RADIO TEST REPORT

Test Report No.: 14524536H-A-R1

Customer	**Murata Manufacturing Co., Ltd.**
Description of EUT	**Communication Module**
Model Number of EUT	**Type1VY-934**
FCC ID	**VPYLB1VY934**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied (Refer to SECTION 3)**
Issue Date	**February 9, 2023**
Remarks	**Wireless LAN (2.4 GHz band) and Bluetooth Low Energy part(s)**

Representative Test Engineer	**Approved By**
T. Noguchi	T. Shimada
Takafumi Noguchi Engineer	Takumi Shimada Engineer

CERTIFICATE 5107.02

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

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- 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.: 14524536H-A

This report is a revised version of 14524536H-A. 14524536H-A is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14524536H-A	November 30, 2022	-
1	14524536H-A-R1	February 9, 2023	2.1: Identification of EUT Correction of Test Date October 11 to November 18, 2022 →October 11, 2022 to February 8, 2023
1	14524536H-A-R1	February 9, 2023	Section 2.2: Radio Specification for Bluetooth (Low Energy) -Deletion of information for PCB Antenna
1	14524536H-A-R1	February 9, 2023	APPENDIX 1: Test Data: Average Output Power for 11n-20 -Changed of Result for 2412 MHz of Chain 0 10.4 dBm→9.36 dBm 10.9 mW→8.63 mW
1	14524536H-A-R1	February 9, 2023	APPENDIX 1: Test Data: Conducted Spurious Emission for BT LE -Correction of Frequency and Reading in the table Frequency: 523.00 kHz→150.00 kHz Reading: -81.2 dBm→-81.0 dBm
1	14524536H-A-R1	February 9, 2023	APPENDIX 2: Test Instruments -Replacement Test Instruments list for Antenna Terminal Conducted test

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

CONTENTS **PAGE**

SECTION 1: Customer Information **5**
SECTION 2: Equipment Under Test (EUT) **5**
SECTION 3: Test Specification, Procedures & Results **7**
SECTION 4: Operation of EUT during testing **10**
SECTION 5: Conducted Emission **15**
SECTION 6: Radiated Spurious Emission **16**
SECTION 7: Antenna Terminal Conducted Tests **18**
APPENDIX 1: Test Data **19**
Conducted Emission 19
99 % Occupied Bandwidth and 6 dB Bandwidth 21
Maximum Peak Output Power 27
Average Output Power 31
Radiated Spurious Emission 37
Conducted Spurious Emission 58
Power Density 60
APPENDIX 2: Test Instruments **68**
APPENDIX 3: Photographs of Test Setup **71**
Conducted Emission 71
Radiated Spurious Emission 72
Worst Case Position 74
Antenna Terminal Conducted Tests 77

SECTION 1: Customer Information

Company Name	Murata Manufacturing Co., Ltd.
Address	1-10-1 Higashikotari, Nagaokakyo-shi, Kyoto 617-8555 Japan
Telephone Number	+81-75-955-6736
Contact Person	Motoo Hayashi

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	Communication Module
Model Number	Type1VY-934
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	October 11, 2022
Test Date	October 11, 2022 to February 8, 2023

2.2 Product Description

General Specification

Rating	VDD_3P3, SWREG_IN, VDD_FEM: Typ.: DC 3.3 V, Min.: DC 3.135 V, Max: DC 3.465 V VDDIO_GPIO, VDDIO_AO: Typ.: DC 3.3 V, Min.: DC 3.14 V, Max: DC 3.46 V

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 Type	Pattern Antenna: Chain 0 PCB Antenna: Chain 1
Antenna Gain	Pattern Antenna: 2.0 dBi PCB Antenna: 2.0 dBi to 1.4 dBi [RF Cable length: 30 mm to 315 mm]

Bluetooth (Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	BT LE: GFSK
Antenna Type	Pattern Antenna: Chain 0
Antenna Gain	Pattern Antenna: 2.0 dBi

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

Equipment Type	Transceiver	
Frequency of Operation	20 MHz Band:	5180 MHz to 5240 MHz 5260 MHz to 5320 MHz 5500 MHz to 5720 MHz 5745 MHz to 5825 MHz
	40 MHz Band:	5190 MHz to 5230 MHz 5270 MHz to 5310 MHz 5510 MHz to 5710 MHz 5755 MHz to 5795 MHz
	80 MHz Band:	5210 MHz 5290 MHz 5530 MHz to 5690 MHz 5775 MHz
Type of Modulation	OFDM	
Antenna Type	Pattern Antenna: Chain 0 PCB Antenna: Chain 1	
Antenna Gain	Pattern Antenna: 1.9 dBi PCB Antenna: 1.3 dBi to -1.3 dBi [RF Cable length: 30 mm to 315 mm]	

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart C
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

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	18.25 dB, 9.68000 MHz, AV, N	Complied a)	-
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
6dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(a)(2)	See data.	Complied b)	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 c)	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 d)	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)	6.3 dB 2483.5 MHz, AV, Vertical	Complied e), f)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
	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) 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 Conducted Emission)
b) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)
c) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
d) Refer to APPENDIX 1 (data of Power Density)
e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
f) Refer to APPENDIX 1 (data of Radiated Spurious Emission)

FCC Part 15.31 (e)

The EUT has the power supply regulator.
However one of the input voltages to RF part doesn't go through the regulator.
The stable voltage will be supplied by the end product, which will be required to have a power supply regulator.
Therefore, the EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

Chain 0: Pattern Antenna

The antenna is not removable from the EUT.
Therefore, the equipment complies with the antenna requirement of Section 15.203.

Chain 1: PCB Antenna

The EUT has a unique coupling/antenna connector (U.FL).
Therefore the equipment complies with the requirement of 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 $k = 2$.

Conducted emission

Using Item	Frequency range	Uncertainty (+/-)
AMN (LISN)	0.009 MHz to 0.15 MHz	3.7 dB
	0.15 MHz to 30 MHz	3.3 dB

Radiated emission

Measurement distance	Frequency range		Uncertainty (+/-)
3 m	9 kHz to 30 MHz		3.2 dB
10 m			3.0 dB
3 m	30 MHz to 200 MHz	Horizontal	4.8 dB
		Vertical	5.0 dB
	200 MHz to 1000 MHz	Horizontal	5.1 dB
		Vertical	6.2 dB
10 m	30 MHz to 200 MHz	Horizontal	4.8 dB
		Vertical	4.8 dB
	200 MHz to 1000 MHz	Horizontal	5.0 dB
		Vertical	5.0 dB
3 m	1 GHz to 6 GHz		4.9 dB
	6 GHz to 18 GHz		5.2 dB
1 m	10 GHz to 26.5 GHz		5.4 dB
	26.5 GHz to 40 GHz		5.4 dB
10 m	1 GHz to 18 GHz		5.4 dB

Antenna Terminal test

Test Item	Uncertainty (+/-)
20 dB Bandwidth / 99 % Occupied Bandwidth	0.96 %
Maximum Peak Output Power / Average Output Power	1.5 dB
Carrier Frequency Separation	0.42 %
Dwell time / Burst rate	0.10 %
Conducted Spurious Emission	2.7 dB

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919
ISED Lab Company Number: 2973C / CAB identifier: JP0002
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan
Telephone: +81-596-24-8999

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

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

3.6 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

[WLAN]

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 CDD (11b)	11 Mbps, PN9
IEEE 802.11g CDD (11g)	54 Mbps, PN9
IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 12, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power.	
*Power of the EUT was set by the software as follows; Power Setting: 11b: 9 dBm 11g: 9 dBm 11n-20: 8 dBm Software: QRCT Ver. 3.0.276.0 (Date: October 11, 2022, Storage location: Driven by connected PC) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The Details of Operating Mode(s)

Test Item	Operating Mode	Tested Antenna	Tested Frequency
Conducted Emission, Radiated Spurious Emission (Below 1 GHz) Conducted Spurious Emission	Tx 11n-20 (MIMO) *1)	Chain 0 + Chain 1	2462 MHz
Radiated Spurious Emission (Above 1 GHz)	Tx 11b (CDD) Tx 11n-20 (MIMO) *2), *3)	Chain 0 + Chain 1	2412 MHz 2437 MHz 2462 MHz
6dB Bandwidth, 99% Occupied Bandwidth	Tx 11b (CDD) Tx 11g (CDD) Tx 11n-20 (MIMO)	Chain 0 *4)	2412 MHz 2437 MHz 2462 MHz
Maximum Peak Output Power, Power Density	Tx 11b (CDD) Tx 11g (CDD) Tx 11n-20 (MIMO)	Chain 0 Chain 1 Chain 0 + Chain 1	2412 MHz 2437 MHz 2462 MHz
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test. *2) Since 11g and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest output power. *3) After the comparison between MIMO and CDD, test was performed with the representative mode that had worst case. *4) The test was conducted with the antenna that had the highest power as a representative.			

[BT LE]

Mode	Remarks*
Bluetooth Low Energy (BT LE) 1M-PHY Uncoded PHY (1M-PHY)	Maximum Packet Size, PRBS9
*Power of the EUT was set by the software as follows; Power Setting: Fixed (2.bin) Software: QRCT Ver. 3.0.276.0 (Date: October 11, 2022, Storage location: Driven by connected PC) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The Details of Operating Mode(s)

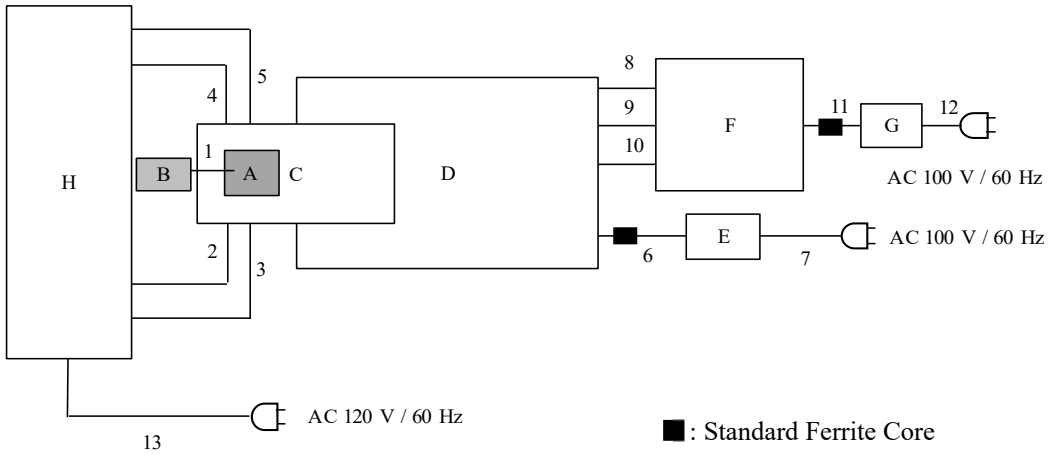
Test Item	Operating Mode	Tested Antenna	Tested frequency
Conducted Emission, Radiated Spurious Emission (Below 1 GHz)	Tx BT LE, 1M-PHY *1)	Chain 0	2480 MHz
Radiated Spurious Emission (Above 1 GHz), Maximum Peak Output Power, Power Density, 6dB Bandwidth, 99% Occupied Bandwidth, Conducted Spurious Emission	Tx BT LE, 1M-PHY	Chain 0	2402 MHz 2440 MHz 2480 MHz
*1) Conducted emissions and 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.			

Simultaneous transmission (simultaneously transmits BT and WLAN 5 GHz band on a single antenna.)

Test Item	Mode *1)	Tested Antenna
Radiated Spurious Emission	Tx BT LE 1M-PHY 2480 MHz + Tx 11ac-40 5795 MHz	Chain 0
*1) The test was conducted on representative mode, the worst mode at Spurious emission test for BT and the mode had the highest power at Antenna terminal conducted test for WLAN 5 GHz band.		

4.2 Configuration and Peripherals

<Conducted 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

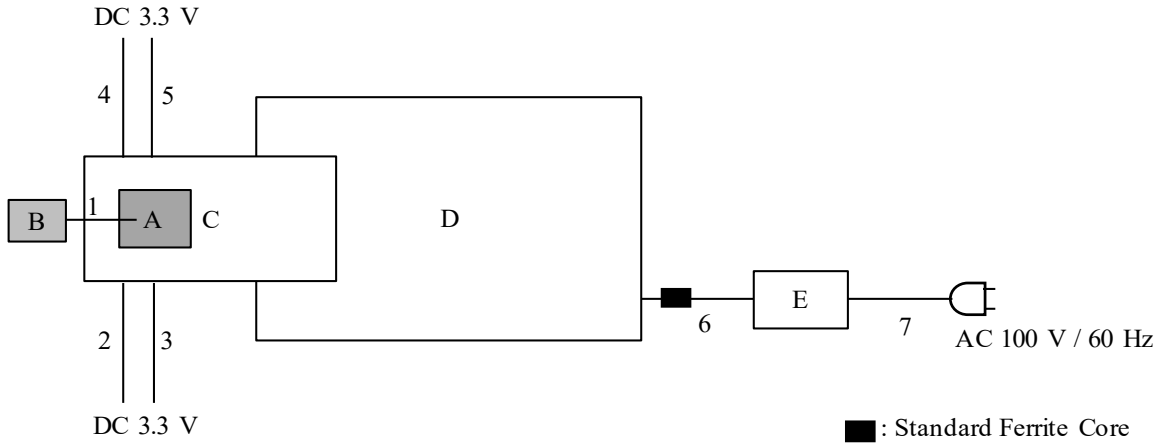
No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Communication Module	Type1VY-934	No.2 *1) No.3 *2)	Murata Manufacturing Co., Ltd.	EUT
B	PCB Antenna	1VY DC1231	No.2 *1) No.3 *2)	Murata Manufacturing Co., Ltd.	EUT
C	Jig board	P2ML10415	No.2 *1) No.3 *2)	Murata Manufacturing Co., Ltd.	-
D	Jig board	TDA6305	TR17472217	-	-
E	AC adapter	EA108683N-120	400-76062	EDACPOWER ELEC,	-
F	Laptop PC	CF-LX4EDHCS	5GKSA17377	Panasonic	-
G	AC adapter	CF-AA62J2C	64B2CM114703755B	Panasonic	-
H	DC Power Supply	PMC35-2A	2871	KIKUSUI	-

*1) Antenna cable length: 30 mm
*2) Antenna cable length: 315 mm

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	0.03 0.315	Unshielded	Unshielded	-
2	DC Cable	0.8	Unshielded	Unshielded	-
3	DC Cable	0.8	Unshielded	Unshielded	-
4	DC Cable	0.8	Unshielded	Unshielded	-
5	DC Cable	0.8	Unshielded	Unshielded	-
6	DC Cable	1.0	Unshielded	Unshielded	-
7	AC Cable	1.0	Unshielded	Unshielded	-
8	LAN Cable	2.0	Unshielded	Unshielded	-
9	USB Cable	1.0	Shielded	Shielded	-
10	USB Cable	2.0	Shielded	Shielded	-
11	DC Cable	1.0	Unshielded	Unshielded	-
12	AC Cable	1.0	Unshielded	Unshielded	-
13	AC Cable	1.8	Unshielded	Unshielded	-

<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

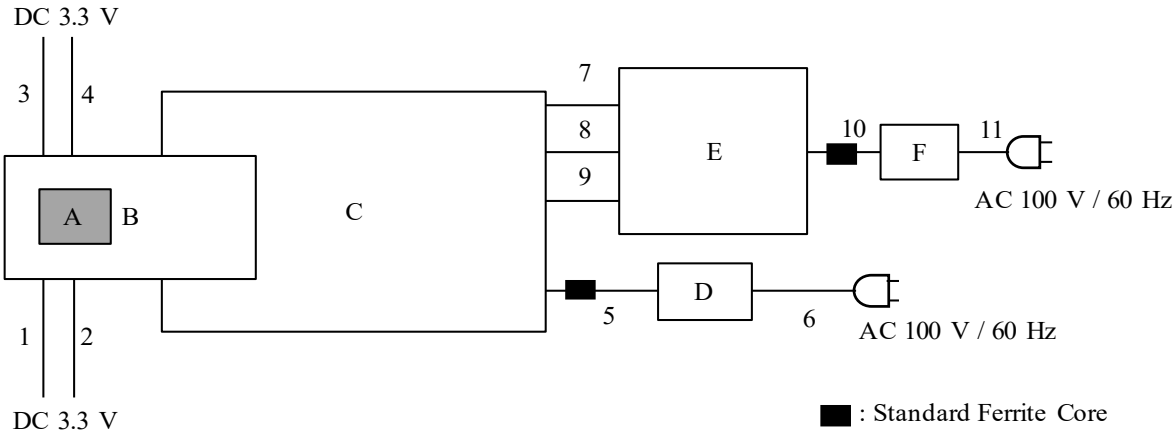
No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Communication Module	Type1VY-934	No.2 *1) No.3 *2)	Murata Manufacturing Co., Ltd.	EUT
B	PCB Antenna	1VY DC1231	No.2 *1) No.3 *2)	Murata Manufacturing Co., Ltd.	EUT
C	Jig board	P2ML10415	No.2 *1) No.3 *2)	Murata Manufacturing Co., Ltd.	-
D	Jig board	TDA6305	TR17472217	-	-
E	AC adapter	EA108683N-120	400-76062	EDACPOWER ELEC,	-

*1) Antenna cable length: 30 mm
*2) Antenna cable length: 315 mm

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	0.03 0.315	Unshielded	Unshielded	-
2	DC Cable	0.8	Unshielded	Unshielded	-
3	DC Cable	0.8	Unshielded	Unshielded	-
4	DC Cable	0.8	Unshielded	Unshielded	-
5	DC Cable	0.8	Unshielded	Unshielded	-
6	DC Cable	1.0	Unshielded	Unshielded	-
7	AC Cable	1.0	Unshielded	Unshielded	-

<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	Communication Module	Type1VY-934	No.1	Murata Manufacturing Co., Ltd.	EUT
B	Jig board	P2ML10415	No.1	Murata Manufacturing Co., Ltd.	-
C	Jig board	TDA6305	TR17472217	-	-
D	AC adapter	EA108683N-120	400-76062	EDACPOWER ELEC,	-
E	Laptop PC	CF-LX4EDHCS	5GKSA17377	Panasonic	-
F	AC adapter	CF-AA62J2C	64B2CM114703755B	Panasonic	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	0.8	Unshielded	Unshielded	-
2	DC Cable	0.8	Unshielded	Unshielded	-
3	DC Cable	0.8	Unshielded	Unshielded	-
4	DC Cable	0.8	Unshielded	Unshielded	-
5	DC Cable	1.0	Unshielded	Unshielded	-
6	AC Cable	1.0	Unshielded	Unshielded	-
7	LAN Cable	2.0	Unshielded	Unshielded	-
8	USB Cable	1.0	Shielded	Shielded	-
9	USB Cable	2.0	Shielded	Shielded	-
10	DC Cable	1.0	Unshielded	Unshielded	-
11	AC Cable	1.0	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and Conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.
The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

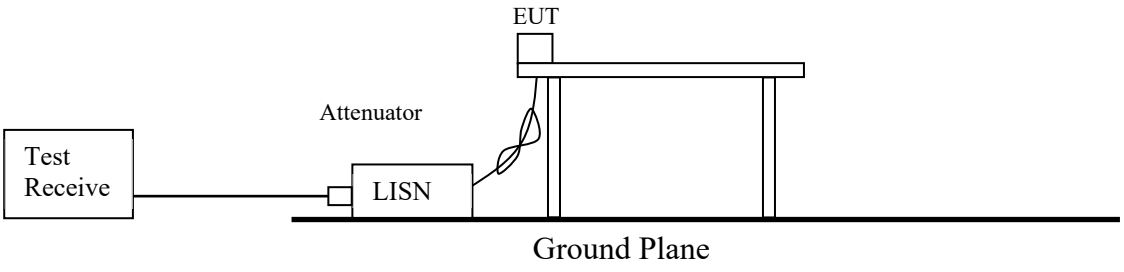
For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.
The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

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

Detector : QP and CISPR AV
Measurement Range : 0.15 MHz to 30 MHz
Test Data : APPENDIX
Test Result : Pass

Figure 1: Test Setup



SECTION 6: 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, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

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

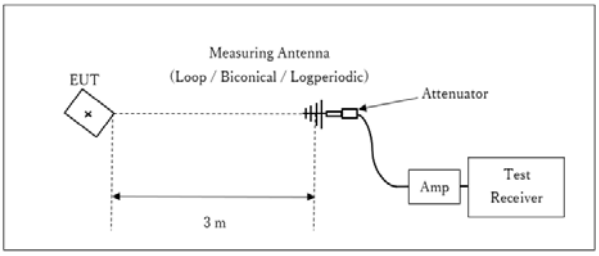
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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	For WLAN (11n-20) 11.12.2.5.3 RBW: 1 MHz VBW: 1 / T (T: burst length, refer to Burst rate confirmation sheet) Detector: Peak Trace: Max Hold For WLAN (11b) and BT LE 11.12.2.5.2 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz

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

Figure 2: Test Setup

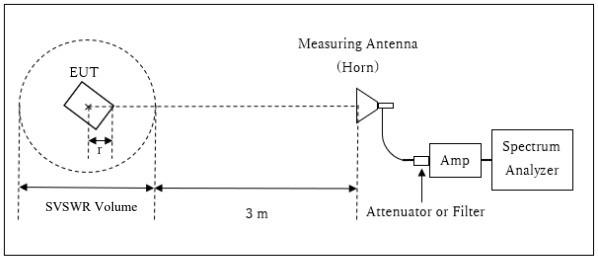
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz



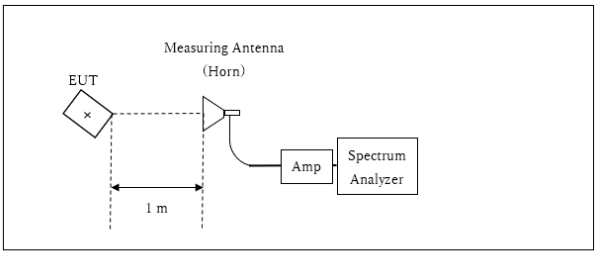
r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (4.0 m / 3.0 m) = 2.50 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 4.0 m

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

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

10 GHz to 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 dB
*Test Distance: 1 m

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

Measurement Range : **30 MHz to 26.5 GHz**
Test Data : **APPENDIX**
Test Result : **Pass**

SECTION 7: 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
6dB Bandwidth	20 MHz	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: 80 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	10 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4) *5)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1 kHz	27 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".
*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 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.

