RADIO TEST REPORT

Test Report No. 14926560S-E-R1

Customer	**KONICA MINOLTA, INC.**
Description of EUT	**SKR 3000**
Model Number of EUT	**P-53**
FCC ID	**YR7SKR3000P9**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied**
Issue Date	**June 27, 2024**
Remarks	**Wireless LAN (2.4 GHz band)**

Representative Test Engineer	**Approved By**
Hiromasa Sato Engineer	Toyokazu Imamura Engineer

CERTIFICATE 1266.03

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

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REVISION HISTORY

Original Test Report No.: 14926560S-E

This report is a revised version of 14926560S-E. 14926560S-E is replaced with this report .

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14926560S-E	March 1, 2024	-
1	14926560S-E-R1	June 27, 2024	p.16 Added Conducted Spurious Emission

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer Information

Company Name	KONICA MINOLTA, INC.
Address	1 Sakura-machi, Hino-shi, Tokyo, 191-8511, Japan
Telephone Number	+81-42-589-8429
Contact Person	Ken Nagami

The information provided by 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

SECTION 2: Equipment Under Test (EUT)

2.1 Identification of EUT

Description	SKR 3000
Model Number	P-53
Serial Number	Refer to SECTION 4.2
Condition	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	October 27 and November 3, 2023
Test Date	November 7 to November 21, 2023

2.2 Product Description

General Specification

Rating	DC 15 V
Operating temperature	10 deg. C to 35 deg. C

Radio Specification

This report contains data provided by the customer which can impact the validity of results. UL Japan, Inc. is only responsible for the validity of results after the integration of the data provided by the customer. The data provided by the customer is marked “a)” in the table below.

	IEEE802.11b	IEEE802.11g	IEEE802.11a	IEEE802.11n (20 M band)
Frequency of operation	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz 5745 MHz - 5825 MHz	2412 MHz - 2462 MHz 5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz 5745 MHz - 5825 MHz
Type of modulation	DSSS (CCK, DQPSK,DBPSK)	OFDM-CCK (64QAM, 16QAM,QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)	
Channel spacing	5 MHz		20 MHz	5 MHz (2.4 GHz band) 20 MHz (5 GHz band)
Antenna Type	[Main Antenna (ANTENNA 1)/Sub Antenna (ANTENNA 2)] PIFA (Planar Inverted F Antenna)			
Antenna gain a)	[Main Antenna (ANTENNA 1)] -1.95 dBi (2.4 GHz Band), -0.98 dBi (5 GHz Band)			
	[Sub Antenna (ANTENNA 2)] -2.21 dBi (2.4 GHz Band), -1.54 dBi (5 GHz Band)			
Antenna Connector type	[Main Antenna (ANTENNA 1)/Sub Antenna (ANTENNA 2)] Connector PCB side: U.FL, Antenna side: Soldered			

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart C The latest version on the first day of the testing period
Title	FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

3.2 Procedures and Results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	-	N/A	*1)
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
6 dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(a)(2)	See data.	Complied	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	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	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)	12.1 dB 900.000 MHz, QP, Horizontal, Tx 11n-20 (SDM) 2412 MHz	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)
	ISED: RSS-Gen 6.13	**ISED:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.
* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

*1) The EUT operates with a battery. AC Line can be connected to the EUT via PC; however, the EUT stops transmission during recharging. Therefore, the test is not applicable to the EUT.
*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6.

FCC Part 15.31 (e)
This EUT provides the stable voltage constantly to RF Module regardless of input voltage.
Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT.
Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to Standard

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
99 % Occupied Bandwidth	**ISED:** RSS-Gen 6.7	**ISED:** -	N/A	-	Conducted

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

3.4 Uncertainty

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

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

Item	Frequency range	Uncertainty (+/-)
Conducted Emission (AC Mains) LISN	150 kHz to 30 MHz	3.2 dB
Radiated Emission (Measurement distance: 3 m)	9 kHz to 30 MHz	3.3 dB
	30 MHz to 200 MHz	4.9 dB
	200 MHz to 1 GHz	6.2 dB
	1 GHz to 6 GHz	4.7 dB
	6 GHz to 18 GHz	5.3 dB
	18 GHz to 40 GHz	5.5 dB
Radiated Emission (Measurement distance: 1 m)	1 GHz to 18 GHz	5.6 dB
	18 GHz to 40 GHz	5.8 dB

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector) SPM-06	1.1 dB
Power Measurement above 1 GHz (Peak Detector) SPM-06	1.8 dB
Power Measurement above 1 GHz (Average Detector) SPM-07	1.0 dB
Power Measurement above 1 GHz (Peak Detector) SPM-07	1.2 dB
Power Measurement above 1 GHz (Average Detector) SPM-13	0.81 dB
Power Measurement above 1 GHz (Peak Detector) SPM-13	1.1 dB
Spurious Emission (Conducted) below 1 GHz	0.91 dB
Conducted Emissions Power Density Measurement 1 GHz to 3 GHz	1.3 dB
Conducted Emissions Power Density Measurement 3 GHz to 18 GHz	2.5 dB
Spurious Emission (Conducted) 18 GHz to 26.5 GHz	2.8 dB
Spurious Emission (Conducted) 26.5 GHz to 40 GHz	2.6 dB
Bandwidth Measurement	0.012 %
Duty Cycle and Time Measurement	0.27 %
Temperature_SCH-01	0.96 deg.C.
Humidity_SCH-01	4.0 %
Temperature_SCH-02	2.2 deg.C.
Voltage	0.74 %

3.5 Test Location

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

Test room	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber (SAC1)	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber (SAC2)	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber (SAC3)	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber (SAC4)	8.1 x 5.1 x 3.55	8.1 x 5.1	-
Wireless anechoic chamber 1 (WAC1)	9.5 x 6.0 x 5.4	9.5 x 6.0	3 m
Wireless anechoic chamber 2 (WAC2)	9.5 x 6.0 x 5.4	9.5 x 6.0	3 m
No.1 Shielded room	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 Shielded room	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	2.55 x 4.1 x 2.5	-	-
No.2 Measurement room	4.5 x 3.5 x 2.5	-	-
Wireless shielded room 1	3.0 x 4.5 x 2.7	3.0 x 4.5	-
Wireless shielded room 2	3.0 x 4.5 x 2.7	3.0 x 4.5	-

3.6 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Mode	Remarks*	Power Setting (dBm)
IEEE 802.11b (11b)	5.5 Mbps Long, PN9	10
IEEE 802.11g (11g)	6 Mbps, PN9	11.5
IEEE 802.11n SISO 20 MHz BW (11n-20)	MCS 6, PN9	11.5
IEEE 802.11n SDM 20 MHz BW (11n-20)	MCS 8, PN9	11.5
*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: Refer to the above table Software: Refer to the below table *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.		

