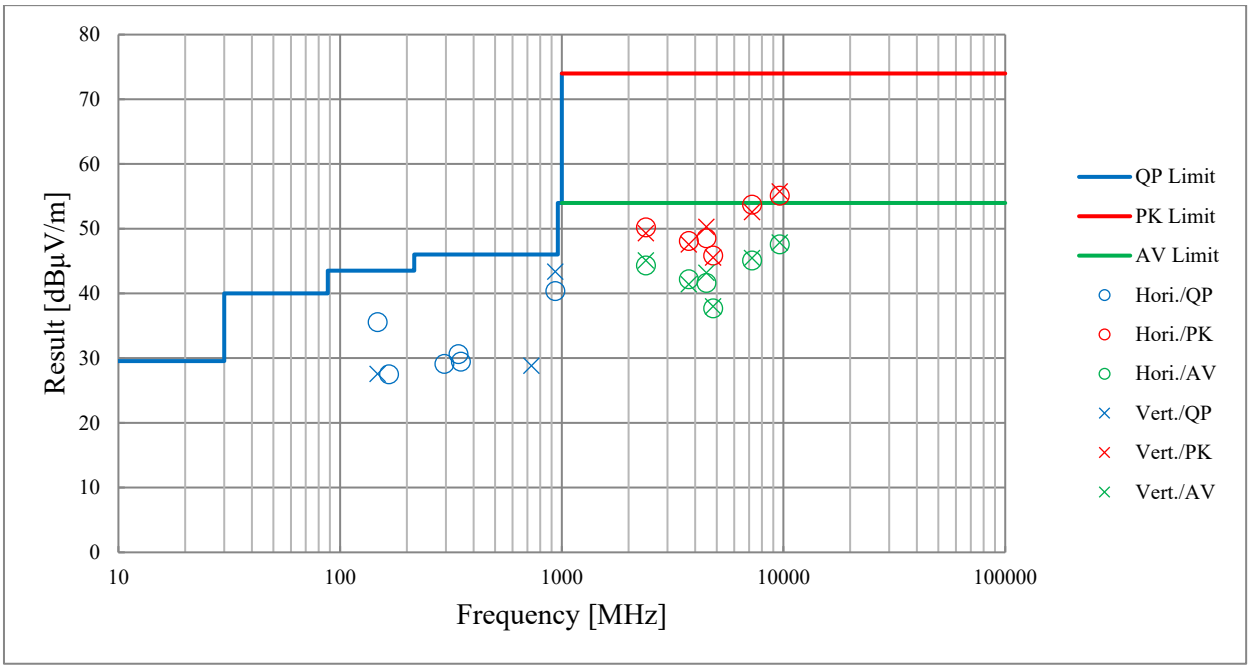


Trace Green : Peak Plot
Trace Purple : Average Plot

* 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 mode for Maximum Peak Output Power)

Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	3	2	2	3	3
Date	September 5, 2022	July 15, 2022	July 17, 2022	July 19, 2022	July 19, 2022
Temperature / Humidity	24 deg.C, 38 %RH	24 deg.C, 56 %RH	22 deg.C, 67 %RH	24 deg.C, 48 %RH	25 deg.C, 52 %RH
Engineer	Yosuke Murakami (30 MHz -1 GHz)	Akihiro Oda (1 GHz -2.8 GHz)	Hiromasa Sato (2.8 GHz -10 GHz)	Takahiro Kawakami (10 GHz -18 GHz)	Hiromasa Sato (18 GHz -26.5 GHz)
Mode	Tx BT LE 2402 MHz				