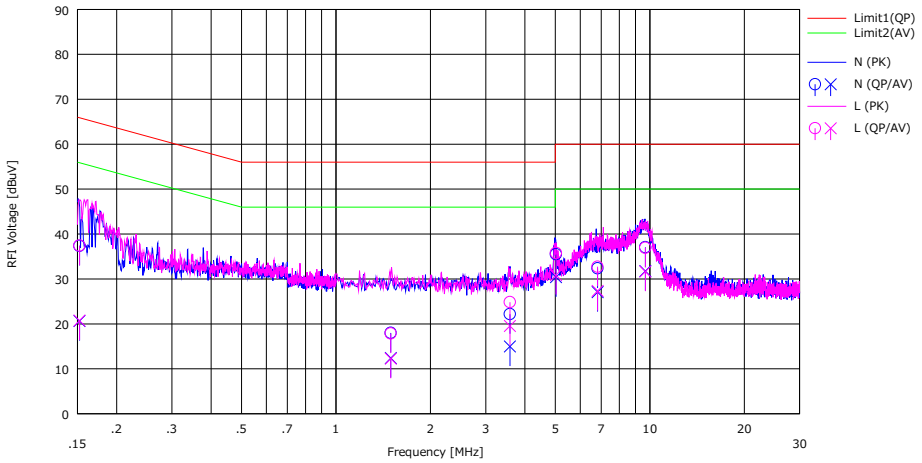
Test Data : APPENDIX
Test Result : Pass

APPENDIX 1: Test Data

Conducted Emission

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Date	November 13, 2022
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Tetsuro Yoshida
Mode	Tx 11n-20 2462MHz

Limit : FCC_Part 15 Subpart C(15.207)



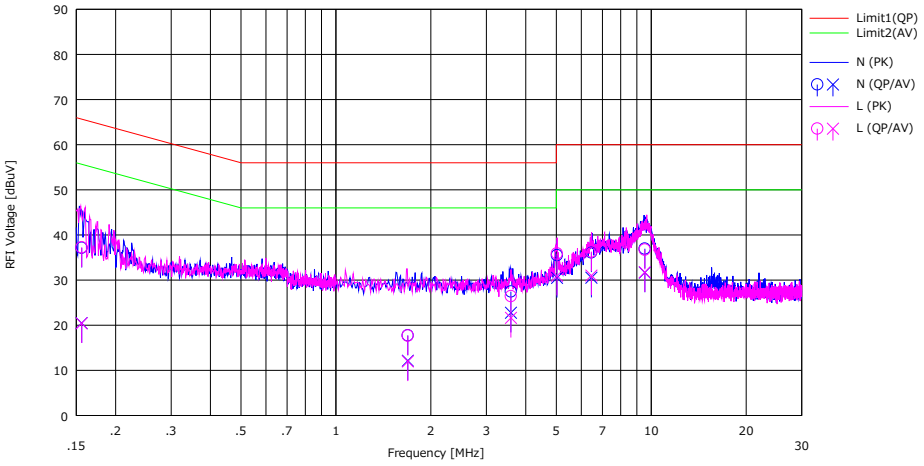
No.	Freq.	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		(QP)	(AV)			(QP)	(AV)	(QP)	(AV)	(QP)	(AV)		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15233	24.20	7.50	0.09	13.06	37.35	20.65	65.87	55.87	28.52	35.22	N	
2	1.49493	4.60	-1.00	0.10	13.29	17.99	12.39	56.00	46.00	38.01	33.61	N	
3	3.58300	8.50	1.30	0.14	13.52	22.16	14.96	56.00	46.00	33.84	31.04	N	
4	5.02640	21.70	16.60	0.16	13.63	35.49	30.39	60.00	50.00	24.51	19.61	N	
5	6.82040	18.40	13.10	0.20	13.76	32.36	27.06	60.00	50.00	27.64	22.94	N	
6	9.68000	22.90	17.60	0.24	13.91	37.05	31.75	60.00	50.00	22.95	18.25	N	
7	0.15233	24.30	7.60	0.07	13.06	37.43	20.73	65.87	55.87	28.44	35.14	L	
8	1.49493	4.50	-1.10	0.07	13.29	17.86	12.26	56.00	46.00	38.14	33.74	L	
9	3.58300	11.20	5.90	0.11	13.52	24.83	19.53	56.00	46.00	31.17	26.47	L	
10	5.02640	22.00	17.10	0.14	13.63	35.77	30.87	60.00	50.00	24.23	19.13	L	
11	6.82040	18.80	13.40	0.17	13.76	32.73	27.33	60.00	50.00	27.27	22.67	L	
12	9.68000	22.80	17.50	0.22	13.91	36.93	31.63	60.00	50.00	23.07	18.37	L	

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

Conducted Emission

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Date	November 13, 2022
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Tetsuro Yoshida
Mode	Tx BT LE 2480MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq.	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		〈QP〉	〈AV〉			〈QP〉	〈AV〉	〈QP〉	〈AV〉	〈QP〉	〈AV〉		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15621	24.00	7.30	0.09	13.06	37.15	20.45	65.66	55.66	28.51	35.21	N	
2	1.68990	4.30	-1.30	0.11	13.32	17.73	12.13	56.00	46.00	38.27	33.87	N	
3	3.58910	13.80	9.10	0.14	13.52	27.46	22.76	56.00	46.00	28.54	23.24	N	
4	5.02540	21.70	16.70	0.16	13.63	35.49	30.49	60.00	50.00	24.51	19.51	N	
5	6.45857	22.20	16.60	0.19	13.74	36.13	30.53	60.00	50.00	23.87	19.47	N	
6	9.54400	22.80	17.50	0.24	13.91	36.95	31.65	60.00	50.00	23.05	18.35	N	
7	0.15621	24.10	7.30	0.07	13.06	37.23	20.43	65.66	55.66	28.43	35.23	L	
8	1.68990	4.30	-1.40	0.07	13.32	17.69	11.99	56.00	46.00	38.31	34.01	L	
9	3.58910	12.80	8.00	0.11	13.52	26.43	21.63	56.00	46.00	29.57	24.37	L	
10	5.02540	22.10	17.20	0.14	13.63	35.87	30.97	60.00	50.00	24.13	19.03	L	
11	6.45857	22.40	17.10	0.16	13.74	36.30	31.00	60.00	50.00	23.70	19.00	L	
12	9.54400	22.60	17.60	0.22	13.91	36.73	31.73	60.00	50.00	23.27	18.27	L	

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

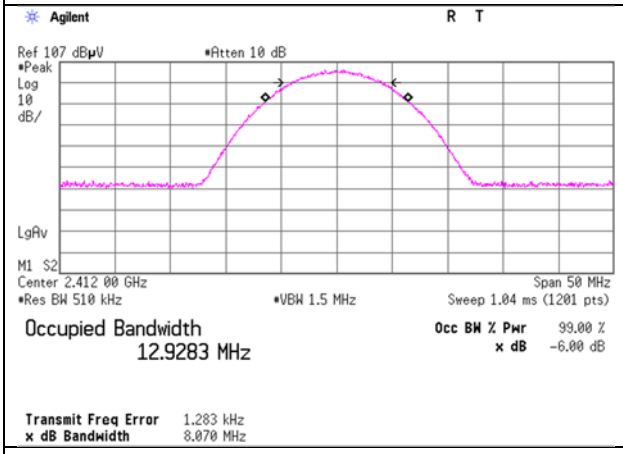
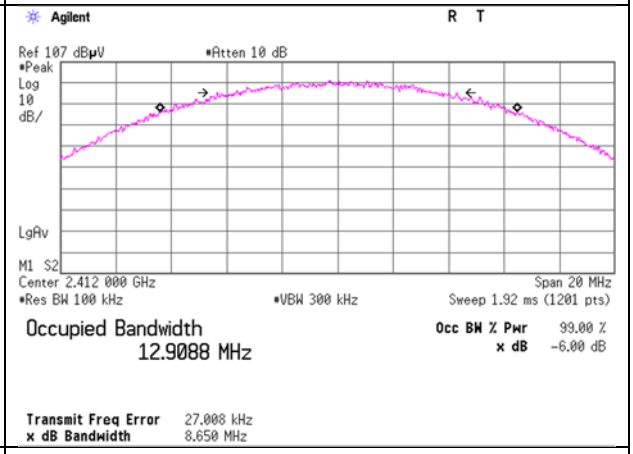
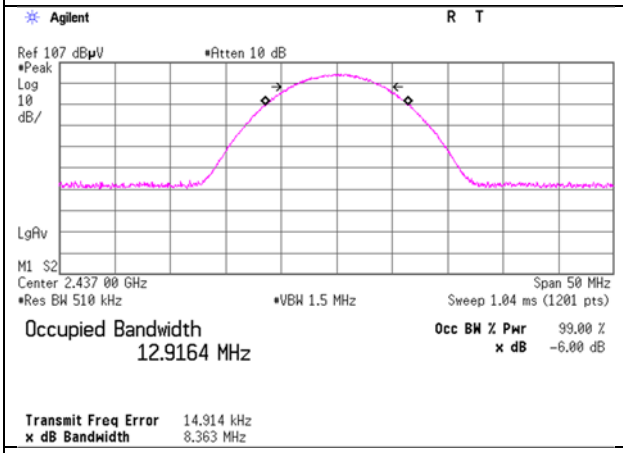
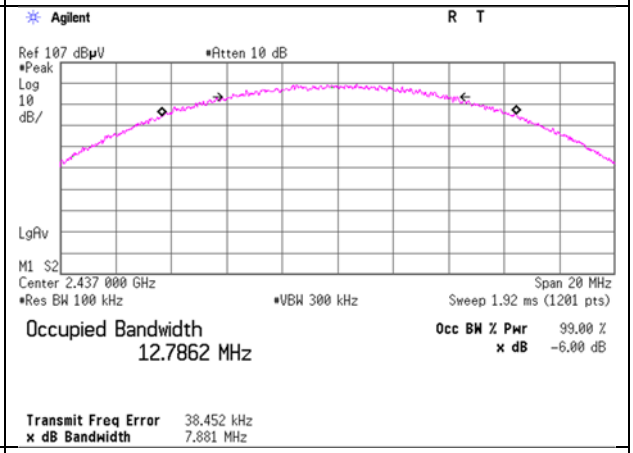
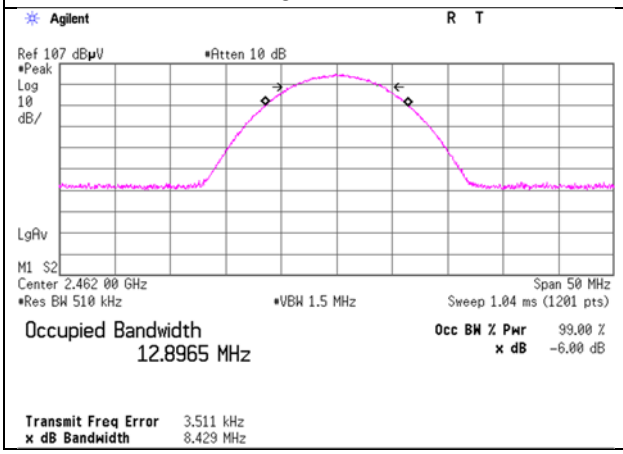
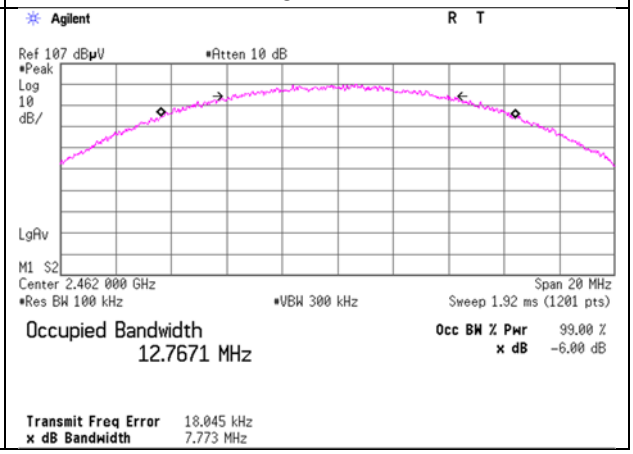
99 % Occupied Bandwidth and 6 dB Bandwidth

Test place	Ise EMC Lab.	
Measurement Room	No.6	No.8
Date	October 31, 2022	November 18, 2022
Temperature / Humidity	20 deg. C / 41 % RH	21 deg. C / 44 % RH
Engineer	Hiroki Numata	Takafumi Noguchi
Mode	Tx	

Mode	Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
11b	2412	12928.3	8.650	> 0.5000
	2437	12916.4	7.881	> 0.5000
	2462	12896.5	7.773	> 0.5000
11g	2412	17092.6	16.507	> 0.5000
	2437	17093.9	16.515	> 0.5000
	2462	17136.2	16.532	> 0.5000
11n-20	2412	18230.3	17.749	> 0.5000
	2437	18275.0	17.692	> 0.5000
	2462	18272.9	17.737	> 0.5000

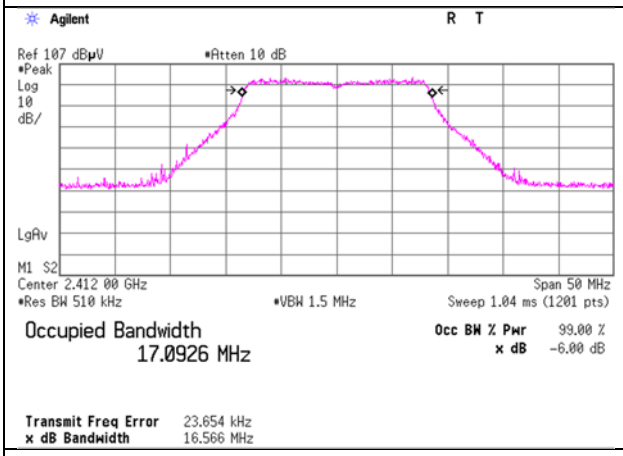
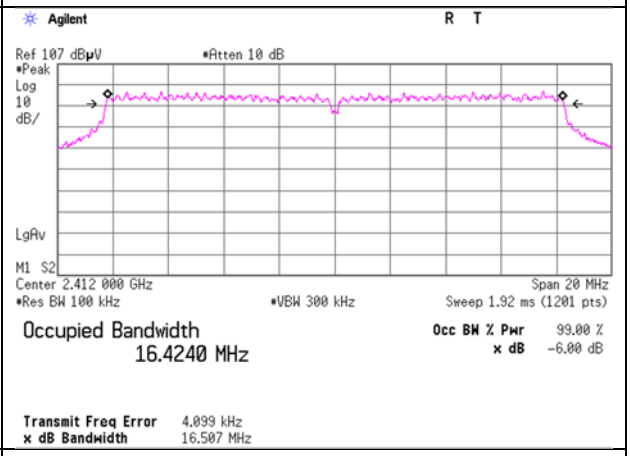
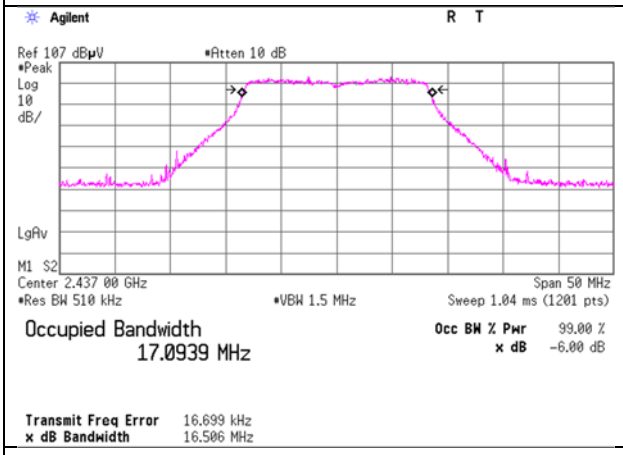
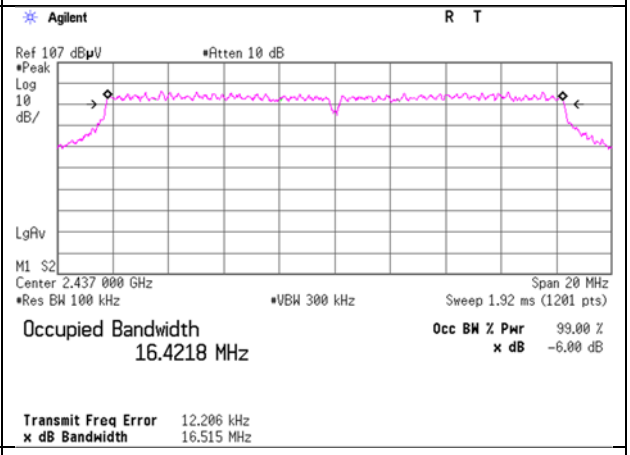
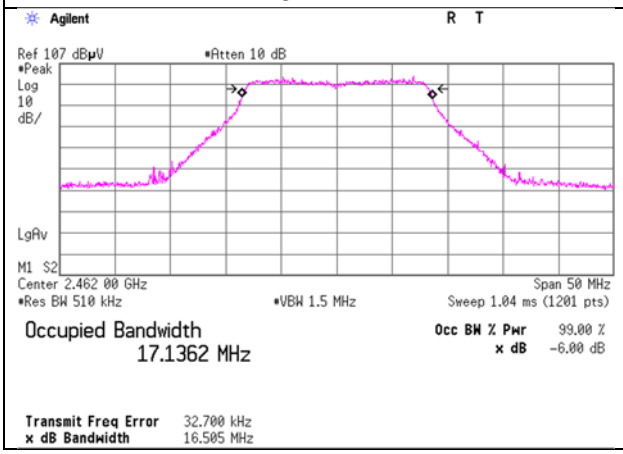
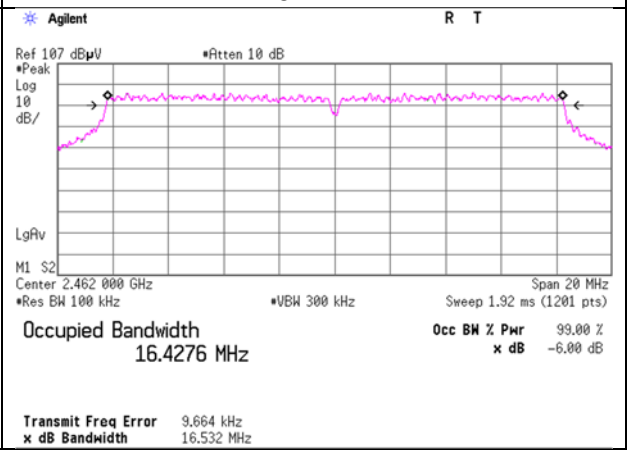
99 % Occupied Bandwidth and 6 dB Bandwidth