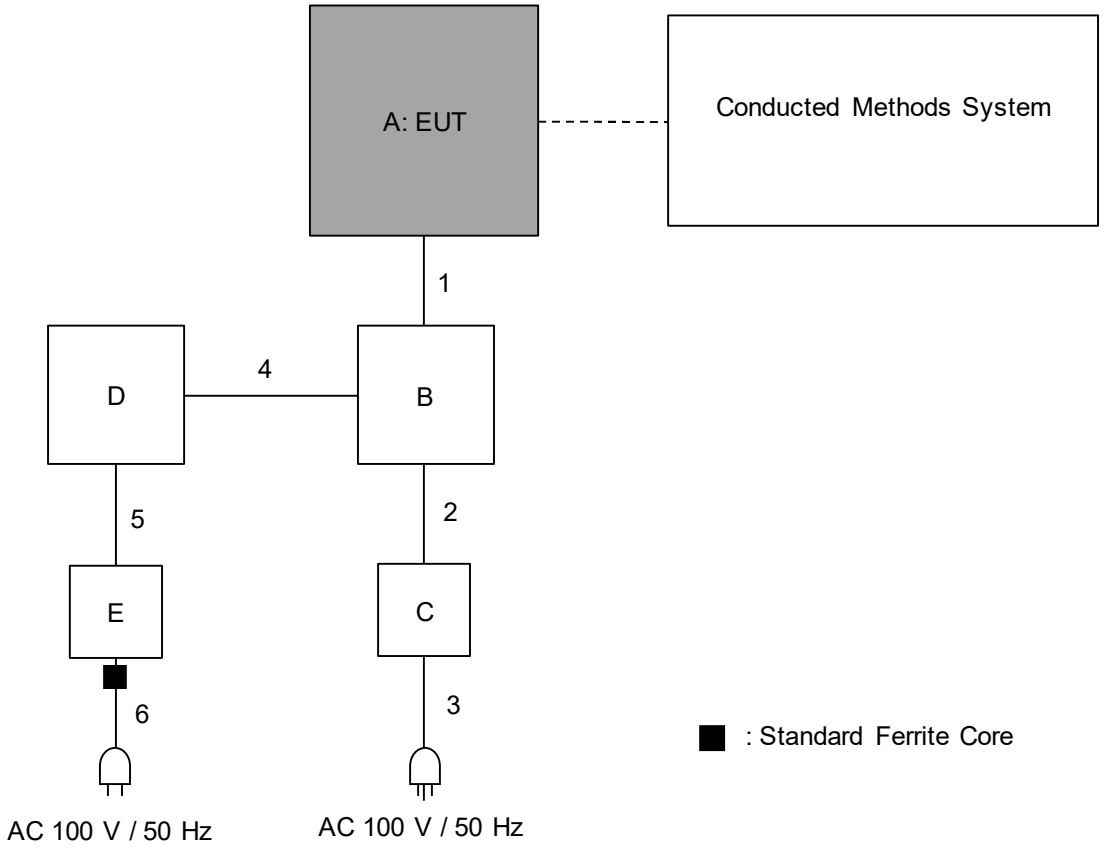
Software name	Version	Released Date	Storage location
Panel Firmware	V5.00R00_004	2023/7/7	EUT memory (* operated by connected host PC)
Qualcomm Radio Control Tool	4.0.00125	2019/03/25 11:37:18	Connected host PC

*The Details of Operating Mode(s)

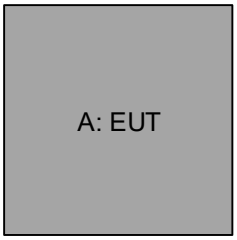
Test Item	Operating Mode	Tested Antenna	Tested Frequency
Radiated Spurious Emission (Below 1 GHz)	Tx 11n-20 (SDM) *1)	1+2	2412 MHz
Conducted Spurious Emission	Tx 11n-20 (SDM) *1)	2 *2)	2412 MHz
Radiated Spurious Emission (Above 1 GHz)	Tx 11b	1 *2)	2412 MHz 2437 MHz 2462 MHz
	Tx 11g	2 *2)	2412 MHz 2437 MHz 2462 MHz
	Tx 11n-20 (SDM)	1+2	2412 MHz 2437 MHz 2462 MHz
6 dB Bandwidth, 99 % Occupied Bandwidth	Tx 11b	1 *2)	2412 MHz 2437 MHz 2462 MHz
	Tx 11g Tx 11n-20 (SISO) Tx 11n-20 (SDM)	2 *2)	2412 MHz 2437 MHz 2462 MHz
Maximum Peak Output Power, Power Density	Tx 11b	1 *2)	2412 MHz 2437 MHz 2462 MHz
	Tx 11g Tx 11n-20 (SISO)	2 *2)	2412 MHz 2437 MHz 2462 MHz
	Tx 11n-20 (SDM)	1+2	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) After comparison between Antenna 1 and Antenna 2, test was performed with the antenna that had higher power as a representative.			

4.2 Configuration and Peripherals

Antenna Terminal conducted test



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	SKR 3000	P-53	AEA0-S0002 *1) AEA0-S0003 *2)	KONICA MINOLTA, INC.	EUT
B	Detector Interface Unit	SKR 3000/G-21	A9G5-09147	KONICA MINOLTA, INC.	-
C	DI Unit AC Adapter	SKR 3000/G-22	A967-05205	KONICA MINOLTA, INC	-
D	Laptop Computer	PC-VJ23LLZGR	66000071A	NEC	-
E	AC Adapter	ADLX45DLC2A	8SSA10E7592L1CZ75 Z0W0R	Lenovo	-

*1) Used for Radiated Spurious Emission and Band Edge Compliance Test.
*2) Used for Antenna Terminal Conducted Tests.

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	IO cable	8.0	Shielded	Shielded	-
2	DC cable	1.3	Unshielded	Unshielded	-
3	AC cable	3.0	Unshielded	Unshielded	-
4	LAN cable	3.0	Unshielded	Unshielded	-
5	DC cable	1.6	Unshielded	Unshielded	-
6	AC cable	0.9	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

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

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

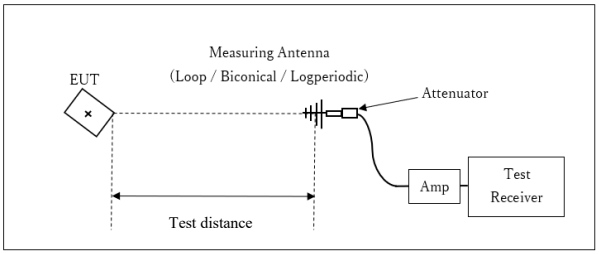
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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	RBW: 1 MHz VBW: 1/T (T: burst length, refer to Burst rate confirmation sheet) Detector: Peak	RBW: 100 kHz VBW: 300 kHz

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

Figure 2: Test Setup

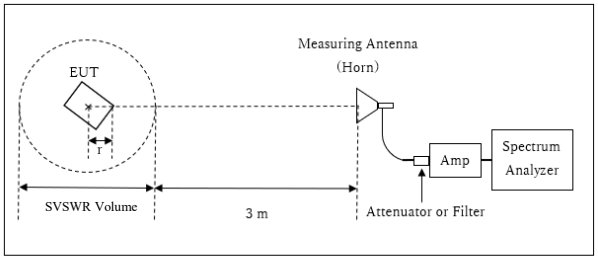
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

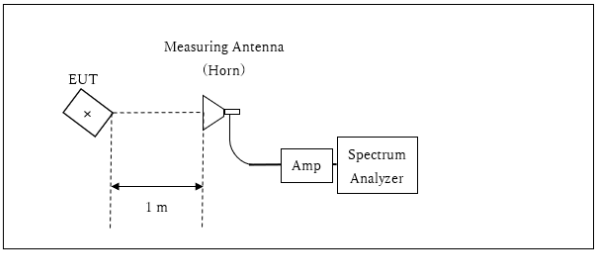


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.7 m / 3.0 m) = 1.83 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.7 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.3 m

10 GHz to 26.5 GHz



× : Center of turn table

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

The carrier level and noise levels were confirmed at each position of 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.

Module SISO (Antenna 1)

Antenna polarization	Carrier	Spurious (30 MHz to 1 GHz)	Spurious (1 GHz to 2.8 GHz)	Spurious (2.8 GHz to 10 GHz)	Spurious (10 GHz to 18 GHz)	Spurious (18 GHz to 26.5 GHz)
Horizontal	X	X	X	Z	X	X
Vertical	X	Z	X	X	X	X

Module SISO (Antenna 2)

Antenna polarization	Carrier	Spurious (30 MHz to 1 GHz)	Spurious (1 GHz to 2.8 GHz)	Spurious (2.8 GHz to 10 GHz)	Spurious (10 GHz to 18 GHz)	Spurious (18 GHz to 26.5 GHz)
Horizontal	Y	X	Y	Z	X	X
Vertical	Y	Z	Y	X	X	X

Module SDM

Antenna polarization	Carrier	Spurious (30 MHz to 1 GHz)	Spurious (1 GHz to 2.8 GHz)	Spurious (2.8 GHz to 10 GHz)	Spurious (10 GHz to 18 GHz)	Spurious (18 GHz to 26.5 GHz)
Horizontal	Z	X	Z	Z	X	X
Vertical	Z	Z	Z	X	X	X

Test results are rounded off and limit are rounded down, so some differences might be observed.