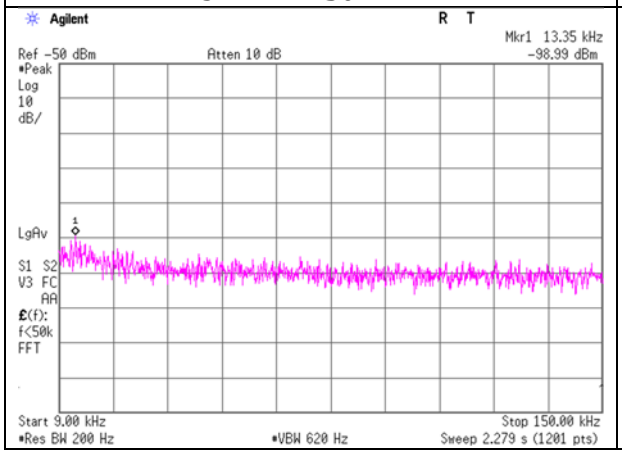


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

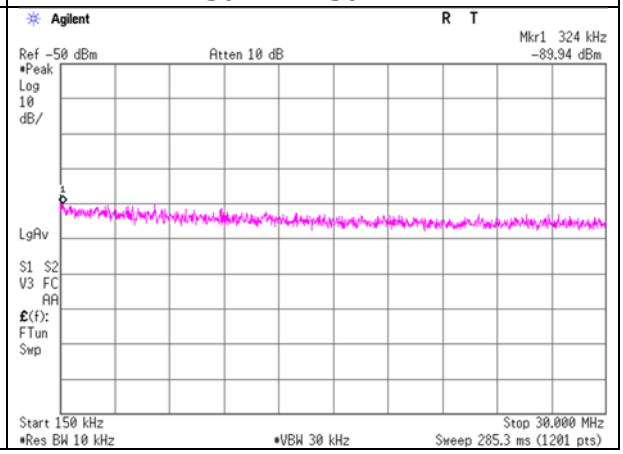
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 29, 2022
Temperature / Humidity	25 deg. C / 45 % RH
Engineer	Takahiro Kawakami
Mode	Tx 11g 2462 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
13.35	-98.99	0.01	9.83	2.0	1	-87.2	300	6.0	-25.9	45.0	70.9	-
324.00	-89.94	0.01	9.83	2.0	1	-78.1	300	6.0	-16.8	17.3	34.1	-

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)

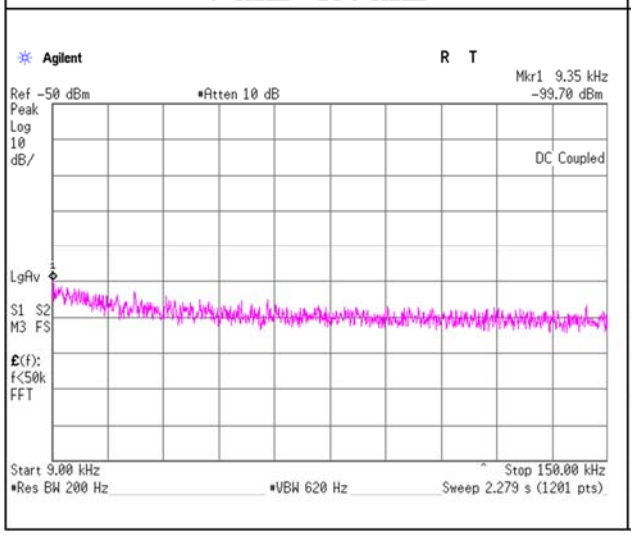
N: Number of output

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

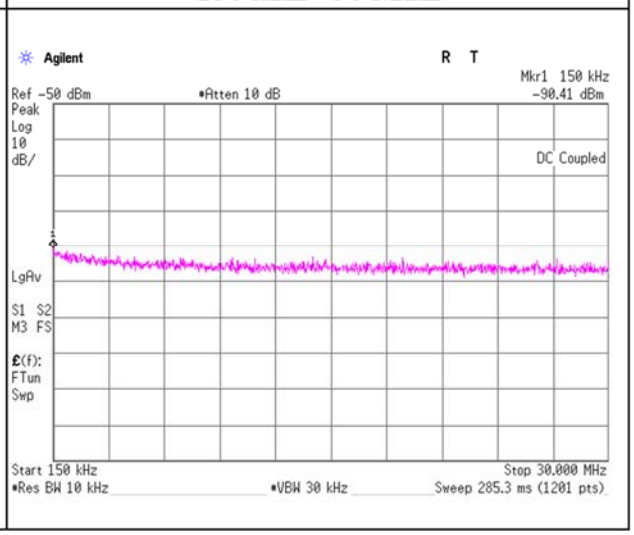
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 19, 2022
Temperature / Humidity	25 deg. C / 47 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE 2402 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
9.350	-99.70	0.01	9.54	2.0	1	-88.2	300	6.0	-26.9	48.1	75.0	-
150.000	-90.41	0.01	9.54	2.0	1	-78.9	300	6.0	-17.6	24.0	41.6	-