11b

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

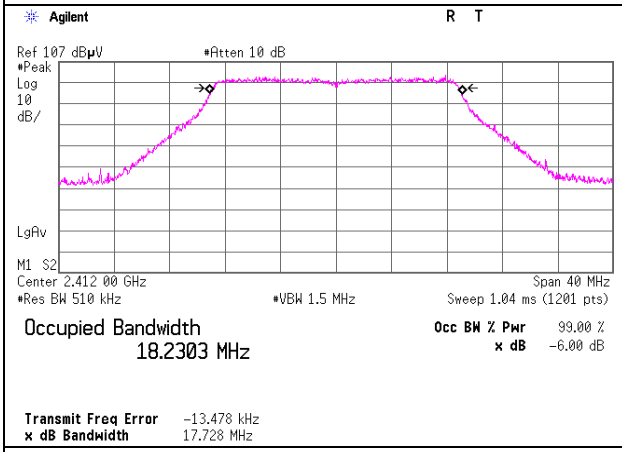
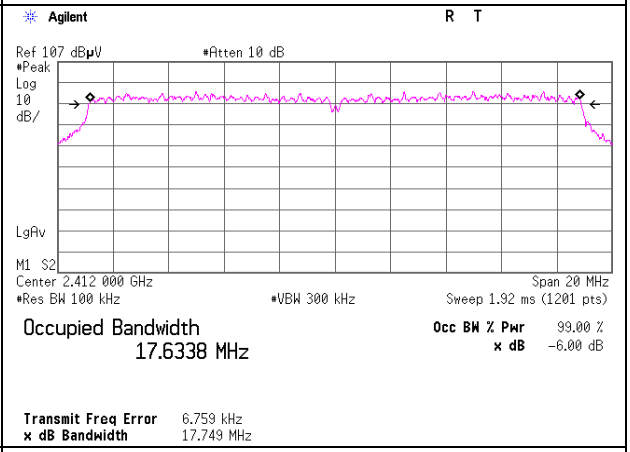
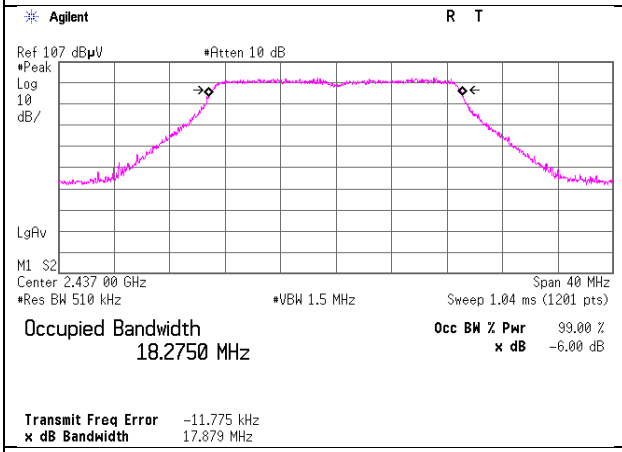
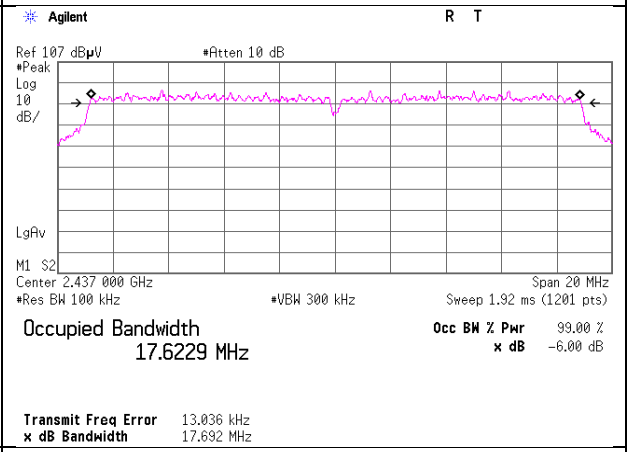
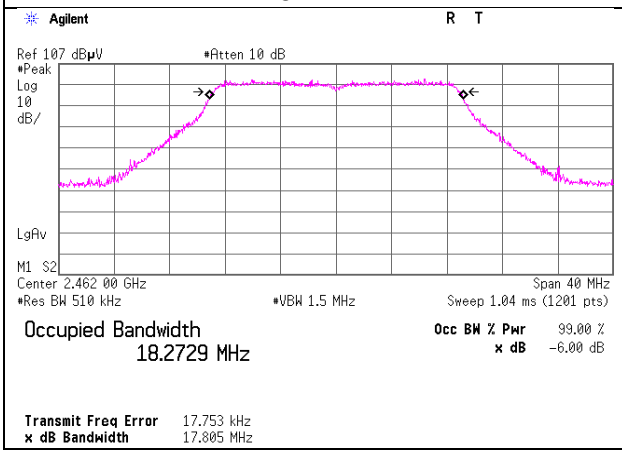
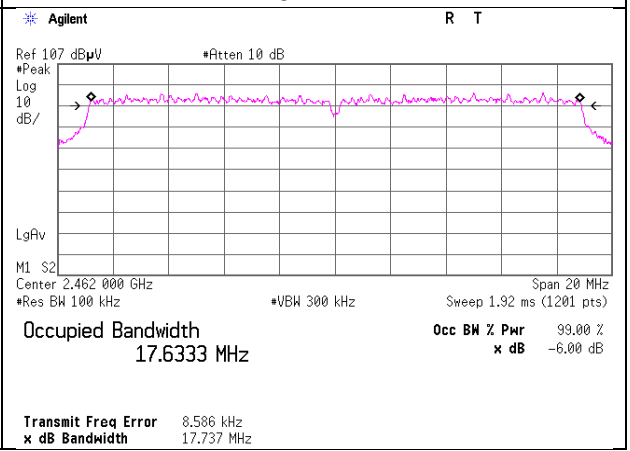
99 % Occupied Bandwidth and 6 dB Bandwidth

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**
	

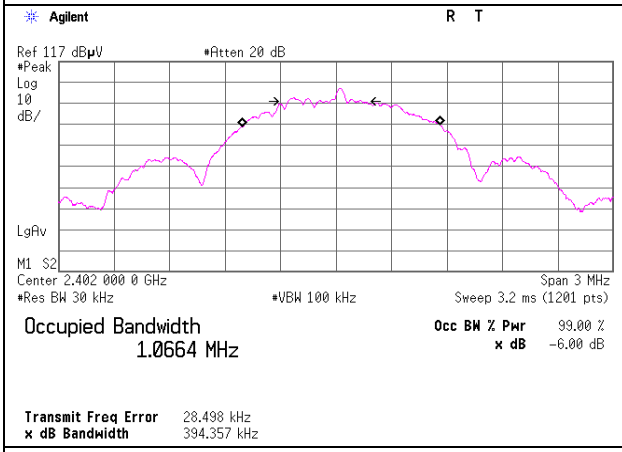
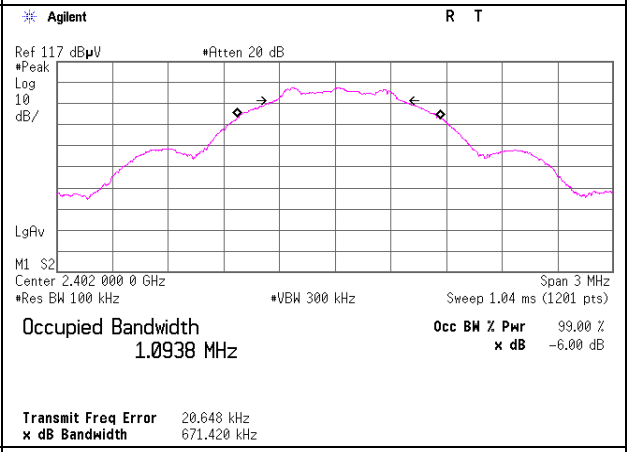
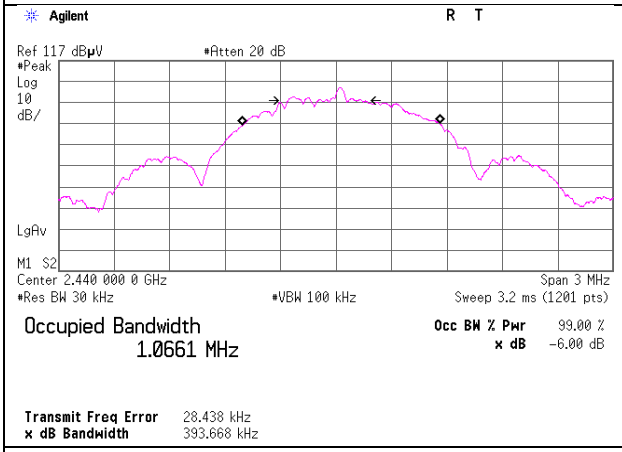
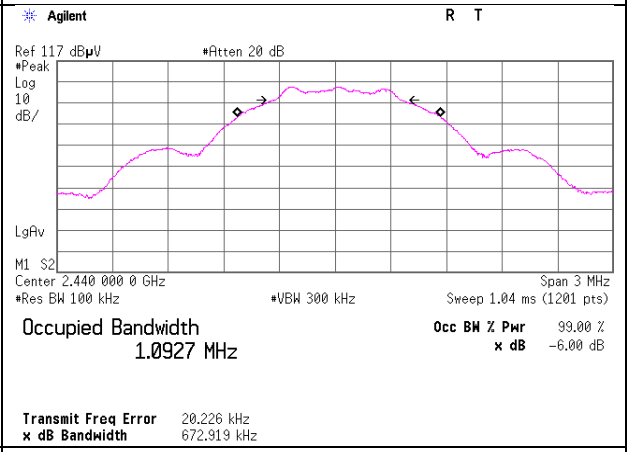
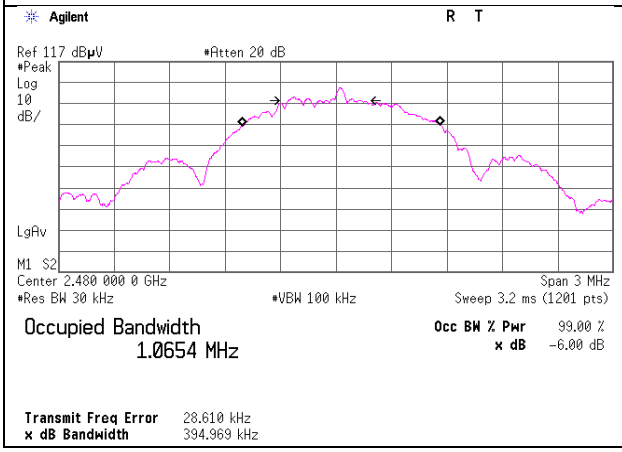
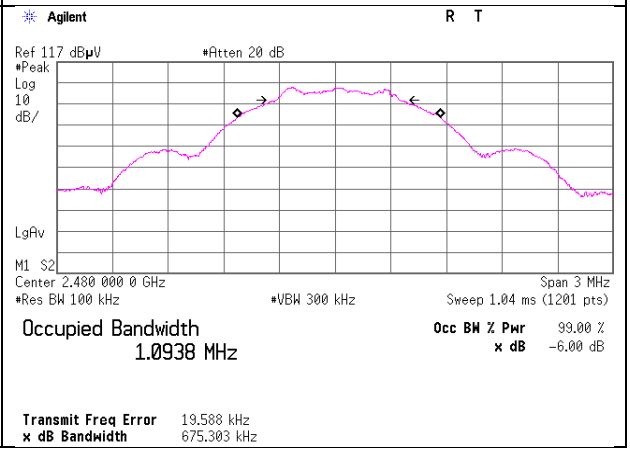
99 % Occupied Bandwidth and 6 dB Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Date	October 18, 2022
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2402	1066.4	0.671	> 0.5000
2440	1066.1	0.673	> 0.5000
2480	1065.4	0.675	> 0.5000

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	Ise EMC Lab.		
Measurement Room	No.5	No.8	No.8
Date	October 11, 2022	November 17, 2022	November 18, 2022
Temperature / Humidity	22 deg. C / 55 % RH	23 deg. C / 46 % RH	21 deg. C / 44 % RH
Engineer	Kiyoshiro Okazaki	Takafumi Noguchi	Takafumi Noguchi
Mode	Tx 11b		

Chain 0 + Chain 1

			Conducted Power					e.i.r.p.					
Freq.	Chain 0 Result	Chain 1 Result	Result		Limit		Margin	Directional Gain	Result		Limit		Margin
[MHz]	[mW]	[mW]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	18.28	15.52	15.29	33.80	30.00	1000	14.71	2.00	17.29	53.58	36.02	4000.00	18.73
2437	12.33	16.22	14.56	28.55	30.00	1000	15.44	2.00	16.56	45.25	36.02	4000.00	19.46
2462	12.97	16.11	14.64	29.08	30.00	1000	15.36	2.00	16.64	46.09	36.02	4000.00	19.38

Sample Calculation:
Result = Chain 0 + Chain 1
e.i.r.p. Result = Conducted Power Result + Directional Gain
Directional Gain = Antenna Gain + Array Gain
Array gain = 0 dB (i.e., no array gain) for NANT ≤ 4

Chain 0

Freq.	Reading	Cable Loss	Atten. Loss	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	2.85	0.25	9.52	12.62	18.28
2437	1.14	0.25	9.52	10.91	12.33
2462	1.36	0.25	9.52	11.13	12.97

Chain 1

Freq.	Reading	Cable Loss	Atten. Loss	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	1.68	0.22	10.01	11.91	15.52
2437	1.87	0.22	10.01	12.10	16.22
2462	1.84	0.22	10.01	12.07	16.11

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

2412MHz

Rate	Chain 0 Reading	Chain 1 Reading	Remark
[Mbps]	[dBm]		
1	3.69	-	
2	3.22	-	Long
2	3.74	-	Short
5.5	3.47	-	Long
5.5	3.69	-	Short
11	3.51	-	Long
11	3.82	2.72	Short

2412 MHz

Rate	Chain 0 Reading	Chain 1 Reading	Chain 0 Reading	Chain 1 Reading	CDD Total	CDD Total	Remark
[Mbps]	[dBm]	[dBm]	[mW]	[mW]	[mW]	[dBm]	
1	3.35	1.93	2.16	1.56	3.72	5.71	
2	3.11	1.97	2.05	1.57	3.62	5.59	Long
2	3.59	2.06	2.29	1.61	3.89	5.90	Short
5.5	3.65	1.85	2.32	1.53	3.85	5.85	Long
5.5	3.52	2.16	2.25	1.64	3.89	5.90	Short
11	3.63	2.09	2.31	1.62	3.92	5.94	Long
11	3.71	2.20	2.35	1.66	4.01	6.03	Short *

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

*The power setting values are different for rate check and final testing.

Maximum Peak Output Power

Test place	Ise EMC Lab.		
Measurement Room	No.5	No.8	No.8
Date	October 11, 2022	November 17, 2022	November 18, 2022
Temperature / Humidity	22 deg. C / 55 % RH	23 deg. C / 46 % RH	21 deg. C / 44 % RH
Engineer	Kiyoshiro Okazaki	Takafumi Noguchi	Takafumi Noguchi
Mode	Tx 11g		

Chain 0 + Chain 1

Freq.	Chain 0 Result	Chain 1 Result	Conducted Power					e.i.r.p.					
			Result		Limit		Margin	Directional Gain	Result		Limit		Margin
[MHz]	[mW]	[mW]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	78.34	94.84	22.39	173.18	30.00	1000	7.61	2.00	24.39	274.48	36.02	4000.00	11.64
2437	77.27	96.16	22.39	173.43	30.00	1000	7.61	2.00	24.39	274.87	36.02	4000.00	11.63
2462	78.34	93.54	22.35	171.88	30.00	1000	7.65	2.00	24.35	272.42	36.02	4000.00	11.67

Sample Calculation:
Result = Chain 0 + Chain 1
e.i.r.p. Result = Conducted Power Result + Directional Gain
Directional Gain = Antenna Gain + Array Gain
Array gain = 0 dB (i.e., no array gain) for NANT ≤ 4

Chain 0

Freq.	Reading	Cable Loss	Atten. Loss	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	9.17	0.25	9.52	18.94	78.34
2437	9.11	0.25	9.52	18.88	77.27
2462	9.17	0.25	9.52	18.94	78.34

Chain 1

Freq.	Reading	Cable Loss	Atten. Loss	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	9.54	0.22	10.01	19.77	94.84
2437	9.60	0.22	10.01	19.83	96.16
2462	9.48	0.22	10.01	19.71	93.54

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

2412 MHz

Rate	Chain 0 Reading	Chain 1 Reading	Remark
[Mbps]	[dBm]	[dBm]	
6	7.28	-	
9	7.25	-	
12	7.45	-	
18	7.16	-	
24	11.64	-	
36	11.68	-	
48	11.72	-	
54	11.83	10.17	

2412 MHz

Rate	Chain 0 Reading	Chain 1 Reading	Chain 0 Reading	Chain 1 Reading	CDD Total	CDD Total	Remark
[Mbps]	[dBm]	[dBm]	[mW]	[mW]	[mW]	[dBm]	
6	7.35	5.64	5.43	3.66	9.10	9.59	
9	7.61	5.62	5.77	3.65	9.42	9.74	
12	7.54	5.71	5.68	3.72	9.40	9.73	
18	7.68	5.72	5.86	3.73	9.59	9.82	
24	11.30	9.83	13.49	9.62	23.11	13.64	
36	11.65	9.71	14.62	9.35	23.98	13.80	
48	11.96	9.70	15.70	9.33	25.04	13.99	
54	11.94	9.83	15.63	9.62	25.25	14.02	*

*: Worst Rate

*The power setting values are different for rate check and final testing.

Maximum Peak Output Power

Test place	Ise EMC Lab.		
Measurement Room	No.6	No.8	No.8
Date	October 20, 2022	October 27, 2022	November 7, 2022
Temperature / Humidity	20 deg. C / 45 % RH	22 deg. C / 38 % RH	22 deg. C / 45 % RH
Engineer	Takafumi Noguchi	Junya Okuno	Keiya Ido
Mode	Tx 11n-20		

Chain 0 + Chain 1

Freq.	Chain 0 Result	Chain 1 Result	Conducted Power Result		Conducted Power Limit		Conducted Power Margin	e.i.r.p. Directional Gain	e.i.r.p. Result		e.i.r.p. Limit		e.i.r.p. Margin
[MHz]	[mW]	[mW]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	87.90	85.90	22.40	173.80	30.00	1000	7.60	2.00	24.40	275.46	36.02	4000.00	11.62
2437	87.30	86.50	22.40	173.79	30.00	1000	7.60	2.00	24.40	275.44	36.02	4000.00	11.62
2462	87.70	87.30	22.43	175.00	30.00	1000	7.57	2.00	24.43	277.35	36.02	4000.00	11.59

Sample Calculation:
Result = Chain 0 + Chain 1
e.i.r.p. Result = Conducted Power Result + Directional Gain
Directional Gain = Antenna Gain + Array Gain
Array gain = 0 dB (i.e., no array gain) for NANT ≤ 4

Chain 0

Freq.	Reading	Cable Loss	Atten. Loss	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	-0.61	0.25	19.80	19.44	87.90
2437	-0.64	0.25	19.80	19.41	87.30
2462	-0.62	0.25	19.80	19.43	87.70

Chain 1

Freq.	Reading	Cable Loss	Atten. Loss	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	9.60	0.22	9.52	19.34	85.90
2437	9.63	0.22	9.52	19.37	86.50
2462	9.67	0.22	9.52	19.41	87.30

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

2412 MHz

Rate	Chain 0 Reading	Chain 1 Reading	Chain 0 Reading	Chain 1 Reading	MIMO Total	MIMO Total	Remark
[MCS]	[dBm]	[dBm]	[mW]	[mW]	[mW]	[dBm]	
0	7.31	-	-	-	-	-	
1	7.22	-	-	-	-	-	
2	7.31	-	-	-	-	-	
3	11.83	10.90	-	-	-	-	
4	11.60	-	-	-	-	-	
5	11.22	-	-	-	-	-	
6	11.78	-	-	-	-	-	
7	11.57	-	-	-	-	-	
8	9.30	6.58	8.51	4.55	13.06	11.16	
9	9.12	6.51	8.17	4.48	12.64	11.02	
10	9.46	6.49	8.83	4.46	13.29	11.23	
11	13.26	11.15	21.18	13.03	34.22	15.34	
12	14.37	10.80	27.35	12.02	39.38	15.95	*
13	13.48	10.68	22.28	11.69	33.98	15.31	
14	13.77	10.97	23.82	12.50	36.33	15.60	
15	13.31	10.82	21.43	12.08	33.51	15.25	

2412 MHz

Rate	Chain 0 Reading	Chain 1 Reading	Chain 0 Reading	Chain 1 Reading	CDD Total	CDD Total	Remark
[MCS]	[dBm]	[dBm]	[mW]	[mW]	[mW]	[dBm]	
0	8.77	6.04	7.53	4.02	11.55	10.63	
1	9.25	6.09	8.41	4.06	12.48	10.96	
2	9.21	6.04	8.34	4.02	12.35	10.92	
3	11.94	10.18	15.63	10.42	26.05	14.16	
4	12.33	10.29	17.10	10.69	27.79	14.44	
5	12.57	11.94	18.07	15.63	33.70	15.28	
6	12.86	12.07	19.32	16.11	35.43	15.49	
7	12.70	10.21	18.62	10.50	29.12	14.64	

*: Worst Rate

*The power setting values are different for rate check and final testing.