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

SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument Used
6 dB Bandwidth	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: 160 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4) *5)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".
*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)
*5) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohmes. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to 45.5 - 51.5 = -6.0 dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

Test results are rounded off and limit are rounded down, so some differences might be observed.
The equipment and cables were not used for factor 0 dB of the data sheets.

Test Data : APPENDIX
Test Result : Pass

APPENDIX 1: Test Data

99 % Occupied Bandwidth and 6 dB Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	November 15, 2023
Temperature / Humidity	25 deg. C / 36 % RH
Engineer	Kouki Yamada
Mode	Tx

11b Antenna: Ant1

Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2412	12774.9	8.345	> 0.5000
2437	12832.4	7.905	> 0.5000
2462	12776.1	8.028	> 0.5000

11g Antenna: Ant2

Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2412	16762.1	15.664	> 0.5000
2437	16739.2	15.523	> 0.5000
2462	16674.1	15.669	> 0.5000

11n-20 (SISO) Antenna: Ant2

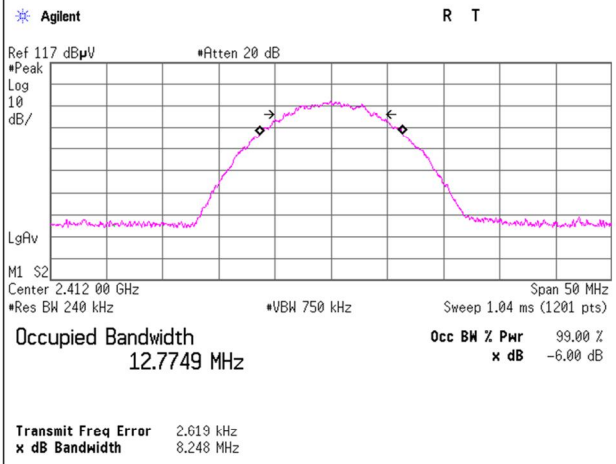
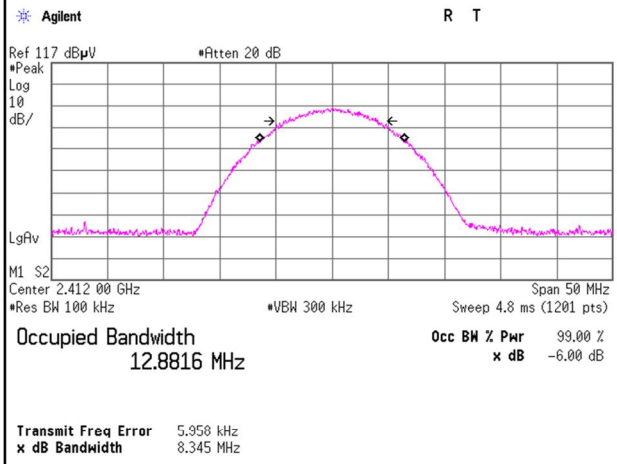
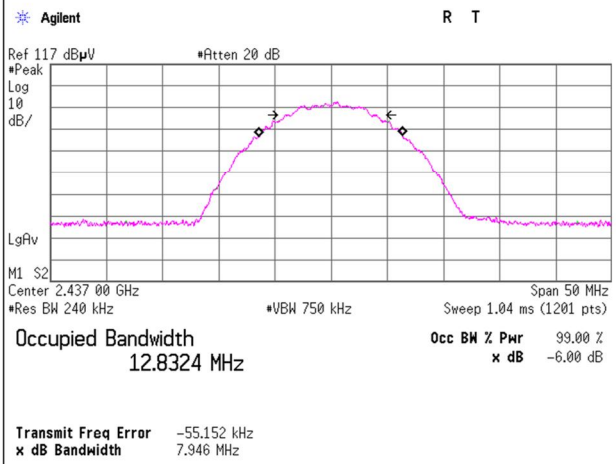
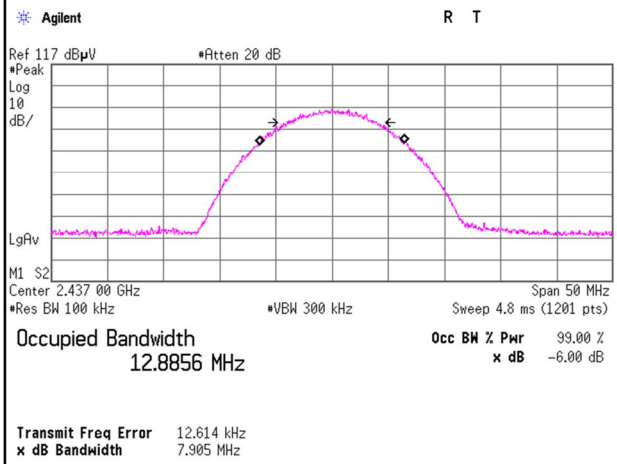
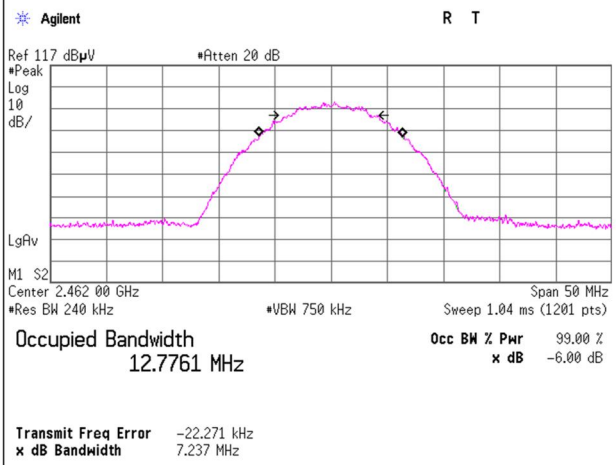
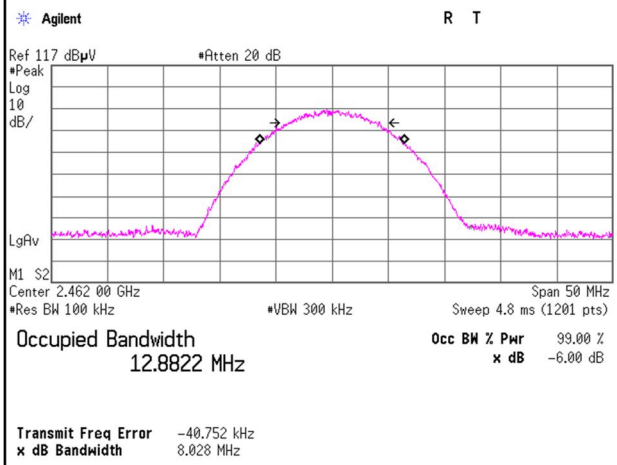
Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2412	18208.1	17.750	> 0.5000
2437	18244.0	17.745	> 0.5000
2462	18236.7	17.732	> 0.5000

11n-20 (SDM) Antenna: Ant2

Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2412	17635.4	16.340	> 0.5000
2437	17605.6	16.350	> 0.5000
2462	17617.3	16.549	> 0.5000