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)

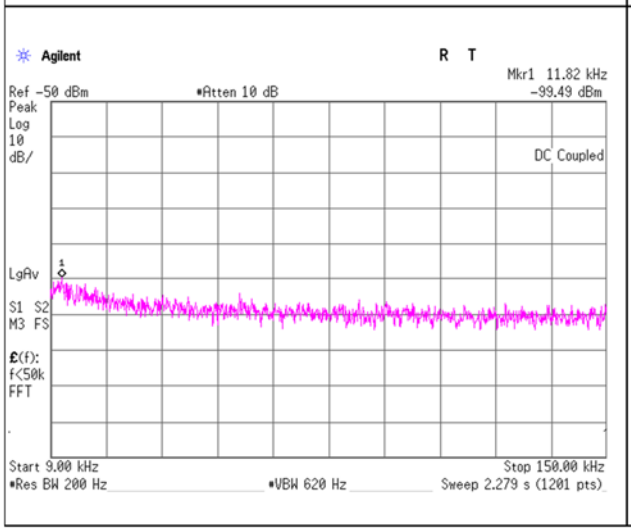
N: Number of output

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

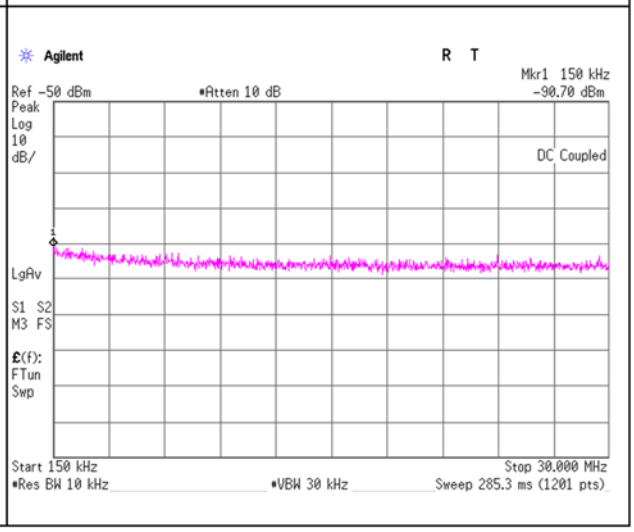
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 19, 2022
Temperature / Humidity	25 deg. C / 47 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE 2440 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
11.820	-99.49	0.01	9.54	2.0	1	-87.9	300	6.0	-26.7	46.1	72.8	-
150.000	-90.70	0.01	9.54	2.0	1	-79.2	300	6.0	-17.9	24.0	41.9	-

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)