Maximum Peak Output Power

Test place	Ise EMC Lab. No.6 Measurement Room
Date	October 18, 2022
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

Chain 0				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	-1.87	0.25	9.52	7.90	6.17	30.00	1000	22.10	2.00	9.90	9.77	36.02	4000	26.12
2440	-1.77	0.25	9.52	8.00	6.31	30.00	1000	22.00	2.00	10.00	10.00	36.02	4000	26.02
2480	-1.61	0.25	9.52	8.16	6.55	30.00	1000	21.84	2.00	10.16	10.38	36.02	4000	25.86

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

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.8 Measurement Room
Date	November 18, 2022
Temperature / Humidity	21 deg. C / 44 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11b

Chain 0 + Chain 1

Freq.	Chain 0 Result	Chain 1 Result	Result (Burst power average)	
[MHz]	[mW]	[mW]	[dBm]	[mW]
2412	8.30	7.31	11.93	15.61
2437	5.53	7.73	11.23	13.26
2462	5.86	7.71	11.33	13.57

Sample Calculation:
Result = Chain 0 + Chain 1

Chain 0

Freq.	Reading	Cable Loss	Atten. Loss	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	-0.58	0.25	9.52	9.19	8.30
2437	-2.34	0.25	9.52	7.43	5.53
2462	-2.09	0.25	9.52	7.68	5.86

Chain 1

Freq.	Reading	Cable Loss	Atten. Loss	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	-1.59	0.22	10.01	8.64	7.31
2437	-1.35	0.22	10.01	8.88	7.73
2462	-1.36	0.22	10.01	8.87	7.71

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
The test was performed with Gate function.

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

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.8 Measurement Room
Date	November 18, 2022
Temperature / Humidity	21 deg. C / 44 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11g

Chain 0 + Chain 1

Freq.	Chain 0 Result	Chain 1 Result	Result (Burst power average)	
[MHz]	[mW]	[mW]	[dBm]	[mW]
2412	6.08	7.14	11.21	13.23
2437	5.37	7.35	11.04	12.72
2462	5.53	7.33	11.09	12.86

Sample Calculation:
Result = Chain 0 + Chain 1

Chain 0

Freq.	Reading	Cable Loss	Atten. Loss	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	-1.93	0.25	9.52	7.84	6.08
2437	-2.47	0.25	9.52	7.30	5.37
2462	-2.34	0.25	9.52	7.43	5.53

Chain 1

Freq.	Reading	Cable Loss	Atten. Loss	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	-1.69	0.22	10.01	8.54	7.14
2437	-1.57	0.22	10.01	8.66	7.35
2462	-1.58	0.22	10.01	8.65	7.33

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
The test was performed with Gate function.

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

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.8 Measurement Room	
Date	October 27, 2022	February 8, 2023
Temperature / Humidity	22 deg. C / 38 % RH	20 deg. C / 39 % RH
Engineer	Junya Okuno	Kiyoshiro Okazaki
Mode	Tx 11n-20	

Chain 0 + Chain 1

Freq.	Chain 0 Result	Chain 1 Result	Result (Burst power average)	
[MHz]	[mW]	[mW]	[dBm]	[mW]
2412	8.63	5.58	11.53	14.21
2437	5.94	5.98	10.77	11.93
2462	5.56	5.65	10.50	11.21

Sample Calculation:
Result = Chain 0 + Chain 1

Chain 0

Freq.	Reading	Cable Loss	Atten. Loss	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	-0.90	0.25	10.01	9.36	8.63
2437	-2.52	0.25	10.01	7.74	5.94
2462	-2.81	0.25	10.01	7.45	5.56

Chain 1

Freq.	Reading	Cable Loss	Atten. Loss	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	-2.27	0.22	9.52	7.47	5.58
2437	-1.97	0.22	9.52	7.77	5.98
2462	-2.22	0.22	9.52	7.52	5.65

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
The test was performed with Gate function.

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

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.6 Measurement Room
Date	October 18, 2022
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

Chain 0

Freq.	Reading	Cable Loss	Atten. Loss	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2402	-2.13	0.25	9.52	7.64	5.81
2440	-2.01	0.25	9.52	7.76	5.97
2480	-1.89	0.25	9.52	7.88	6.14

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
The test was performed with Gate function.

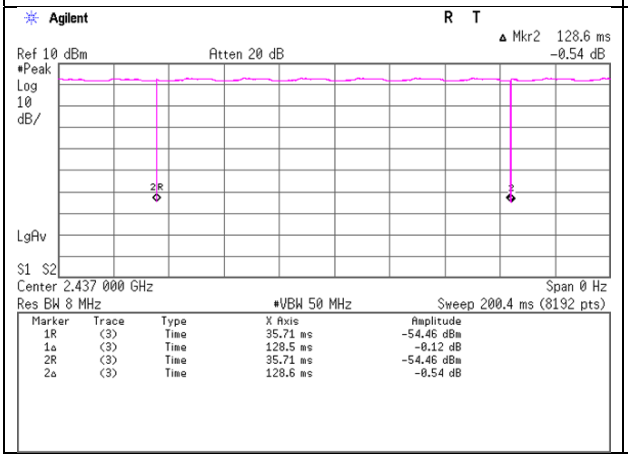
The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

Burst rate confirmation

Test place	Ise EMC Lab. No.8 Measurement Room	
Date	October 27, 2022	November 18, 2022
Temperature / Humidity	22 deg. C / 38 % RH	21 deg. C / 44 % RH
Engineer	Junya Okuno	Takafumi Noguchi
Mode	Tx	

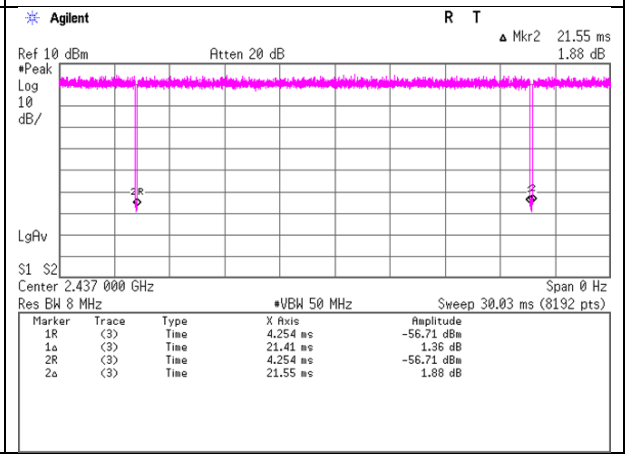
11b 1 Mbps

Tx on / (Tx on + Tx off) = 0.999
Tx on / (Tx on + Tx off) * 100 = 99.9 %
Duty factor = 10 * log (128.6 / 128.5) = 0.00 dB



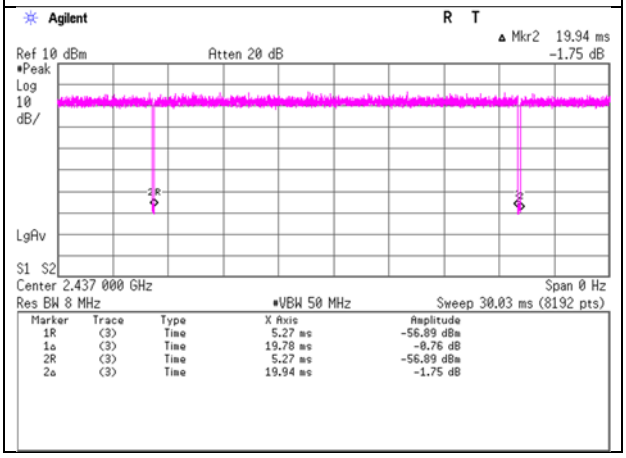
11g 6 Mbps

Tx on / (Tx on + Tx off) = 0.994
Tx on / (Tx on + Tx off) * 100 = 99.4 %
Duty factor = 10 * log (21.55 / 21.41) = 0.03 dB



11n-20 MCS 0

Tx on / (Tx on + Tx off) = 0.992
Tx on / (Tx on + Tx off) * 100 = 99.2 %
Duty factor = 10 * log (19.94 / 19.78) = 0.03 dB



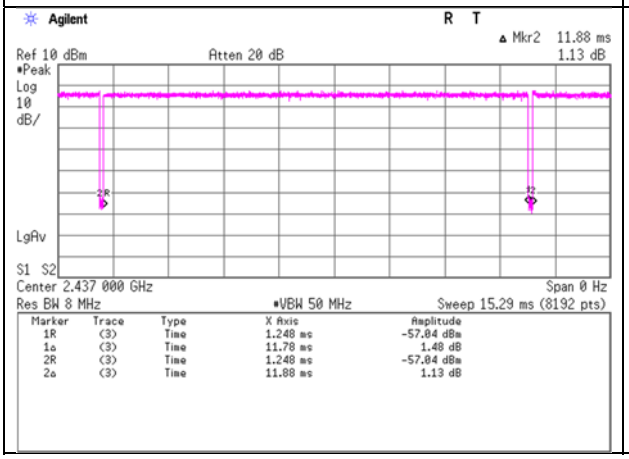
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation

Test place	Ise EMC Lab.		
Measurement Room	No.6	No.8	No.8
Date	October 18, 2022	October 27, 2022	November 18, 2022
Temperature / Humidity	23 deg. C / 45 % RH	22 deg. C / 38 % RH	21 deg. C / 44 % RH
Engineer	Takafumi Noguchi	Junya Okuno	Takafumi Noguchi
Mode	Tx		

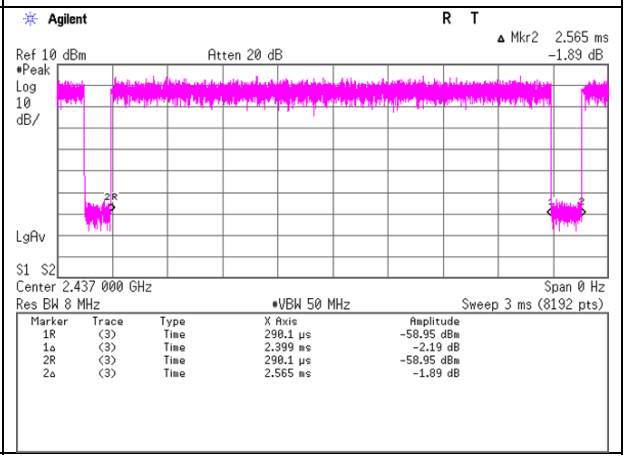
11b 11 Mbps (Short)

Tx on / (Tx on + Tx off) = 0.992
Tx on / (Tx on + Tx off) * 100 = 99.2 %
Duty factor = 10 * log (11.88 / 11.78) = 0.04 dB



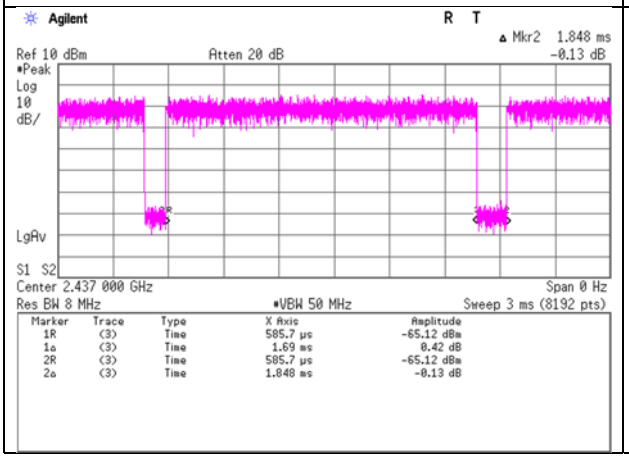
11g 54 Mbps

Tx on / (Tx on + Tx off) = 0.935
Tx on / (Tx on + Tx off) * 100 = 93.5 %
Duty factor = 10 * log (2.565 / 2.399) = 0.29 dB



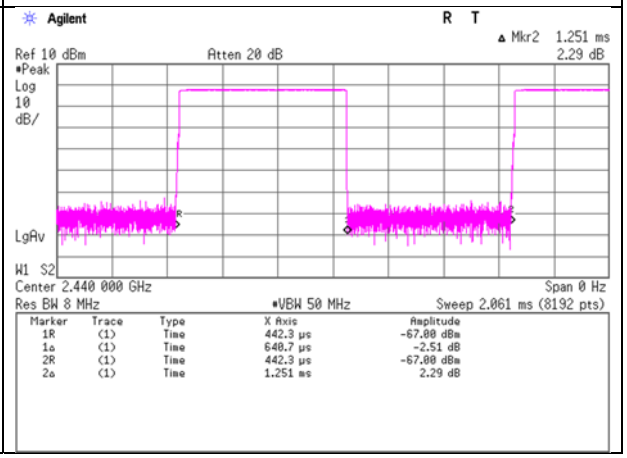
11n-20 MCS 12

Tx on / (Tx on + Tx off) = 0.915
Tx on / (Tx on + Tx off) * 100 = 91.5 %
Duty factor = 10 * log (1.848 / 1.69) = 0.39 dB



BT LE

Tx on / (Tx on + Tx off) = 0.512
Tx on / (Tx on + Tx off) * 100 = 51.2 %
Duty factor = 10 * log (1.251 / 0.6407) = 2.91 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	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 17, 2022
Temperature / Humidity	21 deg. C / 34 % RH
Engineer	Junya Okuno
	(1 GHz to 26.5 GHz)
Mode	Tx 11b 2412 MHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	2390.0	52.0	43.1	27.8	5.7	32.0	-	53.5	44.6	73.9	53.9	20.4	9.3	
Hori.	4824.0	40.4	33.7	31.5	8.0	31.1	-	48.8	42.0	73.9	53.9	25.1	11.9	Floor noise
Hori.	7236.0	42.7	33.4	36.5	9.2	32.4	-	56.0	46.7	73.9	53.9	17.9	7.2	Floor noise
Hori.	9648.0	44.3	32.0	38.1	10.1	32.5	-	59.9	47.6	73.9	53.9	14.0	6.3	Floor noise
Vert.	2390.0	53.3	43.6	27.8	5.7	32.0	-	54.8	45.1	73.9	53.9	19.1	8.8	
Vert.	4824.0	40.4	33.7	31.5	8.0	31.1	-	48.8	42.0	73.9	53.9	25.1	11.9	Floor noise
Vert.	7236.0	42.8	33.5	36.5	9.2	32.4	-	56.1	46.8	73.9	53.9	17.8	7.1	Floor noise
Vert.	9648.0	44.0	32.0	38.1	10.1	32.5	-	59.6	47.6	73.9	53.9	14.3	6.3	Floor noise

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

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

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

*QP detector was used up to 1GHz.

20dBc Data Sheet

Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.0	100.9	27.8	5.7	32.0	102.4	-	-	Carrier
Hori.	2400.0	46.7	27.8	5.7	34.9	45.3	82.4	37.1	
Vert.	2412.0	101.9	27.8	5.7	32.0	103.4	-	-	Carrier
Vert.	2400.0	44.5	27.8	5.7	32.0	46.0	83.4	37.3	

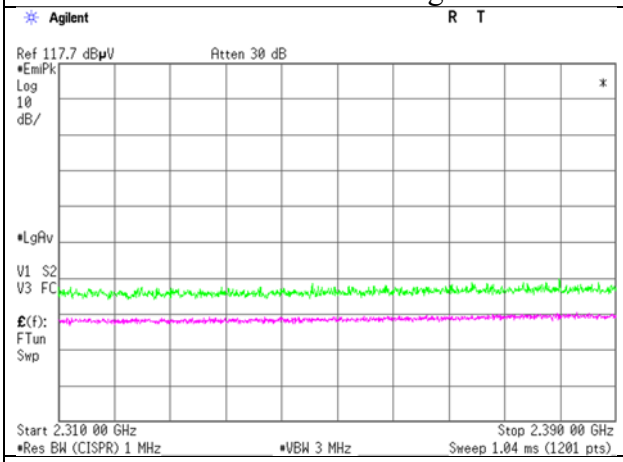
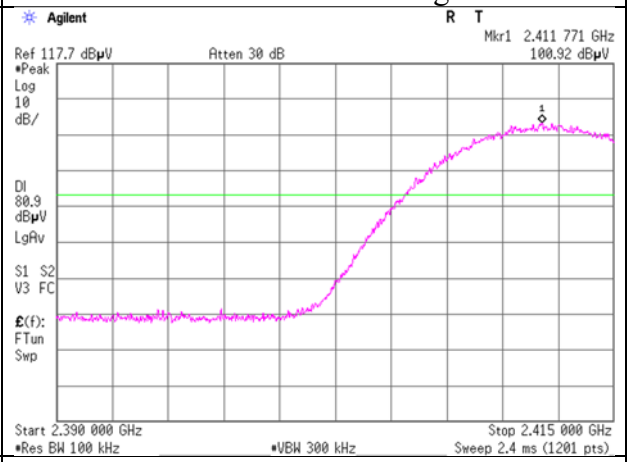
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

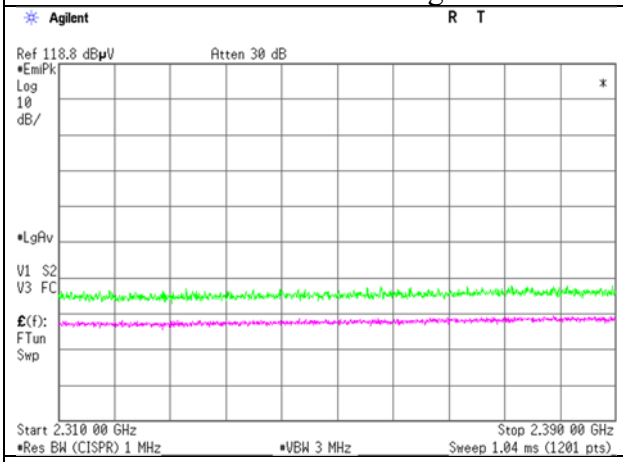
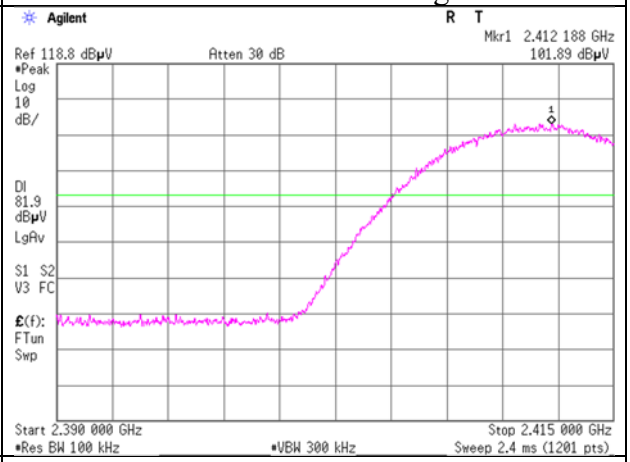
Distance factor: 1 GHz - 10 GHz 20log (4 m / 3.0 m) = 2.5 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 17, 2022
Temperature / Humidity	21 deg. C / 34 % RH
Engineer	Junya Okuno
	(1 GHz to 10 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	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 17, 2022
Temperature / Humidity	21 deg. C / 34 % RH
Engineer	Junya Okuno
	(1 GHz to 26.5 GHz)
Mode	Tx 11b 2437 MHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	4874.0	40.7	33.6	31.6	8.0	31.1	-	49.1	42.1	73.9	53.9	24.8	11.8	Floor noise
Hori.	7311.0	42.1	33.2	36.5	9.2	32.4	-	55.4	46.6	73.9	53.9	18.5	7.3	Floor noise
Hori.	9748.0	43.7	31.8	38.3	10.1	32.6	-	59.5	47.6	73.9	53.9	14.4	6.3	Floor noise
Vert.	4874.0	40.8	33.6	31.6	8.0	31.1	-	49.2	42.0	73.9	53.9	24.7	11.9	Floor noise
Vert.	7311.0	42.0	33.4	36.5	9.2	32.4	-	55.3	46.8	73.9	53.9	18.6	7.1	Floor noise
Vert.	9748.0	44.0	31.6	38.3	10.1	32.6	-	59.8	47.4	73.9	53.9	14.1	6.5	Floor noise

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

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

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

*QP detector was used up to 1GHz.