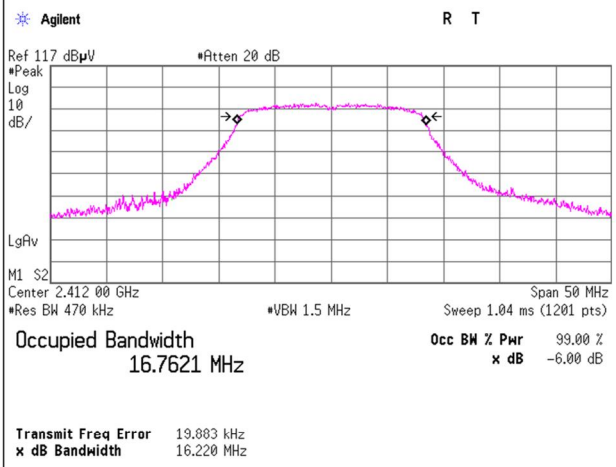
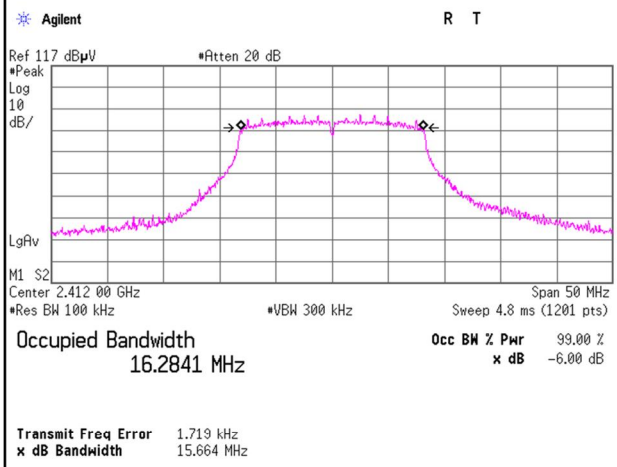
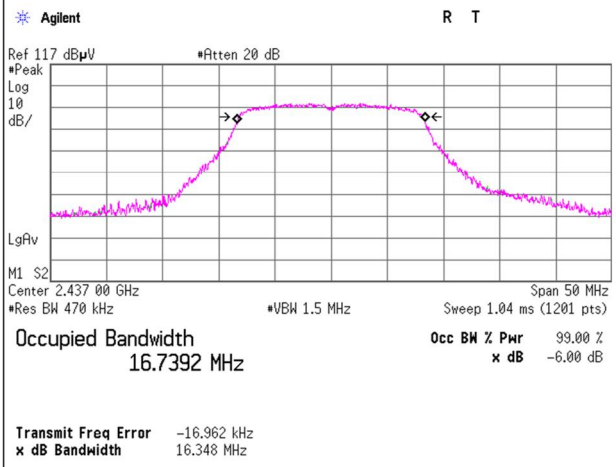
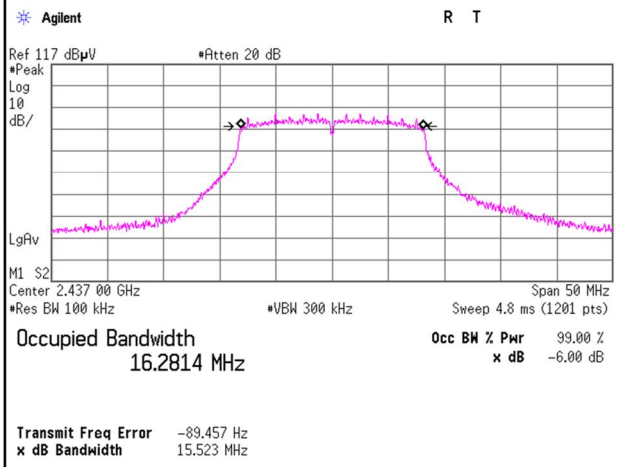
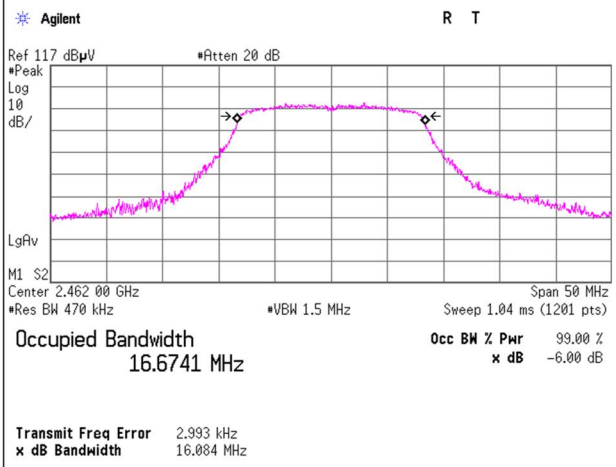
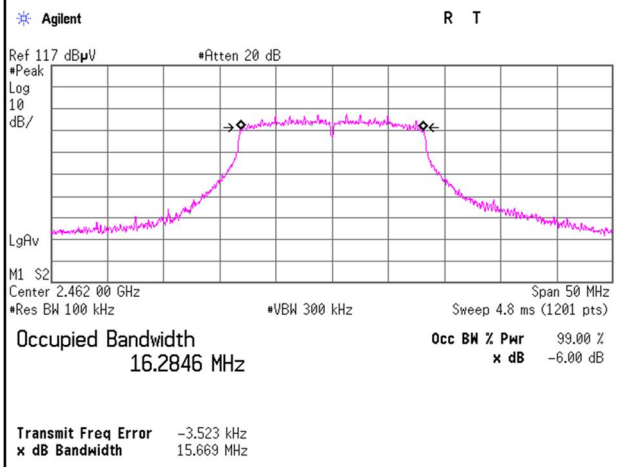
99 % Occupied Bandwidth and 6 dB Bandwidth

11b, Antenna: Ant1

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

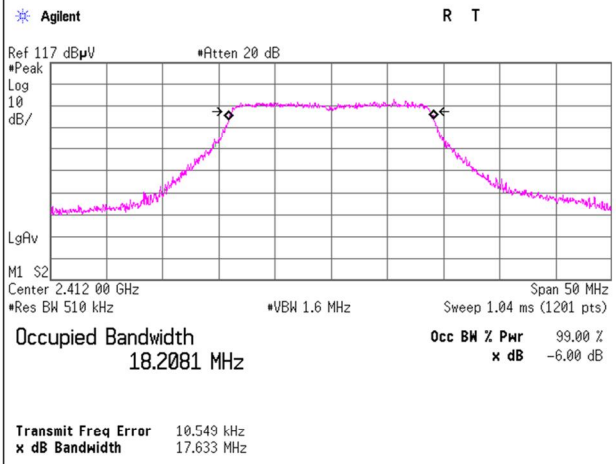
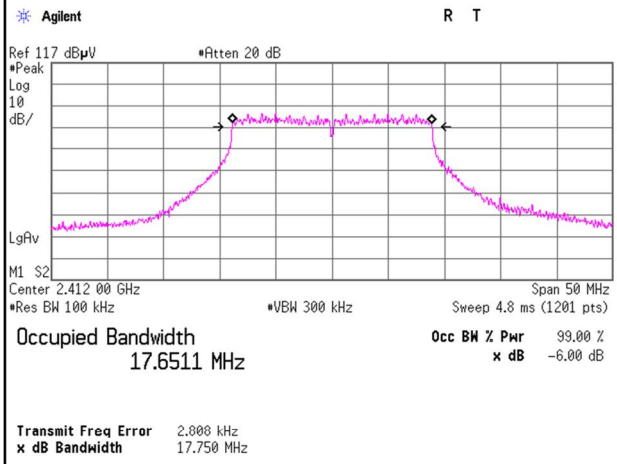
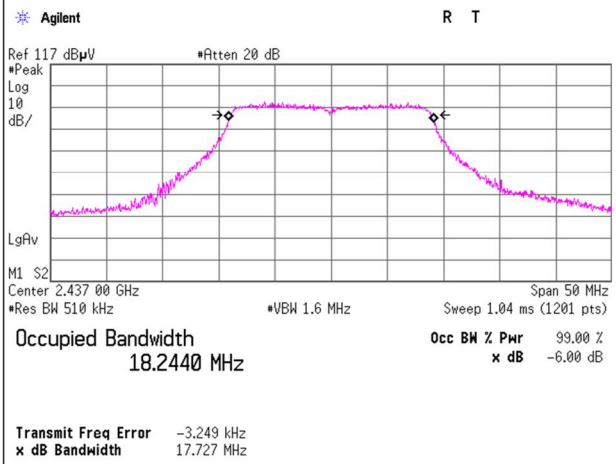
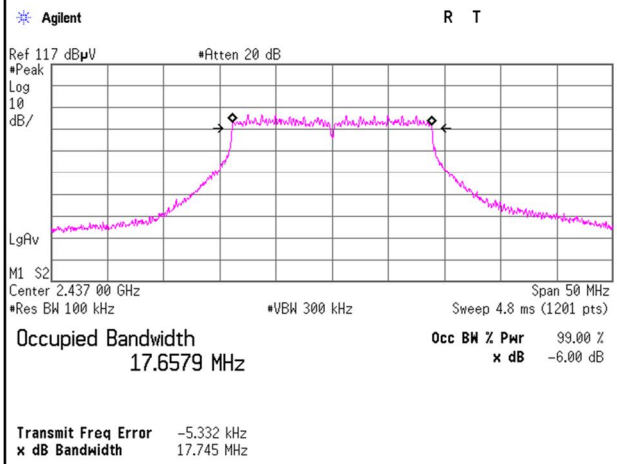
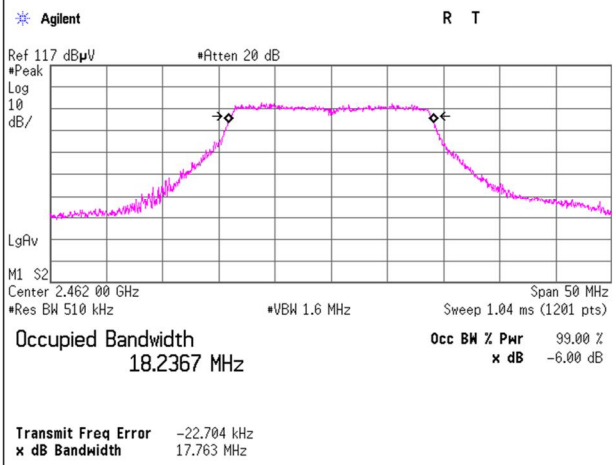
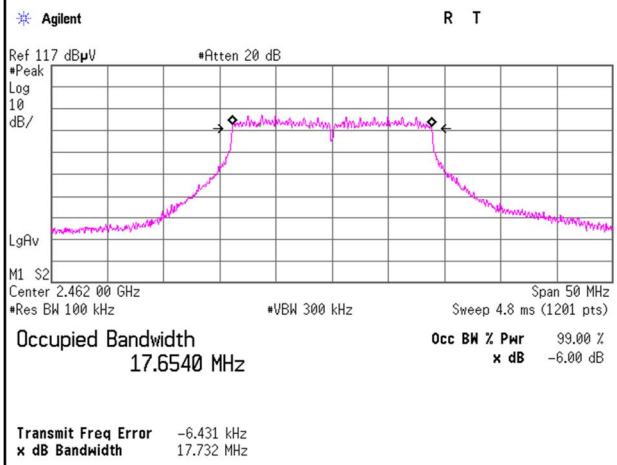
99 % Occupied Bandwidth and 6 dB Bandwidth