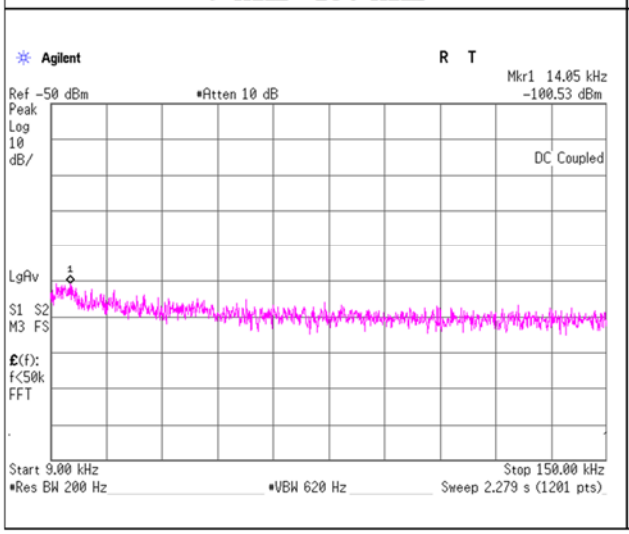
N: Number of output

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

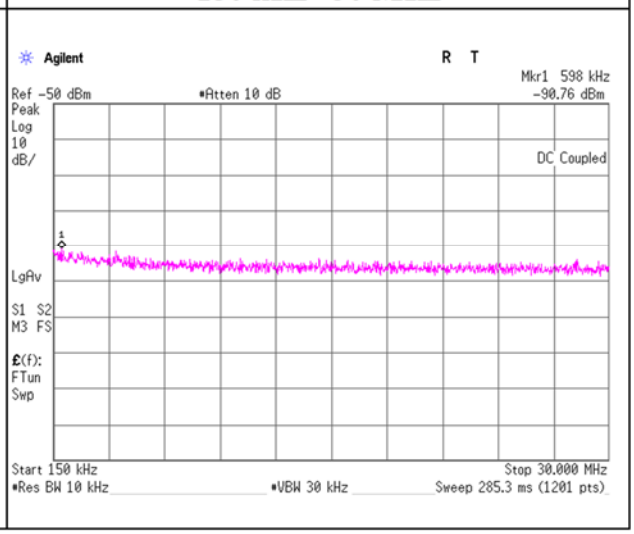
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 19, 2022
Temperature / Humidity	25 deg. C / 47 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE 2480 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
14.050	-100.53	0.01	9.54	2.0	1	-89.0	300	6.0	-27.7	44.6	72.3	-
598.000	-90.76	0.01	9.54	2.0	1	-79.2	30	6.0	2.0	32.0	30.0	-

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

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	July 19, 2022	July 29, 2022
Temperature / Humidity	25 deg. C / 47 % RH	25 deg. C / 45 % RH
Engineer	Shiro Kobayashi	Takahiro Kawakami
Mode	Tx	

11b

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2412	2412.776	-21.81	1.58	9.91	-10.32	8.00	18.32
2437	2436.302	-21.36	1.59	9.91	-9.86	8.00	17.86
2462	2460.380	-20.41	1.59	9.91	-8.91	8.00	16.91

11g

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2412	2406.710	-23.81	1.58	9.91	-12.32	8.00	20.32
2437	2431.710	-23.59	1.59	9.91	-12.09	8.00	20.09
2462	2456.710	-23.08	1.59	9.91	-11.58	8.00	19.58

11n-20

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2412	2415.093	-27.69	1.58	9.91	-16.20	8.00	24.20
2437	2444.120	-24.65	1.59	9.91	-13.15	8.00	21.15
2462	2465.093	-26.98	1.59	9.91	-15.48	8.00	23.48

BT LE

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2402	2401.971	-24.82	1.24	9.64	-13.95	8.00	21.95
2440	2439.975	-24.95	1.25	9.64	-14.07	8.00	22.07
2480	2479.980	-26.08	1.25	9.64	-15.20	8.00	23.20

Sample Calculation:

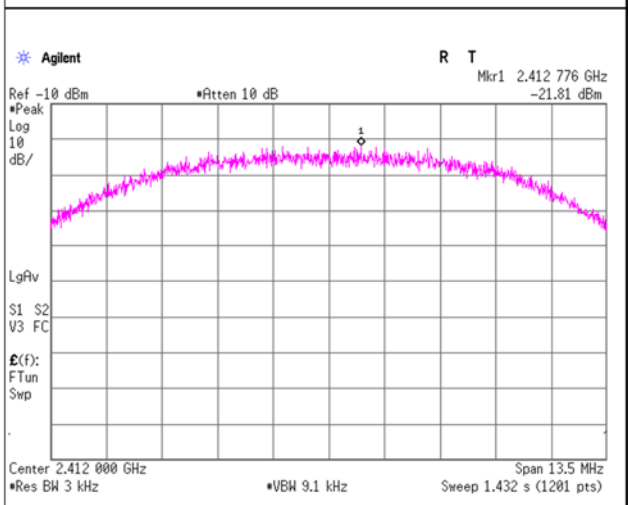
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