Distance factor: 1 GHz - 10 GHz 20log (4 m / 3.0 m) = 2.5 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 17, 2022
Temperature / Humidity	21 deg. C / 34 % RH
Engineer	Junya Okuno
	(1 GHz to 26.5 GHz)
Mode	Tx 11b 2462 MHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	2483.5	54.0	45.2	27.7	5.8	32.0	-	55.5	46.8	73.9	53.9	18.4	7.1	
Hori.	4924.0	40.9	32.1	31.6	8.0	31.1	-	49.4	40.6	73.9	53.9	24.5	13.3	Floor noise
Hori.	7386.0	42.1	33.9	36.6	9.2	32.4	-	55.5	47.3	73.9	53.9	18.4	6.7	Floor noise
Hori.	9848.0	43.0	31.4	38.4	10.2	32.6	-	59.0	47.4	73.9	53.9	15.0	6.6	Floor noise
Vert.	2483.5	54.6	46.1	27.7	5.8	32.0	-	56.1	47.6	73.9	53.9	17.8	6.3	
Vert.	4924.0	40.7	32.2	31.6	8.0	31.1	-	49.2	40.7	73.9	53.9	24.7	13.2	Floor noise
Vert.	7386.0	42.0	33.9	36.6	9.2	32.4	-	55.4	47.3	73.9	53.9	18.5	6.6	Floor noise
Vert.	9848.0	43.2	31.4	38.4	10.2	32.6	-	59.2	47.4	73.9	53.9	14.7	6.5	Floor noise

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

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

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

*QP detector was used up to 1GHz.

Distance factor: 1 GHz - 10 GHz 20log (4 m / 3.0 m) = 2.5 dB

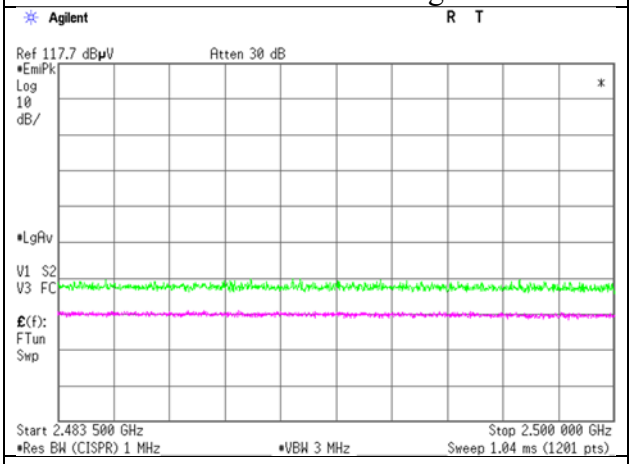
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 17, 2022
Temperature / Humidity	21 deg. C / 34 % RH
Engineer	Junya Okuno
	(1 GHz to 10 GHz)
Mode	Tx 11b 2462 MHz

Horizontal

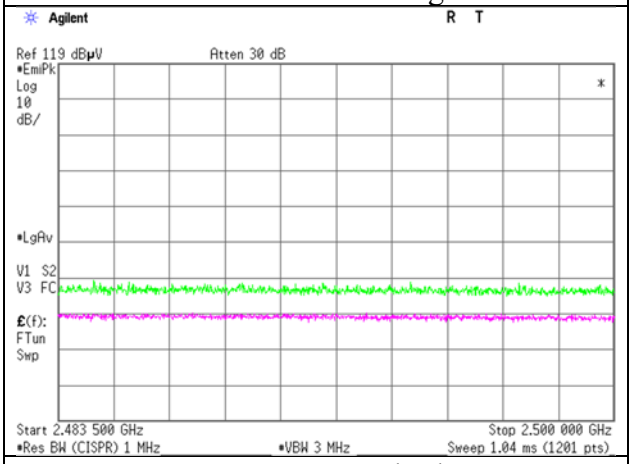
Restricted-band band-edge Plot



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	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	November 2, 2022
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Takumi Nishida
	(1 GHz to 26.5 GHz)
Mode	Tx 11n-20 2412 MHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	2390.0	54.9	40.8	27.6	5.8	32.9	-	55.4	41.3	73.9	53.9	18.6	12.6	
Hori.	4824.0	41.5	31.2	31.5	8.1	32.0	-	49.1	38.9	73.9	53.9	24.8	15.0	Floor noise
Hori.	7236.0	43.4	31.5	35.8	9.5	32.8	-	55.9	43.9	73.9	53.9	18.0	10.0	Floor noise
Hori.	9648.0	43.5	32.0	38.8	10.3	33.5	-	59.1	47.6	73.9	53.9	14.9	6.3	Floor noise
Vert.	2390.0	58.3	43.8	27.6	5.8	32.9	-	58.8	44.3	73.9	53.9	15.1	9.6	
Vert.	4824.0	41.6	31.3	31.5	8.1	32.0	-	49.2	39.0	73.9	53.9	24.7	14.9	Floor noise
Vert.	7236.0	43.4	31.7	35.8	9.5	32.8	-	55.8	44.1	73.9	53.9	18.1	9.8	Floor noise
Vert.	9648.0	43.4	31.9	38.8	10.3	33.5	-	59.0	47.4	73.9	53.9	14.9	6.5	Floor noise

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

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

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

*QP detector was used up to 1GHz.

20dBc Data Sheet

Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.0	96.9	27.5	5.8	32.9	97.4	-	-	Carrier
Hori.	2400.0	61.3	27.5	5.8	32.9	61.8	77.4	15.6	
Vert.	2412.0	99.2	27.5	5.8	32.9	99.7	-	-	Carrier
Vert.	2400.0	63.7	27.5	5.8	32.9	64.1	79.7	15.5	

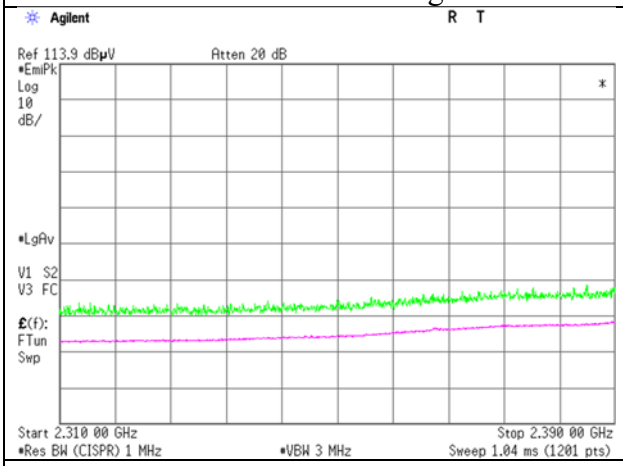
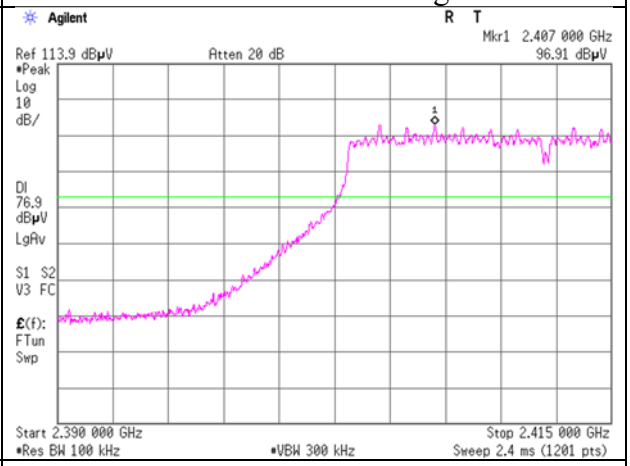
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

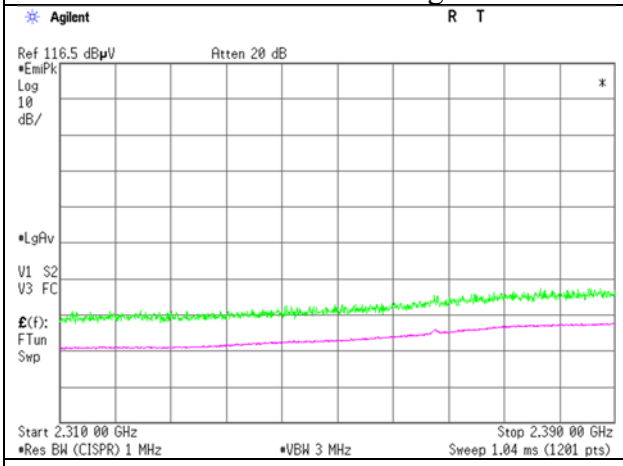
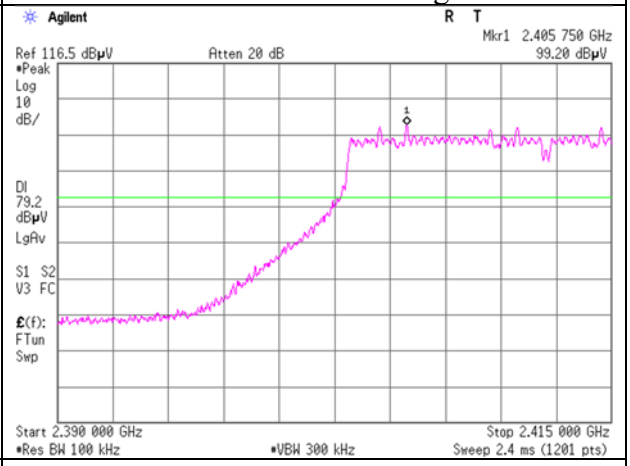
Distance factor: 1 GHz - 10 GHz 20log (4 m / 3.0 m) = 2.5 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	November 2, 2022
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Takumi Nishida
	(1 GHz to 10 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	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	November 2, 2022
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Takumi Nishida
	(1 GHz to 26.5 GHz)
Mode	Tx 11n-20 2437 MHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	4874.0	41.9	31.3	31.5	8.1	32.0	-	49.6	39.0	73.9	53.9	24.3	14.9	Floor noise
Hori.	7311.0	43.4	31.7	35.9	9.5	32.8	-	56.0	44.3	73.9	53.9	18.0	9.7	Floor noise
Hori.	9748.0	43.8	32.0	39.1	10.3	33.6	-	59.6	47.8	73.9	53.9	14.3	6.1	Floor noise
Vert.	4874.0	41.8	31.3	31.5	8.1	32.0	-	49.5	39.0	73.9	53.9	24.4	14.9	Floor noise
Vert.	7311.0	43.5	31.6	35.9	9.5	32.8	-	56.0	44.1	73.9	53.9	17.9	9.8	Floor noise
Vert.	9748.0	43.6	31.9	39.1	10.3	33.6	-	59.4	47.7	73.9	53.9	14.5	6.2	Floor noise

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

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

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

*QP detector was used up to 1GHz.

Distance factor: 1 GHz - 10 GHz 20log (4 m / 3.0 m) = 2.5 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	November 2, 2022	November 11, 2022
Temperature / Humidity	23 deg. C / 51 % RH	22 deg. C / 42 % RH
Engineer	Takumi Nishida	Junya Okuno
	(1 GHz to 26.5 GHz)	(Below 1 GHz)
Mode	Tx 11n-20 2462 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	104.6	32.2	-	11.0	7.4	28.4	-	22.2	-	43.5	-	21.3	-	
Hori.	129.5	26.5	-	13.8	7.6	28.3	-	19.5	-	43.5	-	24.0	-	
Hori.	180.5	22.2	-	16.1	8.0	28.1	-	18.2	-	43.5	-	25.3	-	
Hori.	228.0	32.4	-	12.0	8.3	27.9	-	24.8	-	46.0	-	21.2	-	
Hori.	282.0	34.4	-	14.0	8.6	27.7	-	29.2	-	46.0	-	16.8	-	
Hori.	702.0	31.0	-	20.0	10.6	29.3	-	32.3	-	46.0	-	13.8	-	
Hori.	2483.5	53.6	42.1	27.4	5.9	32.9	-	54.0	42.6	73.9	53.9	19.9	11.3	
Hori.	4924.0	42.1	31.6	31.6	8.1	31.9	-	49.9	39.4	73.9	53.9	24.0	14.6	Floor noise
Hori.	7386.0	43.7	31.7	36.0	9.5	32.8	-	56.4	44.4	73.9	53.9	17.6	9.5	Floor noise
Hori.	9848.0	43.7	32.0	39.2	10.3	33.6	-	59.5	47.9	73.9	53.9	14.4	6.0	Floor noise
Vert.	61.7	39.0	-	7.5	7.0	28.5	-	25.0	-	40.0	-	15.0	-	
Vert.	104.9	43.7	-	11.1	7.4	28.4	-	33.8	-	43.5	-	9.7	-	
Vert.	176.2	29.4	-	15.9	7.9	28.1	-	25.1	-	43.5	-	18.4	-	
Vert.	234.8	26.0	-	12.2	8.3	27.8	-	18.7	-	46.0	-	27.4	-	
Vert.	282.0	31.3	-	14.0	8.6	27.7	-	26.1	-	46.0	-	19.9	-	
Vert.	690.0	26.0	-	19.7	10.5	29.3	-	27.0	-	46.0	-	19.0	-	
Vert.	2483.5	56.2	44.8	27.4	5.9	32.9	-	56.7	45.3	73.9	53.9	17.2	8.7	
Vert.	4924.0	42.0	31.3	31.6	8.1	31.9	-	49.8	39.1	73.9	53.9	24.1	14.8	Floor noise
Vert.	7386.0	43.3	31.7	36.0	9.5	32.8	-	56.0	44.4	73.9	53.9	17.9	9.5	Floor noise
Vert.	9848.0	43.5	31.9	39.2	10.3	33.6	-	59.4	47.8	73.9	53.9	14.5	6.1	Floor noise

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

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

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

*QP detector was used up to 1GHz.

Distance factor: 1 GHz - 10 GHz 20log (4 m / 3.0 m) = 2.5 dB

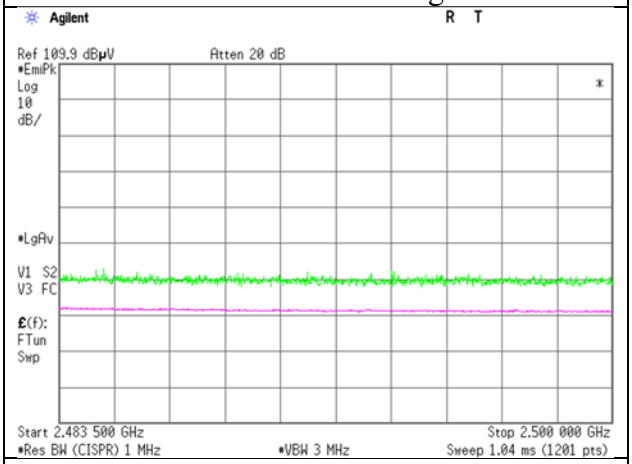
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	November 2, 2022
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Takumi Nishida
	(1 GHz to 10 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

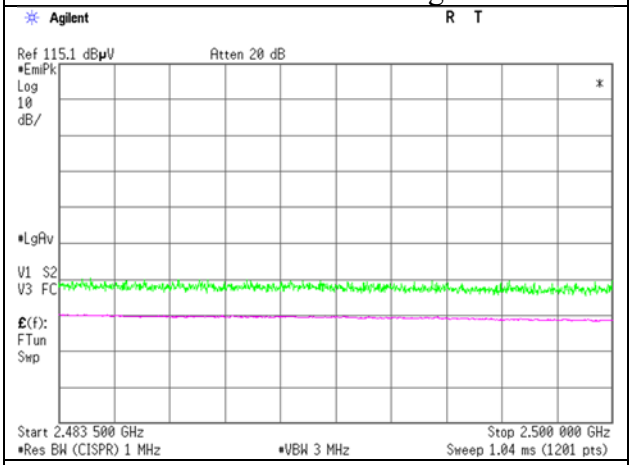
Restricted-band band-edge Plot



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

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 20, 2022
Temperature / Humidity	22 deg. C / 58 % RH
Engineer	Hiroki Numata
	(1 GHz to 26.5 GHz)
Mode	Tx BT LE 2402 MHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	2390.0	53.9	44.9	27.6	5.5	36.3	2.9	50.8	44.7	73.9	53.9	23.1	9.2	*1)
Hori.	4804.0	45.7	35.9	31.5	7.9	35.8	-	49.4	39.7	73.9	53.9	24.5	14.2	Floor noise
Hori.	7206.0	46.7	36.8	35.9	9.2	35.9	-	55.9	46.1	73.9	53.9	18.0	7.9	Floor noise
Hori.	9608.0	45.4	35.3	38.7	9.8	36.3	-	57.6	47.6	73.9	53.9	16.3	6.3	Floor noise
Vert.	2390.0	54.3	45.1	27.6	5.5	36.3	2.9	51.1	44.8	73.9	53.9	22.8	9.1	*1)
Vert.	4804.0	45.7	35.1	31.5	7.9	35.8	-	49.4	38.9	73.9	53.9	24.5	15.1	Floor noise
Vert.	7206.0	46.7	36.9	35.9	9.2	35.9	-	55.9	46.1	73.9	53.9	18.0	7.8	Floor noise
Vert.	9608.0	45.4	35.5	38.7	9.8	36.3	-	57.6	47.7	73.9	53.9	16.3	6.2	Floor noise

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

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

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

*QP detector was used up to 1GHz.