11g, Antenna: Ant2

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

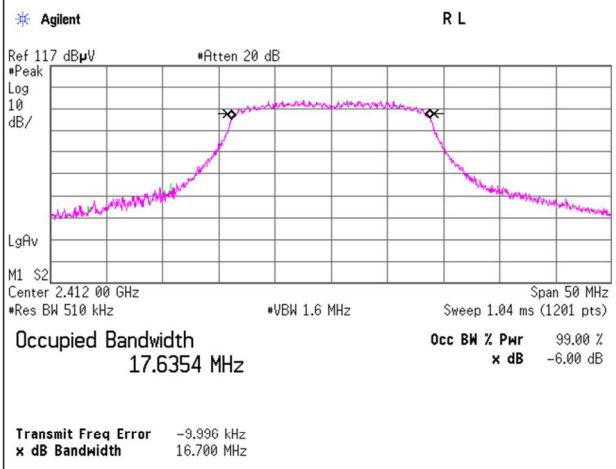
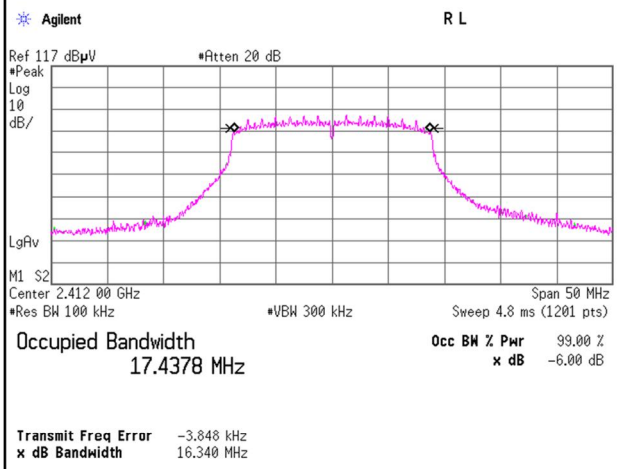
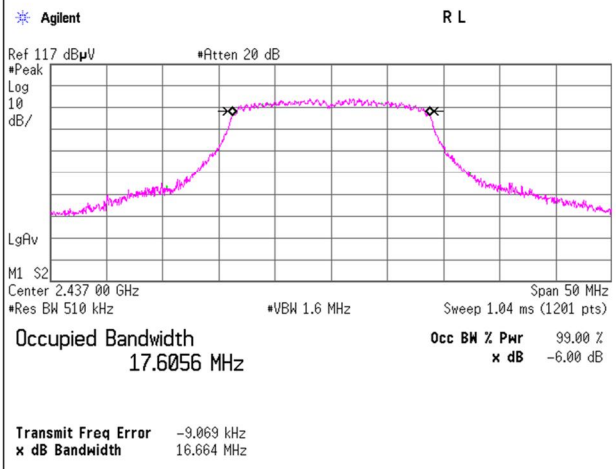
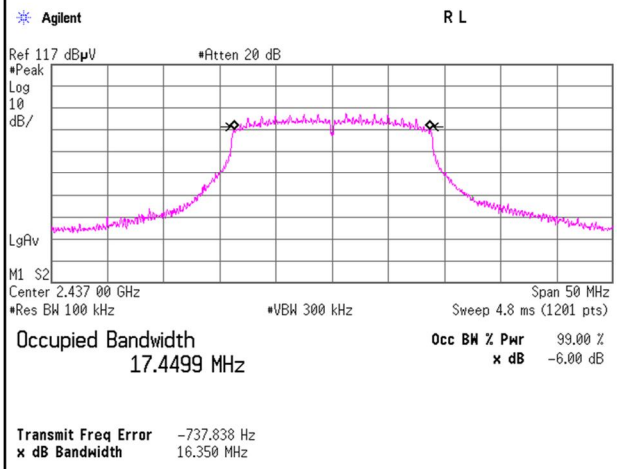
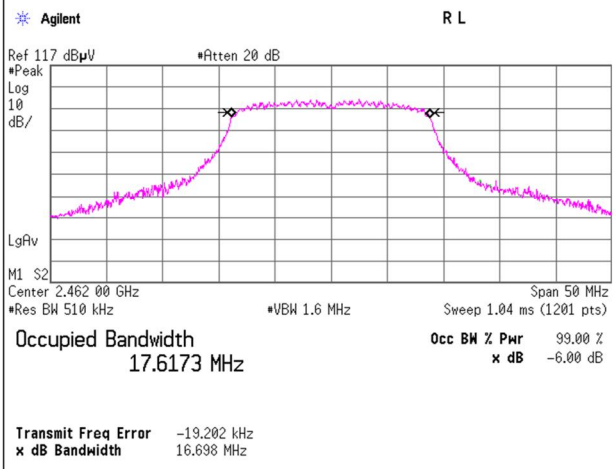
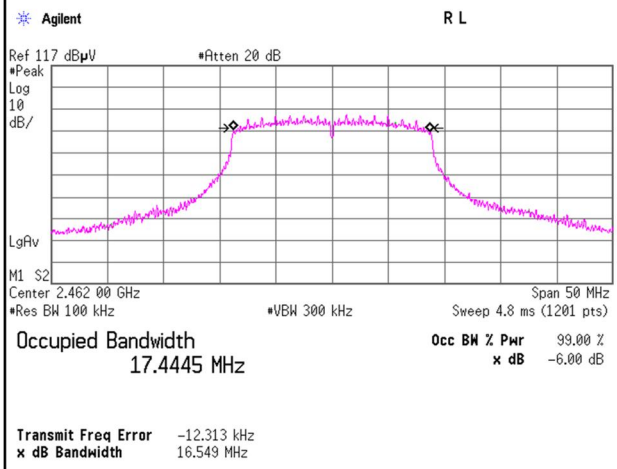
99 % Occupied Bandwidth and 6 dB Bandwidth