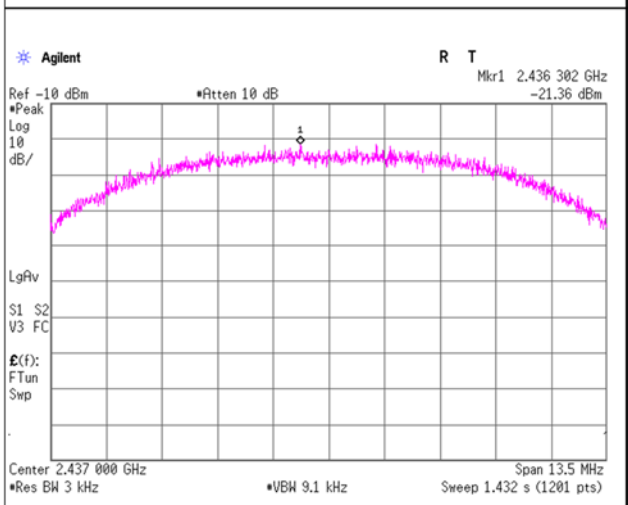
Power Density

11b, 11 Mbps

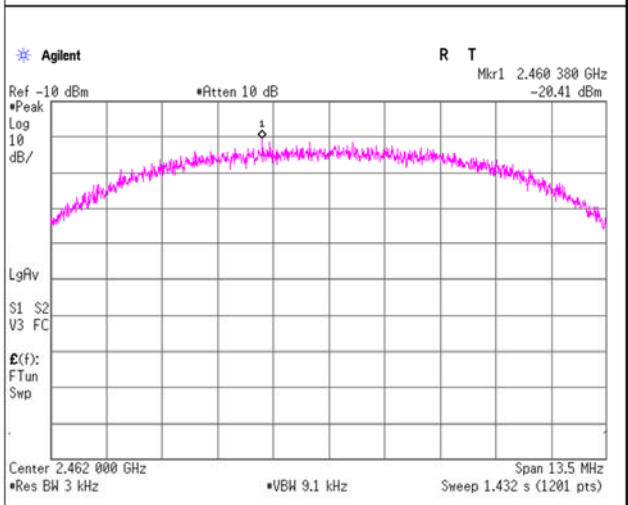
2412 MHz



2437 MHz

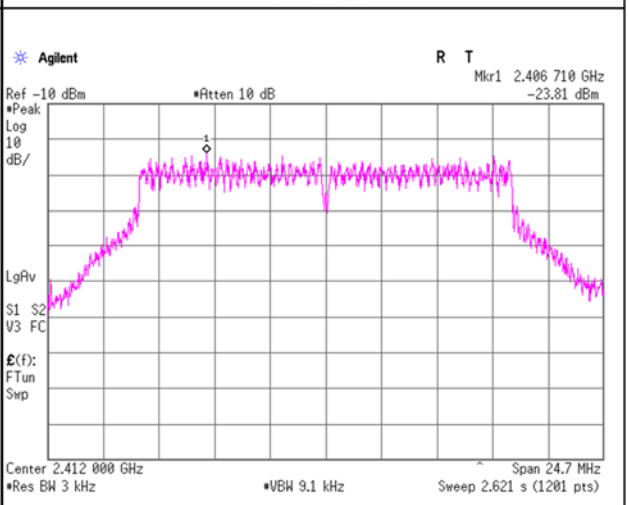


2462 MHz

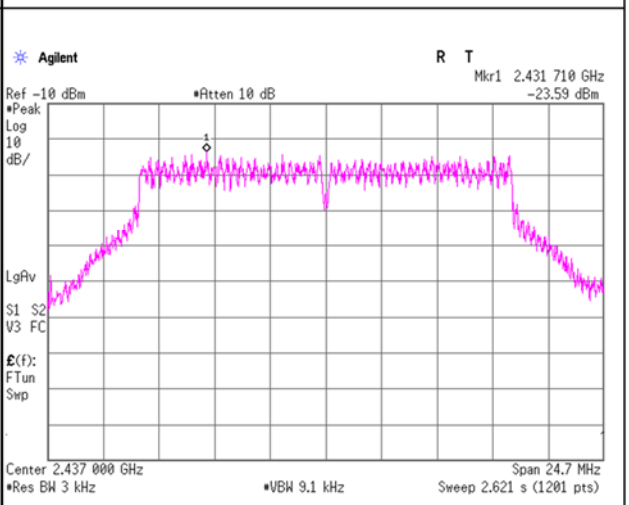


11g, 12 Mbps

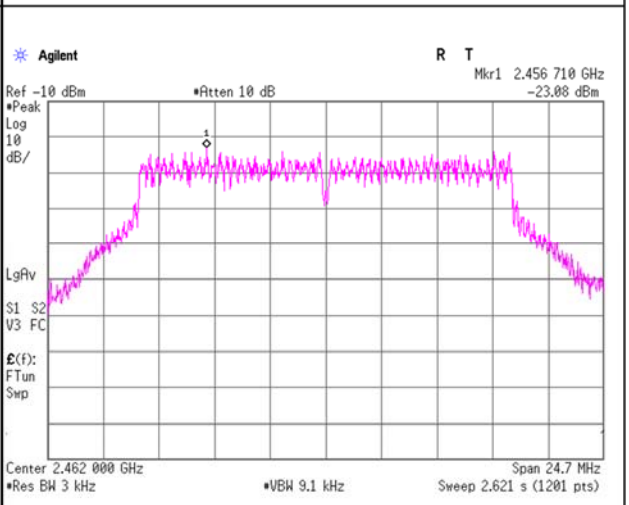
2412 MHz



2437 MHz



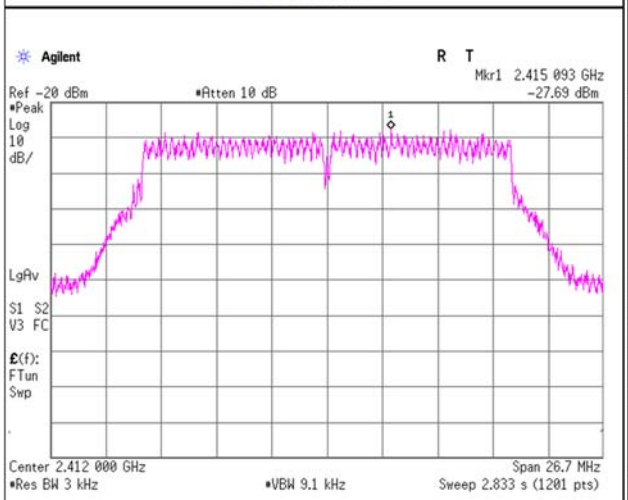
2462 MHz



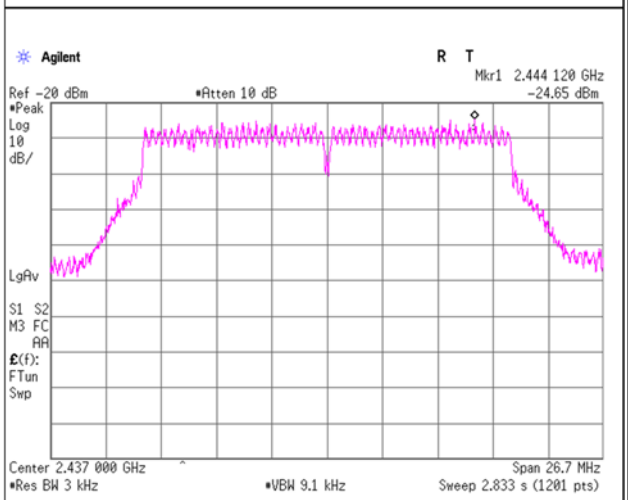
Power Density

11n-20, MCS 3

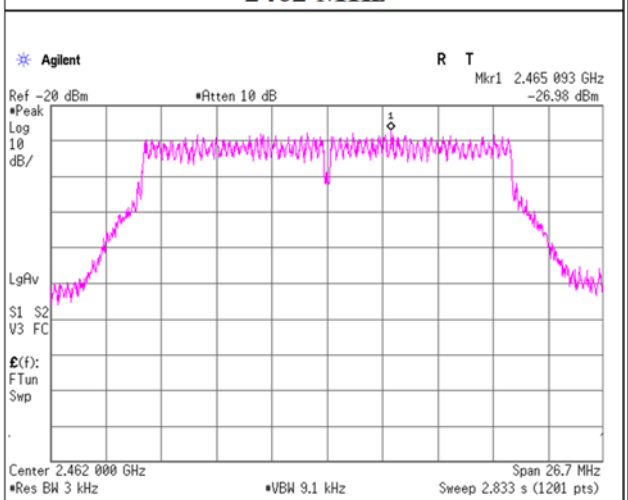
2412 MHz



2437 MHz

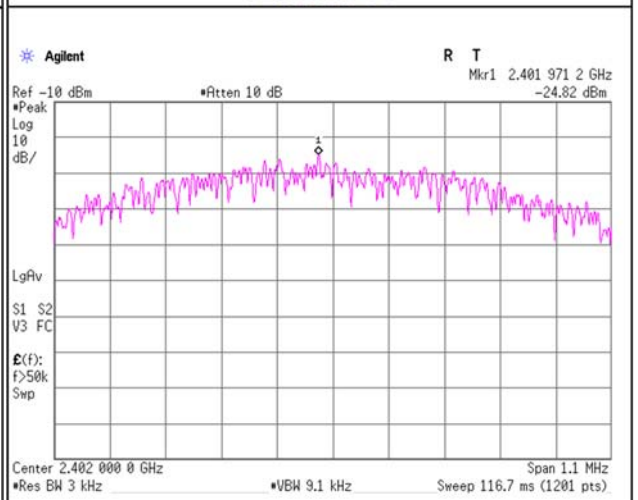


2462 MHz

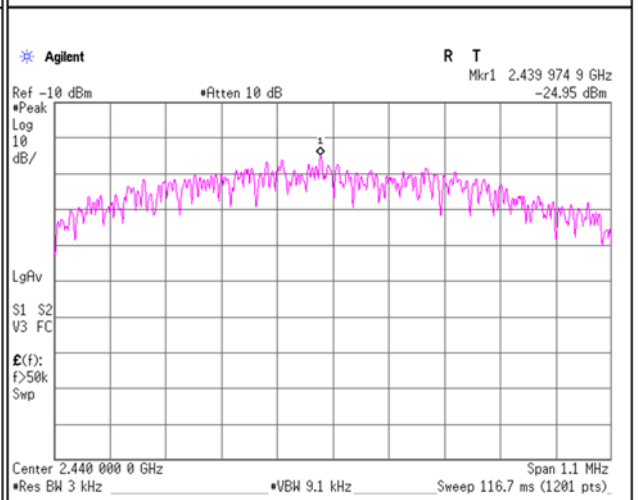


BT LE

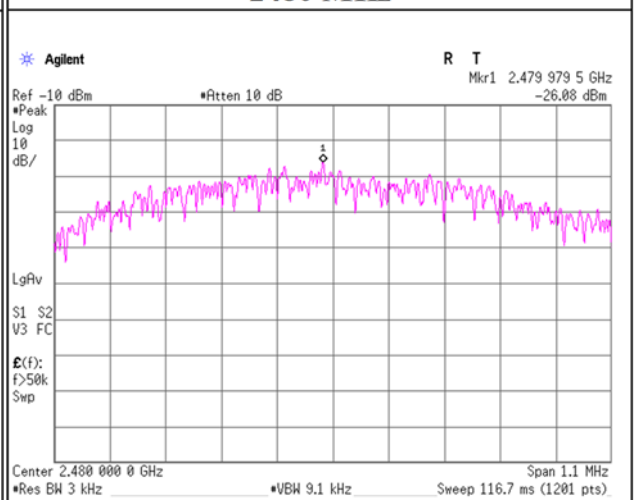
2402 MHz



2440 MHz



2480 MHz



APPENDIX 2: Test Instruments

Test Equipment (1/2)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	KTS-07	145111	Digital Tester	SANWA	PC500	7019232	2021/09/14	12
AT	SAT10-09	145132	Attenuator	Weinschel Corp.	54A-10	W5692	2021/10/05	12
AT	SAT10-12	151609	Attenuator	Weinschel Corp.	54A-10	81601	2022/03/02	12
AT	SCC-G63	196946	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803411/2	2022/03/01	12
AT	SCC-G67	196949	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803480/2	2022/03/02	12
AT	SOS-27	191845	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/08	12