*1) Not Out of Band emission(Leakage Power)

20dBc Data Sheet

Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.0	108.4	27.6	5.5	36.3	105.2	-	-	Carrier
Hori.	2400.0	50.5	27.6	5.5	36.3	47.4	85.2	37.9	
Vert.	2402.0	109.8	27.6	5.5	36.3	106.7	-	-	Carrier
Vert.	2400.0	50.8	27.6	5.5	36.3	47.7	86.7	39.0	

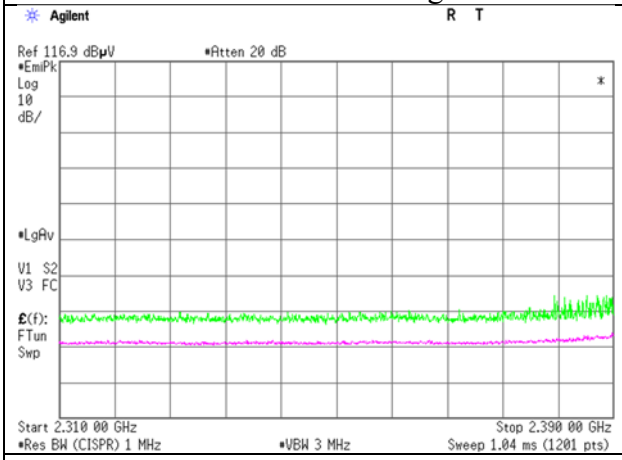
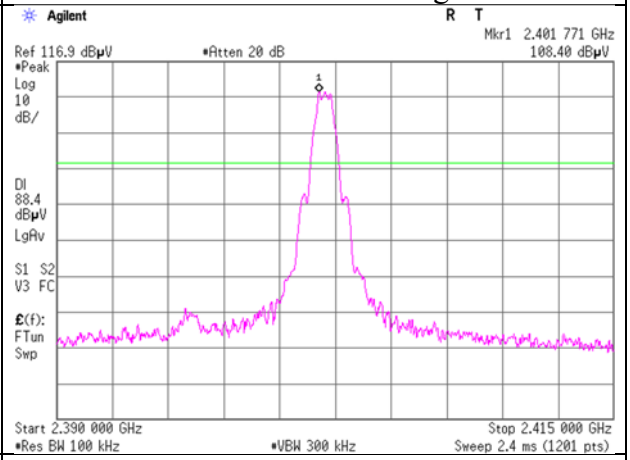
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

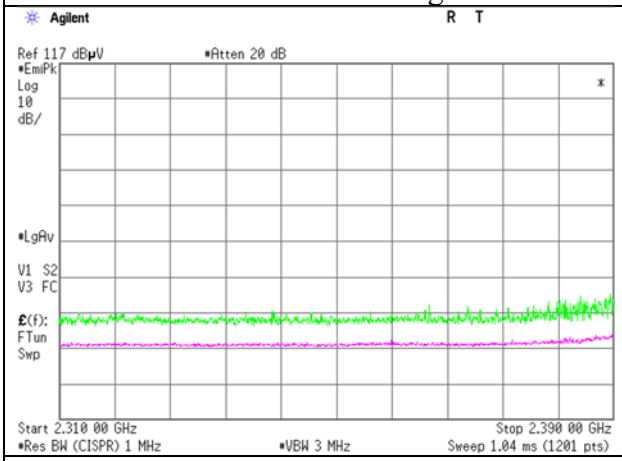
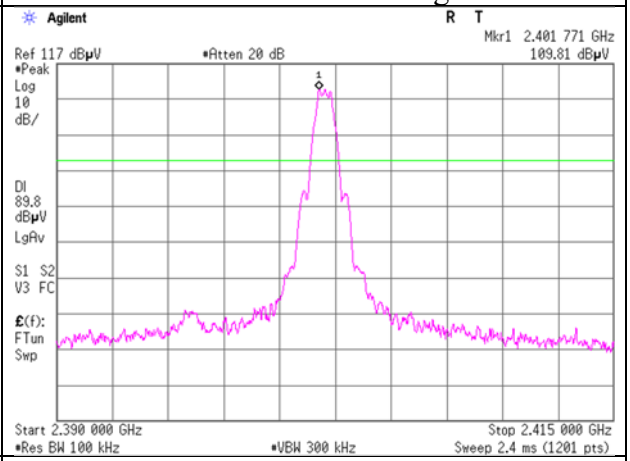
Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 20, 2022
Temperature / Humidity	22 deg. C / 58 % RH
Engineer	Hiroki Numata
	(1 GHz to 10 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	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 20, 2022
Temperature / Humidity	22 deg. C / 58 % RH
Engineer	Hiroki Numata
	(1 GHz to 26.5 GHz)
Mode	Tx BT LE 2440 MHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	4880.0	46.1	35.2	31.6	7.9	35.7	-	49.9	39.0	73.9	53.9	24.0	14.9	Floor noise
Hori.	7320.0	45.5	35.6	36.1	9.2	35.9	-	54.9	45.0	73.9	53.9	19.0	8.9	Floor noise
Hori.	9760.0	45.4	34.7	39.1	9.8	36.4	-	58.0	47.3	73.9	53.9	15.9	6.6	Floor noise
Vert.	4880.0	46.5	36.1	31.6	7.9	35.7	-	50.3	39.9	73.9	53.9	23.6	14.0	Floor noise
Vert.	7320.0	45.5	35.9	36.1	9.2	35.9	-	54.8	45.3	73.9	53.9	19.1	8.7	Floor noise
Vert.	9760.0	45.6	34.6	39.1	9.8	36.4	-	58.2	47.2	73.9	53.9	15.7	6.7	Floor noise

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

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

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

*QP detector was used up to 1GHz.

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 20, 2022
Temperature / Humidity	22 deg. C / 58 % RH
Engineer	Hiroki Numata
	(30 MHz to 26.5 GHz)
Mode	Tx BT LE 2480 MHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	116.4	45.2	-	12.4	8.6	39.1	-	27.1	-	43.5	-	16.4	-	
Hori.	156.0	42.4	-	15.2	9.1	39.1	-	27.6	-	43.5	-	16.0	-	
Hori.	187.1	37.0	-	16.3	9.4	39.1	-	23.6	-	43.5	-	19.9	-	
Hori.	337.0	41.8	-	15.8	10.7	38.8	-	29.5	-	46.0	-	16.5	-	
Hori.	714.0	44.1	-	20.4	13.2	38.4	-	39.3	-	46.0	-	6.7	-	
Hori.	2483.5	59.4	43.9	27.5	5.6	36.3	2.9	56.2	43.6	73.9	53.9	17.7	10.3	*1)
Hori.	4960.0	45.8	35.1	31.7	8.0	35.7	-	49.7	39.0	73.9	53.9	24.2	14.9	Floor noise
Hori.	7440.0	46.8	35.8	36.3	9.2	35.9	-	56.3	45.3	73.9	53.9	17.6	8.6	Floor noise
Hori.	9920.0	45.7	35.1	39.1	9.9	36.4	-	58.2	47.7	73.9	53.9	15.7	6.3	Floor noise
Vert.	49.3	46.3	-	11.3	7.6	39.0	-	26.2	-	40.0	-	13.8	-	
Vert.	79.5	54.1	-	6.9	8.1	39.1	-	30.1	-	40.0	-	9.9	-	
Vert.	112.3	44.9	-	11.9	8.5	39.1	-	26.3	-	43.5	-	17.3	-	
Vert.	162.0	35.1	-	15.5	9.1	39.1	-	20.6	-	43.5	-	22.9	-	
Vert.	337.0	45.5	-	15.8	10.7	38.8	-	33.2	-	46.0	-	12.8	-	
Vert.	714.0	35.4	-	20.4	13.2	38.4	-	30.6	-	46.0	-	15.4	-	
Vert.	2483.5	57.9	41.7	27.5	5.6	36.3	2.9	54.7	41.4	73.9	53.9	19.2	12.5	*1)
Vert.	4960.0	46.6	36.1	31.7	8.0	35.7	-	50.5	40.0	73.9	53.9	23.4	13.9	Floor noise
Vert.	7440.0	46.8	36.7	36.3	9.2	35.9	-	56.3	46.2	73.9	53.9	17.6	7.7	Floor noise
Vert.	9920.0	45.9	35.0	39.1	9.9	36.4	-	58.4	47.6	73.9	53.9	15.5	6.3	Floor noise

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

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

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

*QP detector was used up to 1GHz.

*1) Not Out of Band emission(Leakage Power)

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB

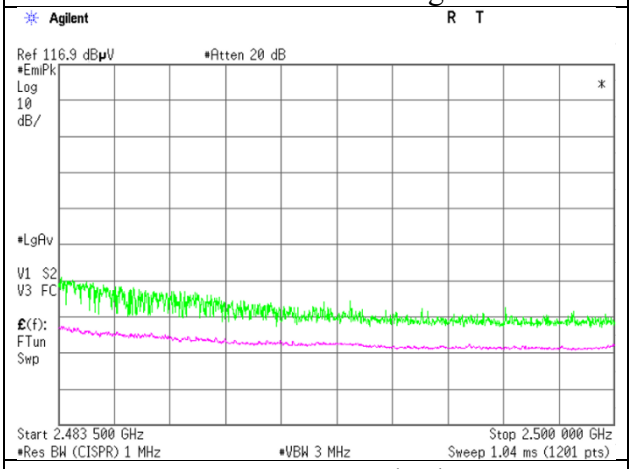
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 20, 2022
Temperature / Humidity	22 deg. C / 58 % RH
Engineer	Hiroki Numata
	(1 GHz to 10 GHz)
Mode	Tx BT LE 2480 MHz

Horizontal

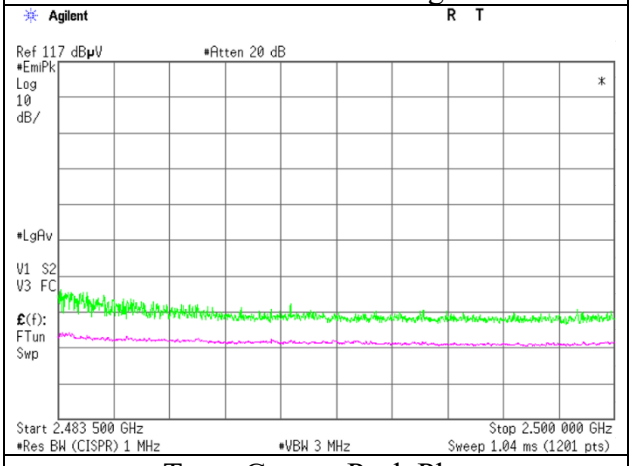
Restricted-band band-edge Plot



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

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 10, 2022
Temperature / Humidity	24 deg. C / 37 % RH
Engineer	Tetsuro Yoshida
	(1 GHz to 26.5 GHz)
Mode	Tx BT LE 2402 MHz + 11ac-40 5795 MHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	2390.0	49.2	34.2	27.8	5.8	32.9	2.9	49.9	37.9	73.9	53.9	24.0	16.0	*1)
Hori.	4804.0	47.8	40.0	31.5	8.1	32.0	2.9	55.5	50.6	73.9	53.9	18.5	3.3	
Hori.	7206.0	43.2	33.0	36.4	9.5	32.8	-	56.4	46.2	73.9	53.9	17.5	7.7	Floor noise
Hori.	9608.0	43.2	33.0	38.0	10.2	33.5	-	57.9	47.7	73.9	53.9	16.0	6.2	Floor noise
Vert.	2390.0	44.9	33.2	27.8	5.8	32.9	2.9	45.6	36.8	73.9	53.9	28.3	17.1	*1)
Vert.	4804.0	45.6	36.9	31.5	8.1	32.0	2.9	53.3	47.4	73.9	53.9	20.6	6.5	
Vert.	7206.0	43.4	33.1	36.4	9.5	32.8	-	56.5	46.3	73.9	53.9	17.4	7.6	Floor noise
Vert.	9608.0	43.3	32.9	38.0	10.2	33.5	-	58.0	47.6	73.9	53.9	15.9	6.3	Floor noise

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

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

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

*QP detector was used up to 1GHz.

*1) Not Out of Band emission(Leakage Power)

20dBc Data Sheet

Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.0	103.8	27.8	5.8	32.9	104.5	-	-	Carrier
Hori.	2400.0	48.3	27.8	5.8	32.9	49.0	84.5	35.5	
Vert.	2402.0	96.7	27.8	5.8	32.9	97.4	-	-	Carrier
Vert.	2400.0	42.4	27.8	5.8	32.9	43.1	77.4	34.3	

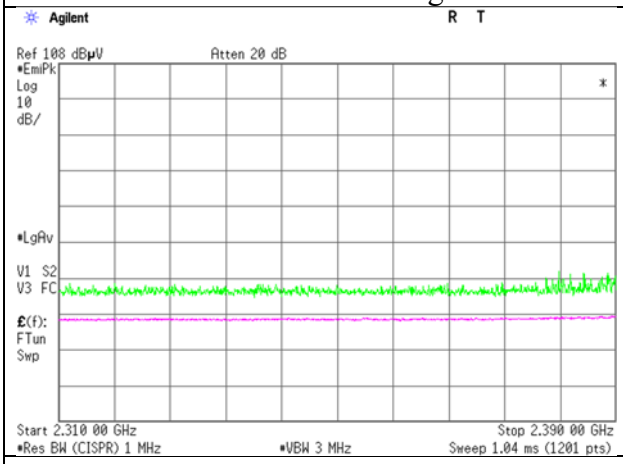
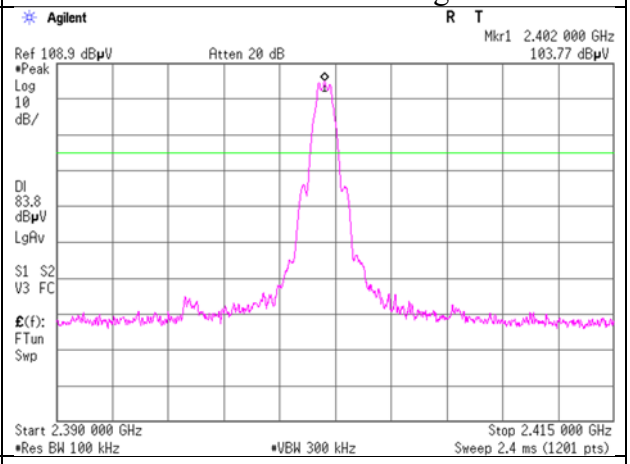
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

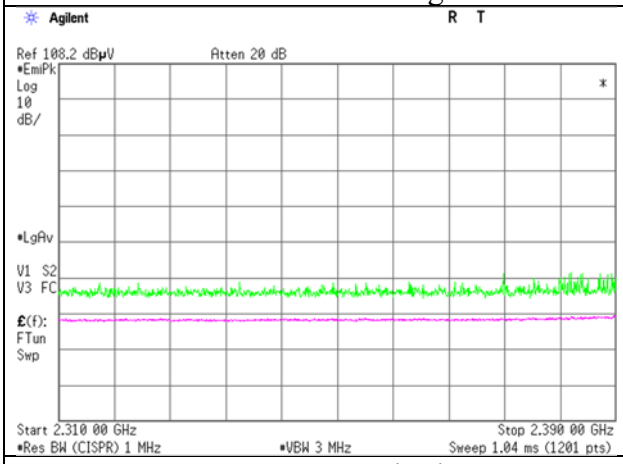
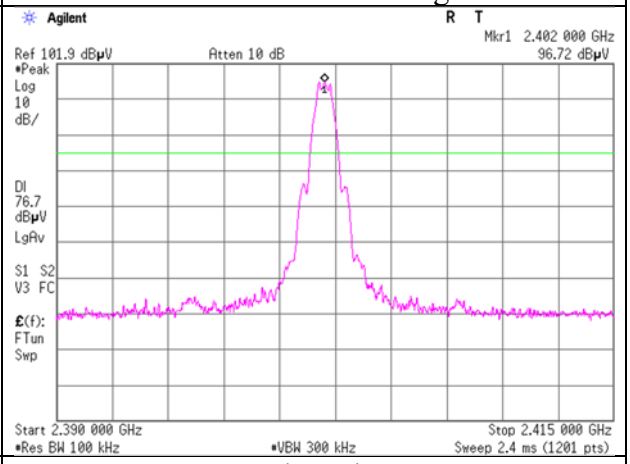
Distance factor: 1 GHz - 10 GHz 20log (4 m / 3.0 m) = 2.5 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 10, 2022
Temperature / Humidity	24 deg. C / 37 % RH
Engineer	Tetsuro Yoshida
	(1 GHz to 10 GHz)
Mode	Tx BT LE 2402 MHz + 11ac-40 5795 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	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 10, 2022
Temperature / Humidity	24 deg. C / 37 % RH
Engineer	Tetsuro Yoshida
	(1 GHz to 26.5 GHz)
Mode	Tx BT LE 2440 MHz + 11ac-40 5795 MHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	4880.0	47.5	39.8	31.6	8.1	32.0	2.9	55.2	50.4	73.9	53.9	18.7	3.5	
Hori.	7320.0	43.6	34.5	36.5	9.5	32.8	-	56.8	47.7	73.9	53.9	17.1	6.2	Floor noise
Hori.	9760.0	42.2	32.8	38.3	10.3	33.6	-	57.2	47.8	73.9	53.9	16.7	6.1	Floor noise
Vert.	4880.0	46.8	37.8	31.6	8.1	32.0	2.9	54.6	48.4	73.9	53.9	19.3	5.5	
Vert.	7320.0	43.2	34.5	36.5	9.5	32.8	-	56.4	47.7	73.9	53.9	17.5	6.2	Floor noise
Vert.	9760.0	42.5	32.7	38.3	10.3	33.6	-	57.5	47.7	73.9	53.9	16.5	6.3	Floor noise

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

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

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

*QP detector was used up to 1GHz.

Distance factor:	1 GHz - 10 GHz	20log (4 m / 3.0 m) = 2.5 dB
	10 GHz - 26.5 GHz	20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 10, 2022
Temperature / Humidity	24 deg. C / 37 % RH
Engineer	Tetsuro Yoshida
	(30 MHz to 26.5 GHz)
Mode	Tx BT LE 2480 MHz + 11ac-40 5795 MHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	117.7	28.2	-	12.7	7.5	28.4	-	20.1	-	43.5	-	23.4	-	
Hori.	162.0	32.9	-	15.4	7.8	28.2	-	28.0	-	43.5	-	15.5	-	
Hori.	185.3	26.3	-	16.3	8.0	28.1	-	22.5	-	43.5	-	21.0	-	
Hori.	228.0	41.9	-	12.0	8.3	27.9	-	34.3	-	46.0	-	11.7	-	
Hori.	234.0	43.3	-	12.2	8.3	27.8	-	35.9	-	46.0	-	10.1	-	
Hori.	510.0	34.5	-	18.0	9.8	29.1	-	33.2	-	46.0	-	12.8	-	
Hori.	2483.5	56.3	39.0	27.7	5.9	32.9	2.9	57.0	42.6	73.9	53.9	16.9	11.3	*1)
Hori.	4960.0	47.5	39.7	31.7	8.2	31.9	2.9	55.4	50.6	73.9	53.9	18.5	3.4	
Hori.	7440.0	43.6	34.5	36.7	9.5	32.9	-	56.9	47.8	73.9	53.9	17.0	6.1	Floor noise
Hori.	9920.0	42.2	32.7	38.4	10.3	33.7	-	57.2	47.8	73.9	53.9	16.7	6.1	Floor noise
Vert.	62.9	38.6	-	7.3	7.0	28.5	-	24.4	-	40.0	-	15.6	-	
Vert.	112.7	37.6	-	12.2	7.5	28.4	-	28.9	-	43.5	-	14.7	-	
Vert.	162.0	36.8	-	15.4	7.8	28.2	-	31.9	-	43.5	-	11.6	-	
Vert.	234.0	35.7	-	12.2	8.3	27.8	-	28.3	-	46.0	-	17.7	-	
Vert.	288.0	31.6	-	14.0	8.6	27.7	-	26.5	-	46.0	-	19.5	-	
Vert.	691.0	28.7	-	19.8	10.5	29.3	-	29.7	-	46.0	-	16.3	-	
Vert.	2483.5	50.6	34.9	27.7	5.9	32.9	2.9	51.4	38.5	73.9	53.9	22.5	15.4	*1)
Vert.	4960.0	46.5	37.8	31.7	8.2	31.9	2.9	54.4	48.6	73.9	53.9	19.5	5.3	
Vert.	7440.0	43.1	34.5	36.7	9.5	32.9	-	56.4	47.8	73.9	53.9	17.5	6.1	Floor noise
Vert.	9920.0	42.5	32.7	38.4	10.3	33.7	-	57.6	47.8	73.9	53.9	16.3	6.1	Floor noise

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

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

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

*QP detector was used up to 1GHz.