11n-20 (SISO), Antenna: Ant2

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 (SDM), Antenna: Ant2

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

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	November 7, 2023
Temperature / Humidity	25 deg. C / 57 % RH
Engineer	Makoto Hosaka
Mode	Tx

11b

Maximum peak output power 5.5 Mbps (worst) Long

Antenna: Ant1

Freq.	Reading	Cable Loss	Atten. Loss	Conducted Power Result		Conducted Power Limit		Margin	Antenna Gain	e.i.r.p. for RSS-247 Result		e.i.r.p. for RSS-247 Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	0.36	3.49	9.94	13.79	23.93	30.00	1000	16.21	-1.95	11.84	15.28	36.02	4000	24.18
2437	0.06	3.50	9.94	13.50	22.39	30.00	1000	16.50	-1.95	11.55	14.29	36.02	4000	24.47
2462	0.37	3.51	9.94	13.82	24.10	30.00	1000	16.18	-1.95	11.87	15.38	36.02	4000	24.15

11g

Maximum peak output power 6 Mbps (worst)

Antenna: Ant2

Freq.	Reading	Cable Loss	Atten. Loss	Conducted Power Result		Conducted Power Limit		Margin	Antenna Gain	e.i.r.p. for RSS-247 Result		e.i.r.p. for RSS-247 Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	9.02	3.49	9.94	22.45	175.79	30.00	1000	7.55	-2.21	20.24	105.68	36.02	4000	15.78
2437	8.94	3.50	9.94	22.38	172.98	30.00	1000	7.62	-2.21	20.17	103.99	36.02	4000	15.85
2462	9.05	3.51	9.94	22.50	177.83	30.00	1000	7.50	-2.21	20.29	106.91	36.02	4000	15.73

11n-20 (SISO)

Maximum peak output power MCS 6 (worst)

Antenna: Ant2

Freq.	Reading	Cable Loss	Atten. Loss	Conducted Power Result		Conducted Power Limit		Margin	Antenna Gain	e.i.r.p. for RSS-247 Result		e.i.r.p. for RSS-247 Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	9.34	3.49	9.94	22.77	189.23	30.00	1000	7.23	-2.21	20.56	113.76	36.02	4000	15.46
2437	9.18	3.50	9.94	22.62	182.81	30.00	1000	7.38	-2.21	20.41	109.90	36.02	4000	15.61
2462	9.41	3.51	9.94	22.86	193.20	30.00	1000	7.14	-2.21	20.65	116.14	36.02	4000	15.37

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	November 8, 2023
Temperature / Humidity	24 deg. C / 42 % RH
Engineer	Makoto Hosaka
Mode	Tx

11n-20 (SDM)

Maximum peak output power MCS 8 (worst)

Ant 1 + Ant 2		Conducted Power					e.i.r.p. for RSS-247				
Ch	Freq.	Result Ant 1 + Ant 2		Limit		Margin	Result Ant 1 + Ant 2		Limit		Margin
	[MHz]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
Low	2412.0	24.42	276.55	30.00	1000	5.58	22.34	171.21	36.02	4000	13.69
Mid	2437.0	23.88	244.41	30.00	1000	6.12	21.81	151.56	36.02	4000	14.21
High	2462.0	24.37	273.81	30.00	1000	5.63	22.29	169.46	36.02	4000	13.73

Ant 1 (* P/M: Power Meter with power sensor)

Ch	Freq.	P/M (Peak) Reading	Cable Loss	Atten. Loss	Result		Antenna Gain	Result (e.i.r.p.)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBi]	[dBm]	[mW]
Low	2412.0	7.83	3.49	9.94	21.26	133.66	-1.95	19.31	85.31
Mid	2437.0	7.52	3.50	9.94	20.96	124.74	-1.95	19.01	79.62
High	2462.0	7.72	3.51	9.94	21.17	130.92	-1.95	19.22	83.56

Ant 2 (* P/M: Power Meter with power sensor)

Ch	Freq.	P/M (Peak) Reading	Cable Loss	Atten. Loss	Result		Antenna Gain	Result (e.i.r.p.)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBi]	[dBm]	[mW]
Low	2412.0	8.00	3.51	10.04	21.55	142.89	-2.21	19.34	85.90
Mid	2437.0	7.22	3.52	10.04	20.78	119.67	-2.21	18.57	71.94
High	2462.0	7.98	3.53	10.04	21.55	142.89	-2.21	19.34	85.90

Sample Calculation:

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

Result (e.i.r.p.) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Antenna Gain

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	November 7, 2023
Temperature / Humidity	25 deg. C / 57 % RH
Engineer	Makoto Hosaka
Mode	Tx

(Peak)

Antenna: Ant1
11b 2412 MHz

Rate [Mbps]	Reading [dBm]	Remark
1	0.32	
2	0.35	
5.5	0.36	*
11	0.34	

*: Worst Rate

Antenna: Ant2
11b 2412 MHz

Rate [Mbps]	Reading [dBm]	Remark
1	-0.11	
2	-0.10	
5.5	-0.08	
11	-0.16	

*: Worst Rate

Antenna: Ant1
11g 2412 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	8.31	
9	7.89	
12	8.09	
18	7.71	
24	6.92	
36	7.80	
48	6.99	
54	8.49	

*: Worst Rate

Antenna: Ant2
11g 2412 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	8.67	*
9	7.99	
12	8.15	
18	8.41	
24	8.04	
36	8.02	
48	7.93	
54	8.58	

*: Worst Rate

Antenna: Ant1
11n-20 (SISO) 2412 MHz

MCS	Reading [dBm]	Remark
0	7.79	
1	8.28	
2	8.12	
3	7.51	
4	7.66	
5	7.62	
6	7.73	
7	8.13	

*: Worst Rate

Antenna: Ant2
11n-20 (SISO) 2412 MHz

MCS	Reading [dBm]	Remark
0	8.32	
1	7.83	
2	8.20	
3	7.44	
4	7.79	
5	7.29	
6	8.73	*
7	7.76	

*: Worst Rate

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	November 8, 2023
Temperature / Humidity	24 deg. C / 42 % RH
Engineer	Makoto Hosaka
Mode	Tx

11n-20 (SDM)

[Pre check]

Mode	Freq.	Cable Loss	Atten. Loss	Antenna 1			Cable Loss	Atten. Loss	Antenna 2			Antenna 1 + 2		
				Reading	Ant Gain	Result(e.i.r.p.)			Reading	Ant Gain	Result(e.i.r.p.)	Total Result (e.i.r.p.)		
(MCS)	[MHz]	[dB]	[dB]	[dBm]	[dBi]	[dBm]	[dB]	[dB]	[dBm]	[dBi]	[dBm]	[dBm]	[mW]	
8	2412.0	3.49	9.94	7.51	-1.95	18.99	3.51	10.04	7.70	-2.21	19.04	22.03	159.42	**Worst**
9	2412.0	3.49	9.94	6.85	-1.95	18.33	3.51	10.04	7.36	-2.21	18.70	21.53	142.21	
10	2412.0	3.49	9.94	7.17	-1.95	18.65	3.51	10.04	7.20	-2.21	18.54	21.61	144.73	
11	2412.0	3.49	9.94	6.79	-1.95	18.27	3.51	10.04	7.25	-2.21	18.59	21.44	139.42	
12	2412.0	3.49	9.94	6.76	-1.95	18.24	3.51	10.04	7.67	-2.21	19.01	21.65	146.30	
13	2412.0	3.49	9.94	6.92	-1.95	18.40	3.51	10.04	7.39	-2.21	18.73	21.58	143.82	
14	2412.0	3.49	9.94	6.98	-1.95	18.46	3.51	10.04	7.17	-2.21	18.51	21.50	141.11	
15	2412.0	3.49	9.94	6.78	-1.95	18.26	3.51	10.04	7.28	-2.21	18.62	21.45	139.77	

Sample Calculation:

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

Result (e.i.r.p.) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Antenna Gain

Total Result [mW] = 10 ^ (Antenna 0 Result / 10) + 10 ^ (Antenna 1 Result / 10)

Total Result [dBm] = 10 * log (Total Result [mW])