AT	SPM-06	146267	Power Meter	Anritsu Corporation	ML2495A	850009	2022/05/24	12
AT	SPM-13	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2022/01/25	12
AT	SPSS-03	146309	Power sensor	Anritsu Corporation	MA2411B	917063	2022/05/24	12
AT	SPSS-06	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2022/01/25	12
AT	SRENT-22	202830	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY48250036	2021/12/01	12
AT	STM-G10	171617	Terminator	Weinschel - API Technologies Corp	M1459A	92420	2022/05/12	12
AT	STM-G8	171615	Terminator	Weinschel - API Technologies Corp	M1459A	88997	2022/05/20	12
AT	STS-05	146212	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997828	2021/09/14	12
AT, RE	KSA-08	145089	Spectrum Analyzer	Keysight Technologies Inc	E4446A	MY46180525	2021/10/13	12
RE	COTS-SEMI-5	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3 (RE,CE,ME,PE)	-	-	-
RE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
RE	SAEC-02(SVSWR)	145598	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	2022/05/16	12
RE	SAEC-03(NSA)	145565	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	2022/04/15	12
RE	SAEC-03(SVSWR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2022/05/18	12
RE	SAF-03	145126	Pre Amplifier	SONOMA	310N	290213	2022/02/24	12
RE	SAF-05	145128	Pre Amplifier	Toyo Corporation	TPA0118-36	1440490	2022/05/12	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2022/02/04	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2022/03/03	12
RE	SAT10-05	145136	Attenuator	Keysight Technologies Inc	8493C-010	74864	2021/10/07	12
RE	SAT10-06	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2021/10/05	12
RE	SAT6-13	167094	Attenuator	JFW	50HF-006N	-	2022/02/21	12
RE	SBA-03	145023	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032666	2022/05/14	12
RE	SCC-C1/C2/C3/C4/C5/C10/SRSE-03	145171	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	2022/04/20	12

Test Equipment (2/2)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2022/03/03	12
RE	SCC-G40	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	2022/01/06	12
RE	SCC-G43	156380	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	SN MY 13406/4E	2022/05/20	12
RE	SCC-G50	178573	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	MY13407/4E	2022/03/03	12
RE	SCC-G51	178572	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	800288 /4A	2022/03/03	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2022/05/12	12
RE	SCC-G58	183047	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	800287/4A	2022/05/20	12
RE	SCC-G70	200010	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	575618/4	2022/07/22	12
RE	SFL-02	145301	Highpass Filter	MICRO-TRONICS	HPM50111	51	2021/10/07	12
RE	SFL-03	145377	Highpass Filter	MICRO-TRONICS	HPM50112	28	2021/10/05	12
RE	SHA-02	145384	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-726	2022/03/10	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-739	2022/03/16	12
RE	SHA-04	145512	Horn Antenna	ETS-Lindgren	3160-09	00094868	2022/06/06	12
RE	SHA-10	194685	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	711	2022/03/16	12
RE	SJM-20	207277	Measuring	ASKUL	-	-	-	-
RE	SLA-07	145529	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	196	2022/05/14	12
RE	SOS-21	191838	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/08	12
RE	SOS-23	191840	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2022/08/08	12
RE	SSA-02	145800	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250106	2022/05/17	12
RE	STR-07	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2021/09/17	12
RE	STR-09	213530	Test Receiver	Rohde & Schwarz	ESW44	103068	2022/01/17	12
RE	STS-02	145793	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997819	2022/04/07	12
RE	STS-03	146210	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997823	2021/09/14	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**
AT: Antenna Terminal Conducted