*1) Not Out of Band emission(Leakage Power)

Distance factor:

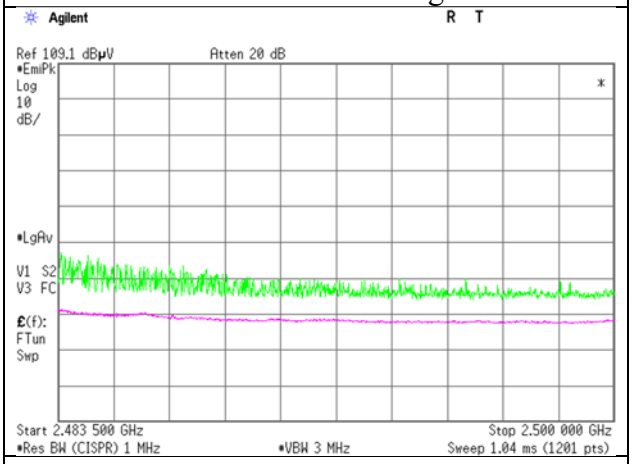
1 GHz - 10 GHz	20log (4 m / 3.0 m) = 2.5 dB
10 GHz - 26.5 GHz	20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 10, 2022
Temperature / Humidity	24 deg. C / 37 % RH
Engineer	Tetsuro Yoshida
	(1 GHz to 10 GHz)
Mode	Tx BT LE 2480 MHz + 11ac-40 5795 MHz

Horizontal

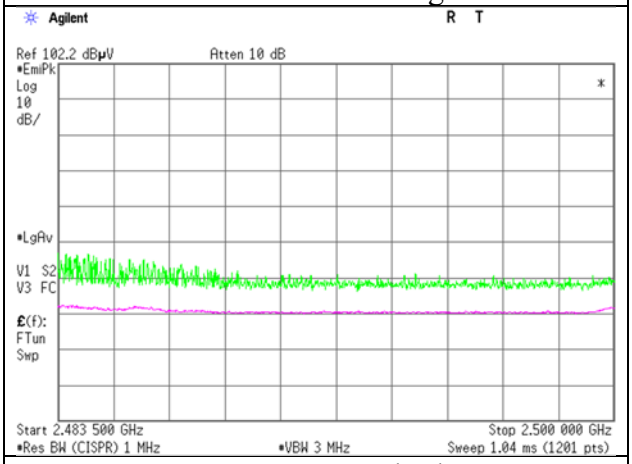
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

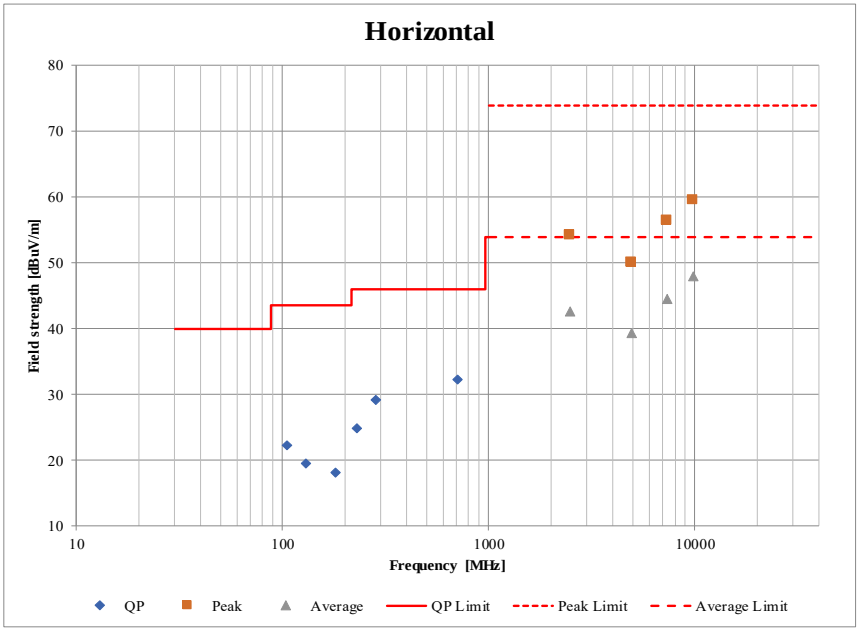


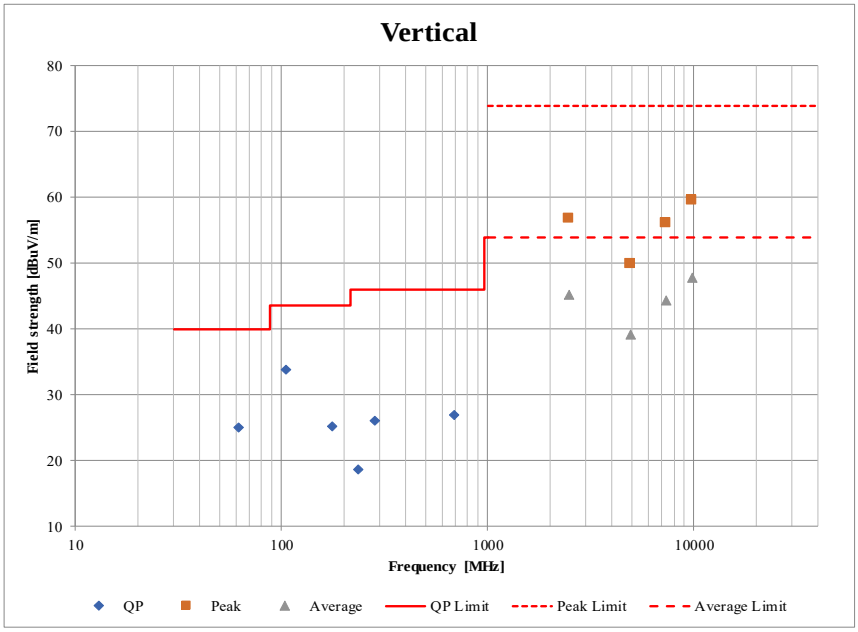
Trace Green : Peak Plot
Trace Purple : Average Plot

* 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	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.2
Date	November 2, 2022	November 11, 2022
Temperature / Humidity	23 deg. C / 51 % RH	22 deg. C / 42 % RH
Engineer	Takumi Nishida	Junya Okuno
	(1 GHz to 26.5 GHz)	(Below 1 GHz)
Mode	Tx 11n-20 2462 MHz	



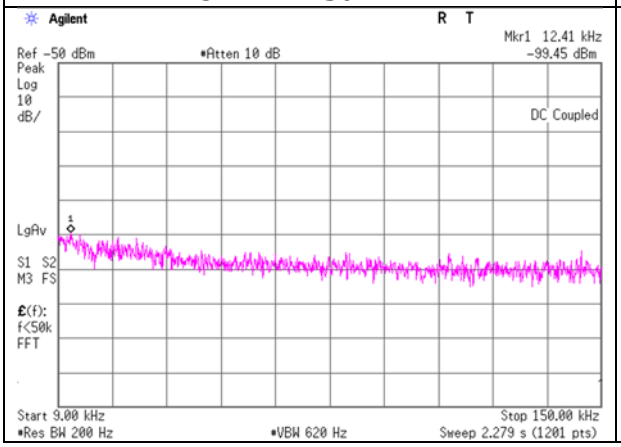


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

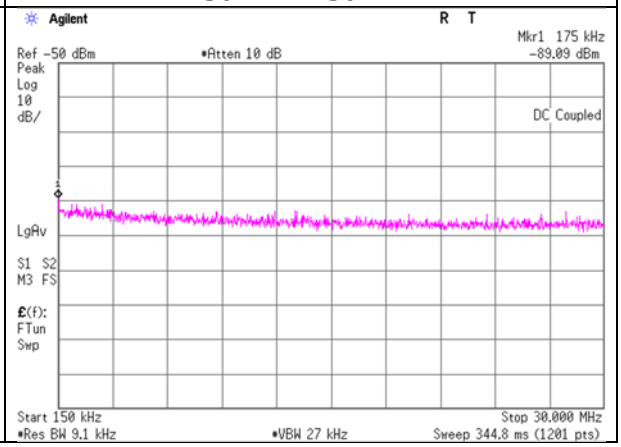
Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Date	October 31, 2022
Temperature / Humidity	20 deg. C / 41 % RH
Engineer	Hiroki Numata
Mode	Tx 11n-20 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
12.41	-99.5	0.25	9.68	2.0	2	-84.5	300	6.0	-23.3	45.7	69.0	
175.00	-89.1	0.26	9.68	2.0	2	-74.1	300	6.0	-12.9	22.7	35.6	

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

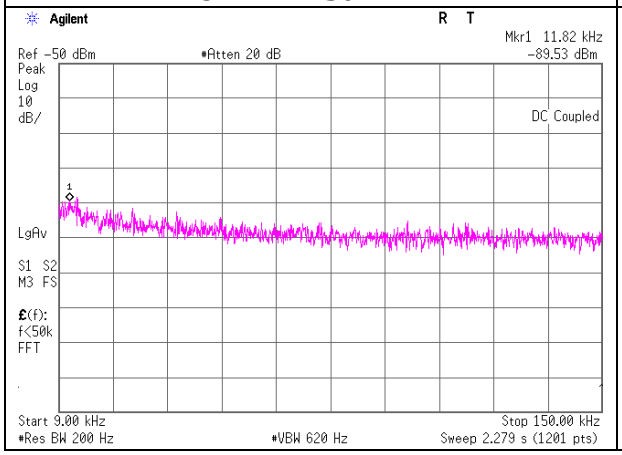
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

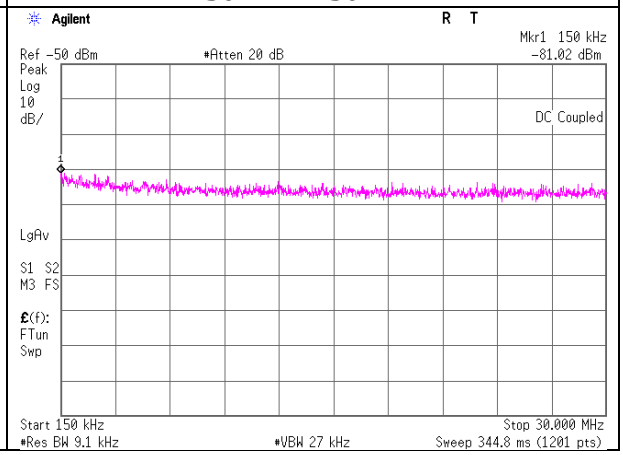
Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Date	October 18, 2022
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

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
11.82	-89.5	0.25	9.7	2.0	1	-77.6	300	6.0	-16.3	46.1	62.4	
150.00	-81.0	0.99	9.8	2.0	1	-68.3	300	6.0	-7.0	24.0	31.0	

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

Power Density

Test place	Ise EMC Lab. No.8 Measurement Room
Date	November 18, 2022
Temperature / Humidity	21 deg. C / 44 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11b

Chain 0 + 1

Freq.	Chain 0 Result	Chain 1 Result	Result		Limit	Margin
[MHz]	[mW / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	0.09	0.12	-6.80	0.21	8.00	14.80
2437	0.08	0.23	-5.10	0.31	8.00	13.10
2462	0.07	0.06	-8.89	0.13	8.00	16.89

Sample Calculation:
Result = Chain 0 + 1

Chain 0

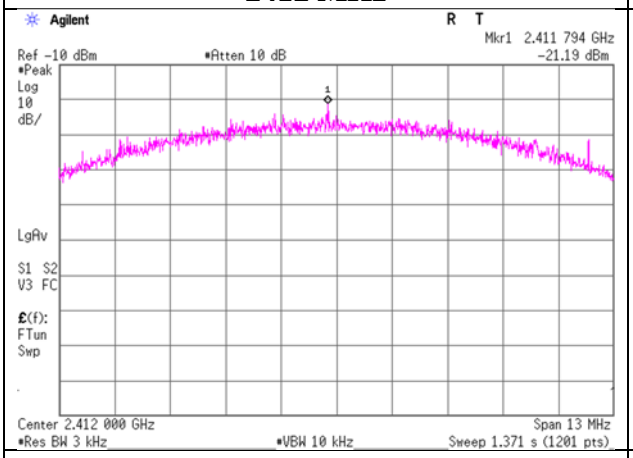
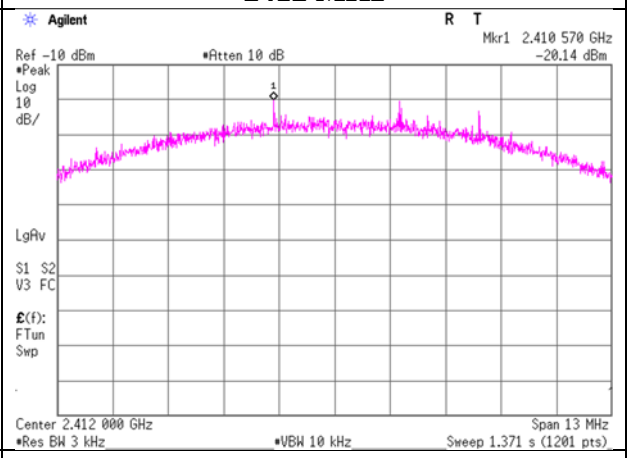
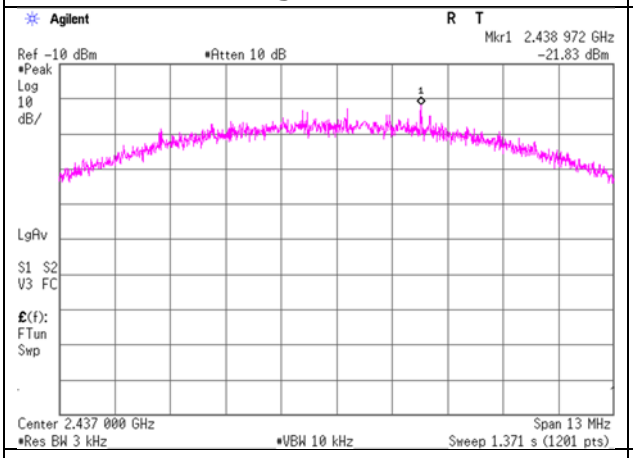
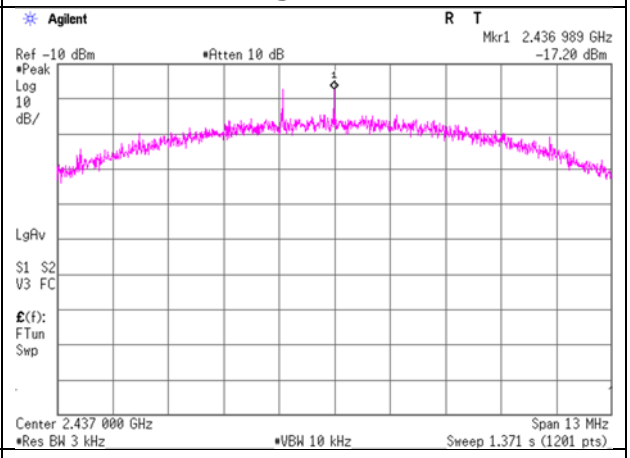
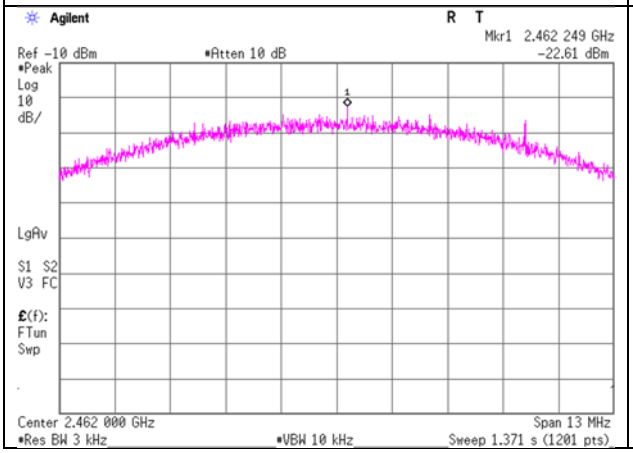
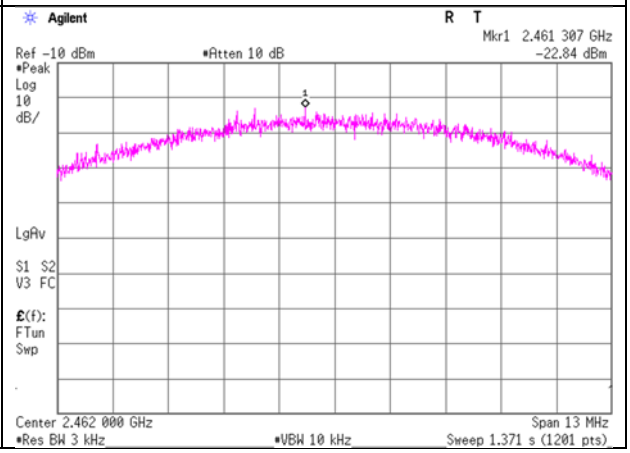
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin
[MHz]	[dBm / 3 kHz]	[dB]	[dB]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-21.19	1.32	9.52	-10.35	0.09	8.00	18.35
2437	-21.83	1.32	9.52	-10.99	0.08	8.00	18.99
2462	-22.61	1.32	9.52	-11.77	0.07	8.00	19.77

Chain 1

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin
[MHz]	[dBm / 3 kHz]	[dB]	[dB]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-20.14	1.29	9.52	-9.33	0.12	8.00	17.33
2437	-17.20	1.29	9.52	-6.39	0.23	8.00	14.39
2462	-22.84	1.29	9.52	-12.03	0.06	8.00	20.03

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

Power Density

11b Chain 0	11b Chain 1
2412 MHz	2412 MHz
	
2437 MHz	2437 MHz
	
2462 MHz	2462 MHz
	

Power Density

Test place	Ise EMC Lab. No.8 Measurement Room
Date	November 18, 2022
Temperature / Humidity	21 deg. C / 44 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11g

Chain 0 + 1

Freq.	Chain 0 Result	Chain 1 Result	Result		Limit	Margin
[MHz]	[mW / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	0.03	0.03	-12.31	0.06	8.00	20.31
2437	0.02	0.02	-13.58	0.04	8.00	21.58
2462	0.02	0.03	-13.08	0.05	8.00	21.08

Sample Calculation:
Result = Chain 0 + 1

Chain 0

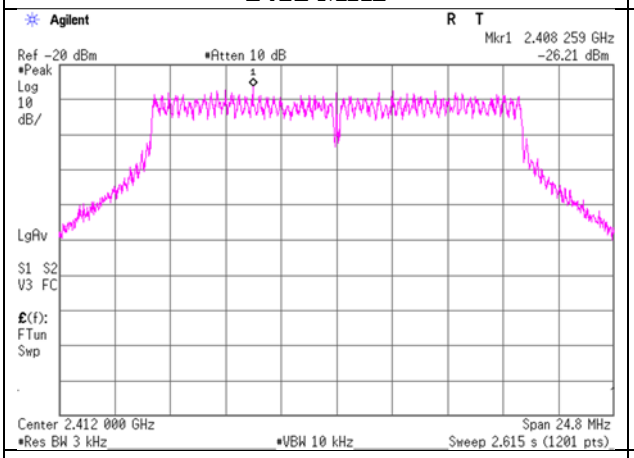
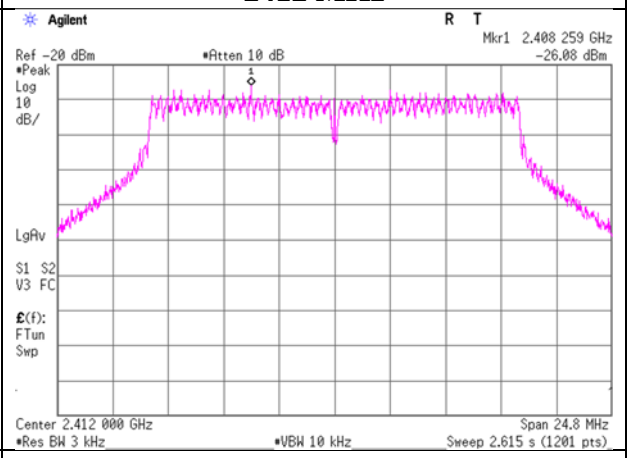
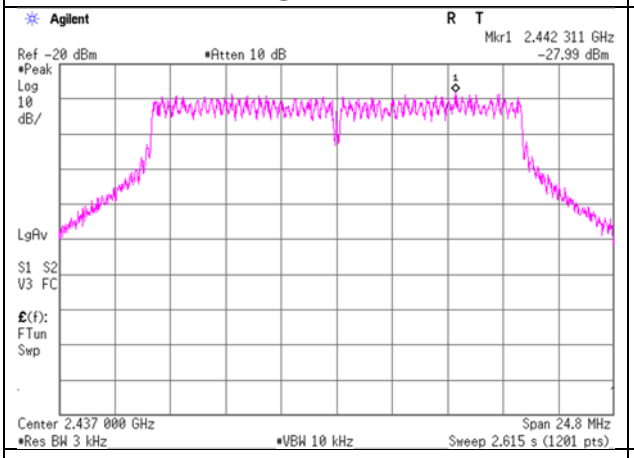
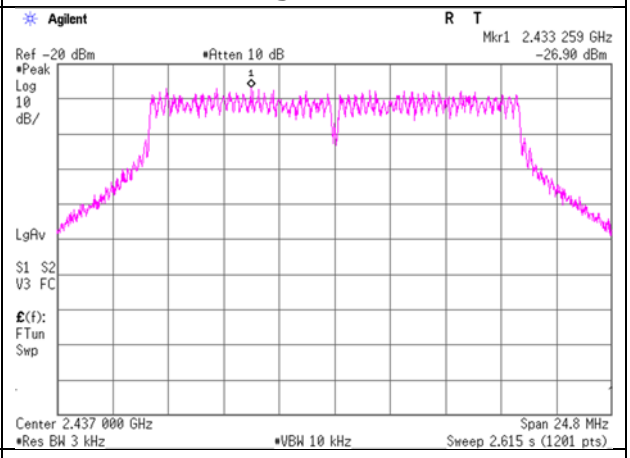
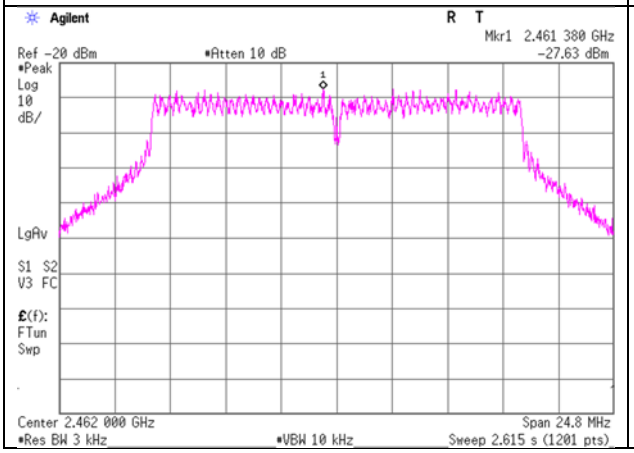
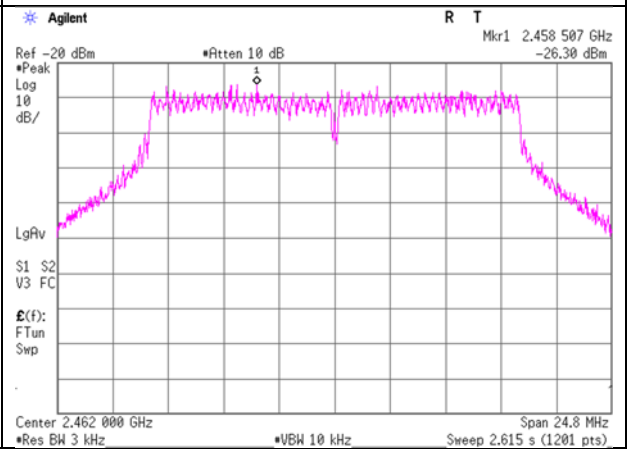
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin
[MHz]	[dBm / 3 kHz]	[dB]	[dB]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-26.21	1.32	9.52	-15.37	0.03	8.00	23.37
2437	-27.99	1.32	9.52	-17.15	0.02	8.00	25.15
2462	-27.63	1.32	9.52	-16.79	0.02	8.00	24.79