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	November 7, 2023
Temperature / Humidity	25 deg. C / 57 % RH
Engineer	Makoto Hosaka
Mode	Tx

11b

Average power 1 Mbps

Antenna: Ant1

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average) [dBm]	Result (Time average) [mW]	Duty factor [dB]	Result (Burst power average) [dBm]	Result (Burst power average) [mW]
2412	-2.73	3.49	9.94	10.70	11.75	0.00	10.70	11.75
2437	-2.65	3.50	9.94	10.79	11.99	0.00	10.79	11.99
2462	-2.34	3.51	9.94	11.11	12.91	0.00	11.11	12.91

11g

Average power 6 Mbps

Antenna: Ant1

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average) [dBm]	Result (Time average) [mW]	Duty factor [dB]	Result (Burst power average) [dBm]	Result (Burst power average) [mW]
2412	-1.82	3.49	9.94	11.61	14.49	0.00	11.61	14.49
2437	-1.77	3.50	9.94	11.67	14.69	0.00	11.67	14.69
2462	-1.48	3.51	9.94	11.97	15.74	0.00	11.97	15.74

11n-20 (SISO)

Average power MCS 0

Antenna: Ant1

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average) [dBm]	Result (Time average) [mW]	Duty factor [dB]	Result (Burst power average) [dBm]	Result (Burst power average) [mW]
2412	-1.98	3.49	9.94	11.45	13.96	0.00	11.45	13.96
2437	-1.92	3.50	9.94	11.52	14.19	0.00	11.52	14.19
2462	-1.66	3.51	9.94	11.79	15.10	0.00	11.79	15.10

Power was measured with using the gate function of power meter.

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	Shonan EMC Lab. No.5 Shielded Room
Date	November 8, 2023
Temperature / Humidity	24 deg. C / 42 % RH
Engineer	Makoto Hosaka
Mode	Tx

11n-20 (SDM)

Average power MCS 8 (worst)

Ant 1 + Ant 2

Ch	Freq. [MHz]	Ant 1 Result [mW]	Ant 2 Result [mW]	Result [dBm]	Result [mW]
Low	2412.0	13.96	13.96	14.46	27.92
Mid	2437.0	13.87	13.84	14.43	27.71
High	2462.0	14.35	14.32	14.57	28.67

Ant 1 (* P/M: Power Meter with power sensor, AV: Average with gate trigger mode)

Ch	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty factor [dB]	Result [dBm]	Result [mW]
Low	2412.0	-1.98	3.49	9.94	0.00	11.45	13.96
Mid	2437.0	-2.02	3.50	9.94	0.00	11.42	13.87
High	2462.0	-1.88	3.51	9.94	0.00	11.57	14.35

Ant 2 (* P/M: Power Meter with power sensor, AV: Average with gate trigger mode)

Ch	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty factor [dB]	Result [dBm]	Result [mW]
Low	2412.0	-2.10	3.51	10.04	0.00	11.45	13.96
Mid	2437.0	-2.15	3.52	10.04	0.00	11.41	13.84
High	2462.0	-2.01	3.53	10.04	0.00	11.56	14.32

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty factor

* This data shows output power is appropriate for maximum typical power at tested data mode.

Power was measured with using the gate function of power meter.

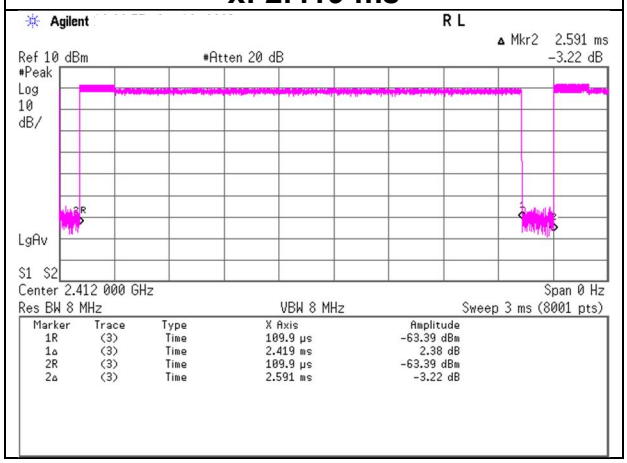
The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

Burst rate confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	November 7, 2023
Temperature / Humidity	25 deg. C / 57 % RH
Engineer	Makoto Hosaka
Mode	Tx

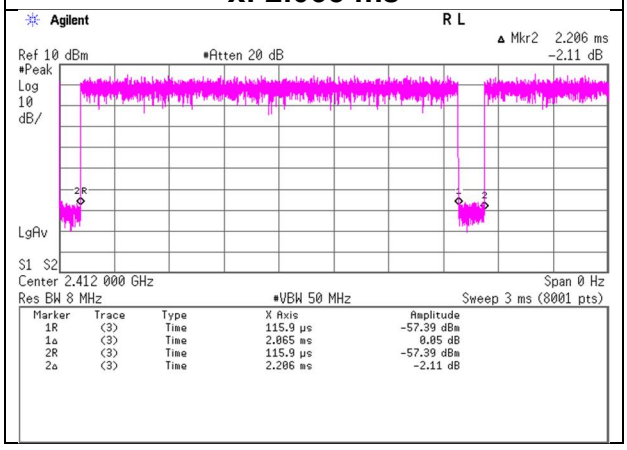
11b 5.5 Mbps Long

VBW: 1/x = 414 Hz<500 Hz
x: 2.419 ms



11g 6 Mbps

VBW: 1/x = 485 Hz<500 Hz
x: 2.065 ms



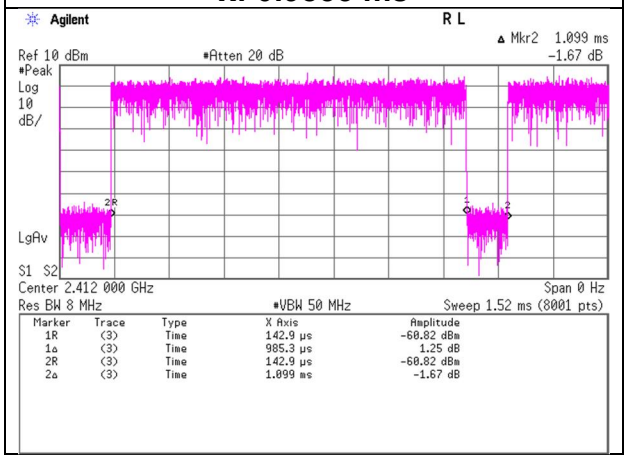
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	November 8, 2023
Temperature / Humidity	24 deg. C / 42 % RH
Engineer	Makoto Hosaka
Mode	Tx

11n-20 (SDM) MCS8

VBW: 1/x = 1015 Hz<2 kHz
x: 0.9853 ms



Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	SAC3	SAC3	SAC3
Date	November 10, 2023	November 14, 2023	November 15, 2023
Temperature / Humidity	24 deg.C, 45 %RH	22 deg.C, 35 %RH	22 deg.C, 38 %RH
Engineer	Makoto Hosaka	Hiromasa Sato	Makoto Hosaka
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11b 2412 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	48.86	27.98	14.53	41.61	1.83	51.59	73.9	22.3	153	111	-
Hori.	4824.000	PK	53.24	31.41	7.19	42.87	1.83	50.80	73.9	23.1	159	76	-
Hori.	7236.000	PK	48.64	37.15	8.68	43.36	1.83	52.94	73.9	20.9	150	0	-
Hori.	9648.000	PK	48.86	38.72	9.88	43.09	1.83	56.20	73.9	17.7	150	0	-
Hori.	2390.000	AV	34.92	27.98	14.53	41.61	1.83	37.65	53.9	16.2	153	111	VBW:500 Hz
Hori.	4824.000	AV	41.49	31.41	7.19	42.87	1.83	39.05	53.9	14.8	159	76	VBW:500 Hz
Hori.	7236.000	AV	35.49	37.15	8.68	43.36	1.83	39.79	53.9	14.1	150	0	VBW:500 Hz, Floor noise
Hori.	9648.000	AV	35.64	38.72	9.88	43.09	1.83	42.98	53.9	10.9	150	0	VBW:500 Hz, Floor noise
Vert.	2390.000	PK	48.78	27.98	14.53	41.61	1.83	51.51	73.9	22.3	382	77	-
Vert.	4823.900	PK	52.74	31.41	7.19	42.87	1.83	50.30	73.9	23.6	273	88	-
Vert.	7236.000	PK	48.68	37.15	8.68	43.36	1.83	52.98	73.9	20.9	150	0	-
Vert.	9648.000	PK	48.94	38.72	9.88	43.09	1.83	56.28	73.9	17.6	150	0	-
Vert.	2390.000	AV	34.86	27.98	14.53	41.61	1.83	37.59	53.9	16.3	382	77	VBW:500 Hz
Vert.	4823.900	AV	40.20	31.41	7.19	42.87	1.83	37.76	53.9	16.1	273	88	VBW:500 Hz
Vert.	7236.000	AV	35.56	37.15	8.68	43.36	1.83	39.86	53.9	14.0	150	0	VBW:500 Hz, Floor noise
Vert.	9648.000	AV	35.68	38.72	9.88	43.09	1.83	43.02	53.9	**10.8**	150	0	VBW:500 Hz, Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.70 m / 3.0 m) = 1.83 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