Chain 1

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin
[MHz]	[dBm / 3 kHz]	[dB]	[dB]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-26.08	1.29	9.52	-15.27	0.03	8.00	23.27
2437	-26.90	1.29	9.52	-16.09	0.02	8.00	24.09
2462	-26.30	1.29	9.52	-15.49	0.03	8.00	23.49

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

Power Density

11g Chain 0	11g Chain 1
2412 MHz	2412 MHz
	
2437 MHz	2437 MHz
	
2462 MHz	2462 MHz
	

Power Density

Test place	Ise EMC Lab. No.6 Measurement Room
Date	October 31, 2022
Temperature / Humidity	20 deg. C / 41 % RH
Engineer	Hiroki Numata
Mode	Tx 11n-20

Chain 0 + 1

Freq.	Chain 0 Result	Chain 1 Result	Result		Limit	Margin
[MHz]	[mW / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	0.03	0.01	-13.59	0.04	8.00	21.59
2437	0.02	0.02	-14.46	0.04	8.00	22.46
2462	0.02	0.02	-13.75	0.04	8.00	21.75

Sample Calculation:
Result = Chain 0 + 1

Chain 0

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin
[MHz]	[dBm / 3 kHz]	[dB]	[dB]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-26.21	1.32	9.52	-15.37	0.03	8.00	23.37
2437	-28.18	1.32	9.52	-17.34	0.02	8.00	25.34
2462	-27.29	1.32	9.52	-16.45	0.02	8.00	24.45

Chain 1

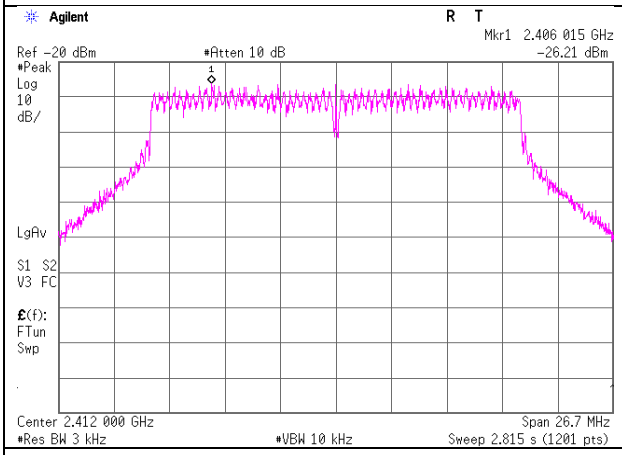
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin
[MHz]	[dBm / 3 kHz]	[dB]	[dB]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-29.14	1.29	9.52	-18.33	0.01	8.00	26.33
2437	-28.41	1.29	9.52	-17.60	0.02	8.00	25.60
2462	-27.90	1.29	9.52	-17.09	0.02	8.00	25.09

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

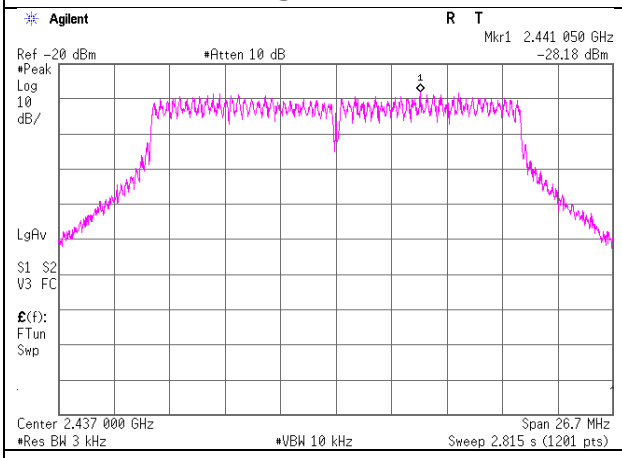
Power Density

11n-20 Chain 0

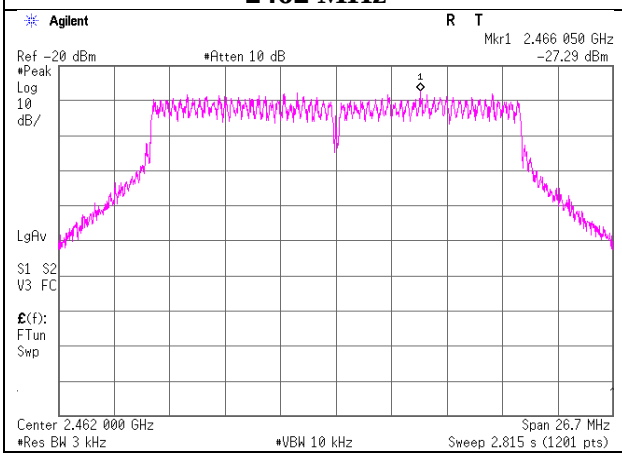
2412 MHz



2437 MHz

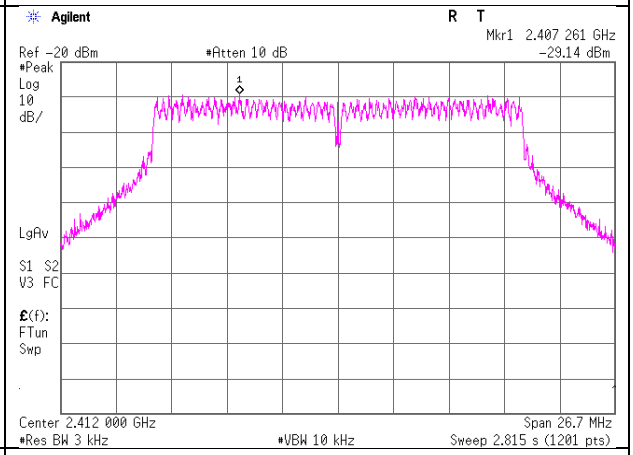


2462 MHz

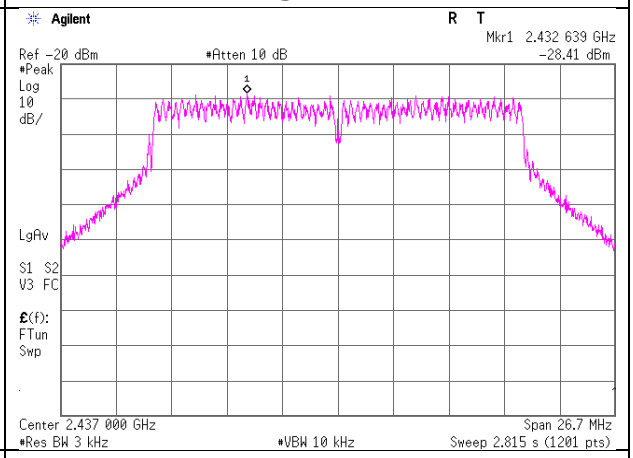


11n-20 Chain 1

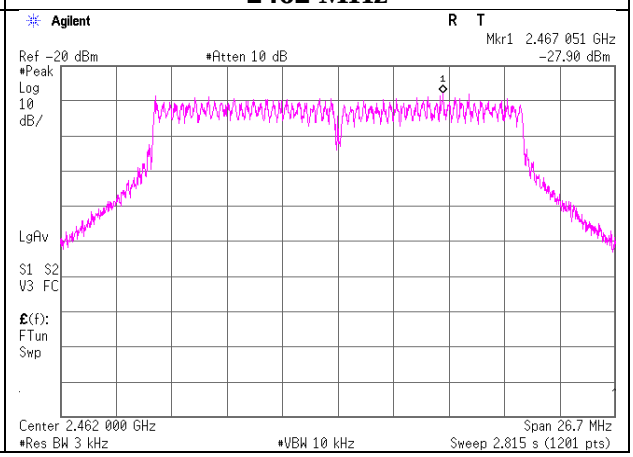
2412 MHz



2437 MHz



2462 MHz



Power Density

Test place	Ise EMC Lab. No.6 Measurement Room
Date	October 18, 2022
Temperature / Humidity	23 deg. C / 45 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2402	-17.37	1.10	9.52	-6.75	8.00	14.75
2440	-17.23	1.11	9.52	-6.60	8.00	14.60
2480	-17.09	1.12	9.52	-6.45	8.00	14.45

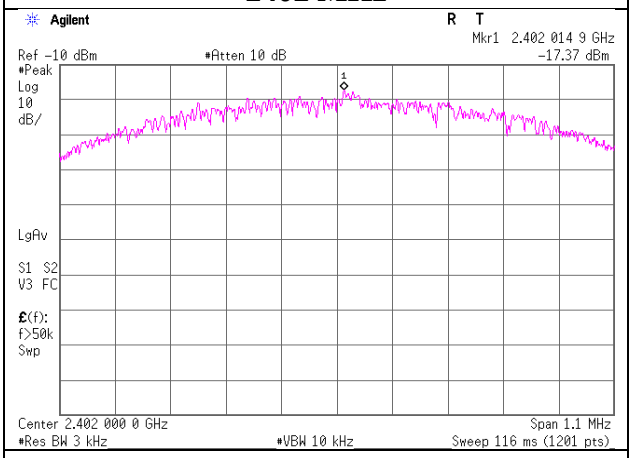
Sample Calculation:

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

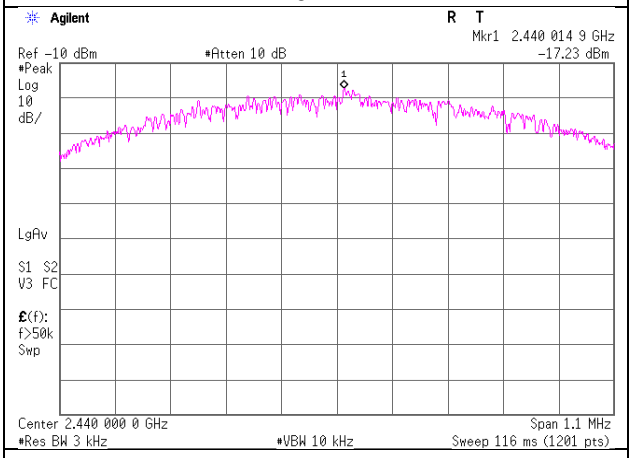
Power Density

1M-PHY

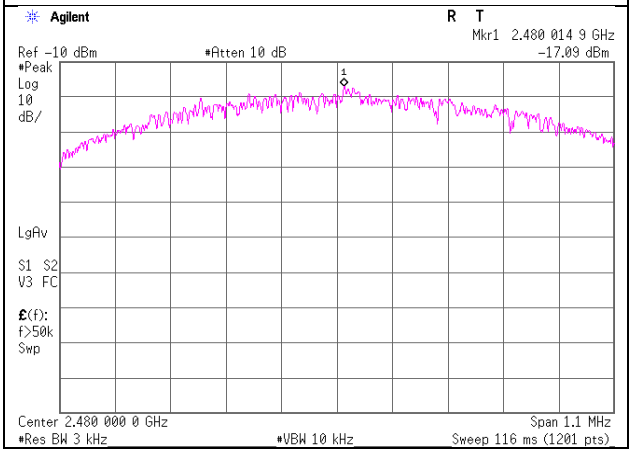
2402 MHz



2440 MHz



2480 MHz



APPENDIX 2: Test Instruments

Test Equipment (1/3)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
CE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
CE	MAEC-01	141998	AC1_Semi Anechoic Chamber (NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	06/28/2022	24
CE	MAT-64	141290	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	12/17/2021	12
CE	MCC-03	141215	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W/3D-2W/RG400u/ RFM-E421(SW)	-/01068 (Switcher)	06/11/2022	12
CE	MJM-25	142226	Measure	KOMELON	KMC-36	-	-	-
CE	MLS-25	141537	LISN(AMN)	Schwarzbeck Mess-Elektronik OHG	NSLK8127	8127-731	07/25/2022	12
CE	MLS-26	141538	LISN(AMN)	Schwarzbeck Mess-Elektronik OHG	NSLK8127	8127-732	07/25/2022	12
CE	MMM-09	141533	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201195	01/16/2022	12
CE	MOS-27	141566	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	A08Q26	01/10/2022	12
CE	MTA-55	141937	Terminator	TME	CT-01BP	-	12/16/2021	12
CE	MTR-09	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	10/11/2022	12
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	KBA-05	141198	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103+ BBA9106	2513	05/14/2022	12
RE	MAEC-01	141998	AC1_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	06/28/2022	24
RE	MAEC-01-SVSWR	141994	AC1_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 10m	DA-06881	04/05/2021	24
RE	MAEC-02	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	05/30/2022	24
RE	MAEC-03-SVSWR	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/01/2021	24
RE	MAEC-04-SVSWR	142017	AC4_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/12/2021	24
RE	MAT-08	141213	Attenuator(6dB)	Weinschel Corp	2	BK7971	11/19/2022	12
RE	MAT-112	220646	Attenuator	Huber+Suhner	6806_N-50-1	-	06/07/2022	12
RE	MBA-08	141427	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103B+ BBA9106	08031	07/30/2022	12
RE	MCC-02	141350	Coaxial Cable	Suhner/storm/Agilent/ TSJ	-	-	03/08/2022	12
RE	MCC-12	141317	Coaxial Cable	UL Japan	-	-	09/27/2022	12
RE	MCC-178	141227	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S305	03/15/2022	12
RE	MCC-217	141393	Microwave Cable	Junkosha	MWX221	1604S254(1 m) / 1608S088(5 m)	08/02/2022	12
RE	MCC-218	141394	Microwave Cable	Junkosha	MWX221	1607S141(1 m) / 1608S264(5 m)	09/12/2022	12
RE	MCC-231	177964	Microwave Cable	Junkosha INC.	MMX221	1901S329(1m)/ 1902S579(5m)	03/15/2022	12
RE	MHA-05	141511	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	253	09/20/2022	12
RE	MHA-16	141513	Horn Antenna 15-40GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9170	BBHA9170306	07/05/2022	12
RE	MHA-17	141506	Horn Antenna 15-40GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9170	BBHA9170307	07/22/2022	12
RE	MHA-20	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	258	11/09/2021	12
RE	MHA-21	141508	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	557	05/20/2022	12

Test Equipment (2/3)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MHF-23	141294	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCC	603	02/24/2022	12
RE	MHF-25	141232	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	09/07/2022	12
RE	MJM-16	142183	Measure	KOMELON	KMC-36	-	10/03/2022	12
RE	MJM-25	142226	Measure	KOMELON	KMC-36	-	-	-
RE	MJM-27	142228	Measure	KOMELON	KMC-36	-	-	-
RE	MJM-29	142230	Measure	KOMELON	KMC-36	-	-	-
RE	MLA-20	141264	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	189	05/14/2022	12
RE	MLA-21	141265	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-190	07/30/2022	12
RE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/12/2022	12
RE	MMM-08	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201197	01/16/2022	12
RE	MMM-09	141533	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201195	01/16/2022	12
RE	MMM-10	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	01/16/2022	12
RE	MOS-13	141554	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1301	01/10/2022	12
RE	MOS-15	141562	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0010	01/10/2022	12
RE	MOS-27	141566	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	A08Q26	01/10/2022	12
RE	MOS-41	192300	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0013	12/19/2021	12
RE	MPA-01	141576	Pre Amplifier	Keysight Technologies Inc	8449B	3008A01671	02/22/2022	12
RE	MPA-11	141580	MicroWave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	03/17/2022	12
RE	MPA-12	141581	MicroWave System Amplifier	Keysight Technologies Inc	83017A	00650	10/05/2022	12
RE	MPA-19	141585	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	02/28/2022	12
RE	MPA-24	141594	Pre Amplifier	Keysight Technologies Inc	8447D	2944A10150	02/25/2022	12
RE	MPA-33	220253	Broadband Amplifier	SAGE Millimeter, Inc.	SBB-0115033218-2F2F-E3	0001	05/13/2022	12
RE	MSA-03	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	03/31/2022	12
RE	MSA-04	141885	Spectrum Analyzer	Keysight Technologies Inc	E4448A	US44300523	11/10/2021	12
RE	MSA-10	141899	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180655	02/18/2022	12
RE	MTR-09	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	10/11/2022	12
RE	MTR-10	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	07/25/2022	12
AT	MAT-26	141244	Attenuator(10dB)	Weinschel - API Technologies Corp	WA8-10-34	A198	02/01/2023	12
AT	MAT-90	141223	Attenuator	Weinschel Associates	WA56-10	56100306	05/12/2022	12
AT	MAT-91	141420	Attenuator	Weinschel Associates	WA56-10	56100307	05/02/2022	12
AT	MAT-92	141421	Attenuator	Weinschel Associates	WA56-10	56100308	05/12/2022	12
AT	MCC-144	141414	Microwave Cable	Junkosha	MWX221	1207S407	08/01/2022	12
AT	MCC-245	197220	Microwave cable	Huber+Suhner	SF126E/11PC35/11PC35/2000MM	537003/126E	03/17/2022	12
AT	MCC-64	141327	Coaxial Cable	UL Japan	-	-	02/01/2023	12
AT	MJM-24	142225	Measure	ASKUL	-	-	-	-
AT	MMM-17	141557	DIGIITAL HiTESTER	HIOKI E.E. CORPORATION	3805	70900530	01/18/2023	12
AT	MMM-18	141558	Digital Tester(TRUE RMS MULTIMETER)	Fluke Corporation	115	17930030	05/17/2022	12
AT	MOS-14	141561	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1401	01/13/2023	12
AT	MOS-28	141567	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0008	01/13/2023	12

Test Equipment (3/3)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	MPM-16	141812	Power Meter	Keysight Technologies Inc	8990B	MY51000271	08/05/2022	12
AT	MPM-17	141813	Power Meter	Raditeq (Formerly DARE!! Instruments)	RPR3006W	14I00048SNO081	10/21/2022	12
AT	MPM-18	141814	Power Meter	Raditeq (Formerly DARE!! Instruments)	RPR3006W	14I00048SNO082	10/21/2022	12
AT	MPSE-22	141842	Power sensor	Keysight Technologies Inc	N1923A	MY54070003	08/05/2022	12
AT	MPSE-23	141835	Power sensor	Keysight Technologies Inc	N1923A	MY54070004	08/05/2022	12
AT	MRENT-130	141855	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187750	12/01/2022	12
AT	MSA-04	141885	Spectrum Analyzer	Keysight Technologies Inc	E4448A	US44300523	11/21/2022	12
AT	MSA-10	141899	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180655	02/18/2022	12

***Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.**

The expiration date of the calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item: **CE: Conducted Emission**
RE: Radiated Emission
AT: Antenna Terminal Conducted