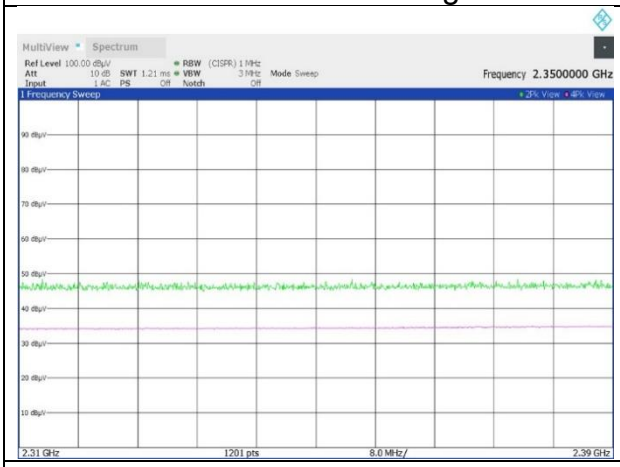
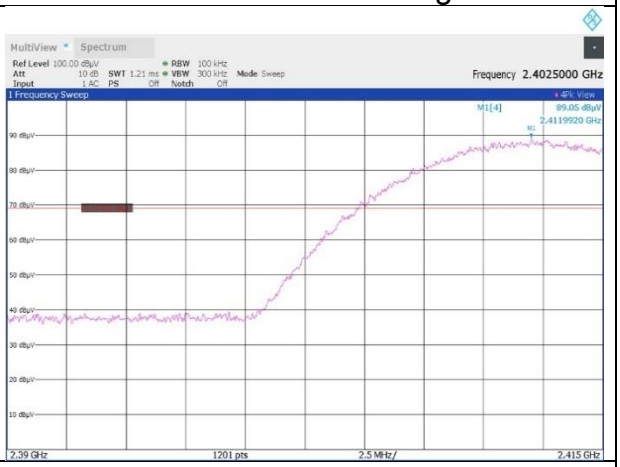
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

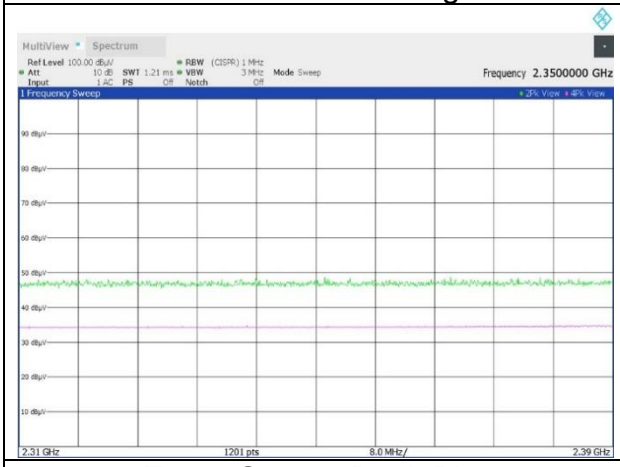
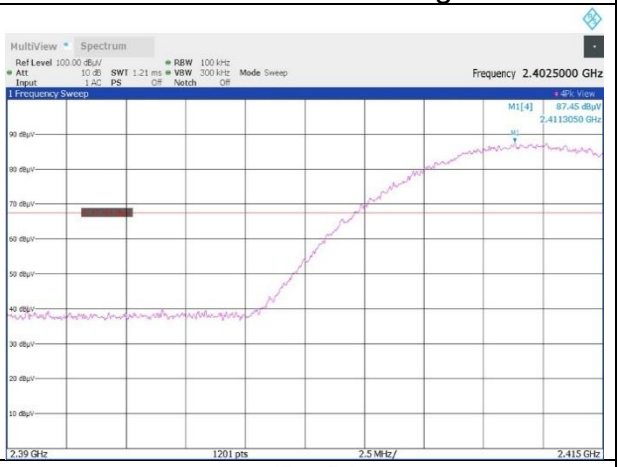
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	89.07	27.95	14.56	41.61	1.83	91.80	-	-	Carrier
Hori.	2400.000	PK	40.22	27.97	14.54	41.61	1.83	42.95	71.8	28.8	-
Vert.	2412.000	PK	87.98	27.95	14.56	41.61	1.83	90.71	-	-	Carrier
Vert.	2400.000	PK	40.11	27.97	14.54	41.61	1.83	42.84	70.7	27.8	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.70 m / 3.0 m) = 1.83 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	SAC3
Date	November 10, 2023
Temperature / Humidity	24 deg.C, 45 %RH
Engineer	Makoto Hosaka
Mode	Tx 11b 2412 MHz

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

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

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	SAC3	SAC3	SAC3
Date	November 10, 2023	November 14, 2023	November 15, 2023
Temperature / Humidity	24 deg.C, 45 %RH	22 deg.C, 35 %RH	22 deg.C, 38 %RH
Engineer	Makoto Hosaka	Hiromasa Sato	Makoto Hosaka
	(1 GHz to 10 GHz)	(10 GHz to18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11b 2437 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	52.79	31.50	7.22	42.88	1.83	50.46	73.9	23.4	147	76	-
Hori.	7311.000	PK	49.59	37.24	8.52	43.41	1.83	53.77	73.9	20.1	150	0	-
Hori.	9748.000	PK	49.50	39.00	9.68	43.02	1.83	56.99	73.9	16.9	150	0	-
Hori.	4874.000	AV	40.64	31.50	7.22	42.88	1.83	38.31	53.9	15.5	147	76	VBW500 Hz
Hori.	7311.000	AV	35.63	37.24	8.52	43.41	1.83	39.81	53.9	14.0	150	0	VBW:500 Hz, Floor noise
Hori.	9748.000	AV	35.79	39.00	9.68	43.02	1.83	43.28	53.9	**10.6**	150	0	VBW:500 Hz, Floor noise
Vert.	4874.000	PK	53.27	31.50	7.22	42.88	1.83	50.94	73.9	22.9	186	166	-
Vert.	7311.000	PK	49.66	37.24	8.52	43.41	1.83	53.84	73.9	20.0	150	0	-
Vert.	9748.000	PK	49.42	39.00	9.68	43.02	1.83	56.91	73.9	16.9	150	0	-
Vert.	4874.000	AV	41.52	31.50	7.22	42.88	1.83	39.19	53.9	14.7	186	166	VBW500 Hz
Vert.	7311.000	AV	35.68	37.24	8.52	43.41	1.83	39.86	53.9	14.0	150	0	VBW:500 Hz, Floor noise
Vert.	9748.000	AV	35.78	39.00	9.68	43.02	1.83	43.27	53.9	**10.6**	150	0	VBW:500 Hz, Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.70 m / 3.0 m) = 1.83 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	SAC3	SAC3	SAC3
Date	November 10, 2023	November 14, 2023	November 15, 2023
Temperature / Humidity	24 deg.C, 45 %RH	22 deg.C, 35 %RH	22 deg.C, 38 %RH
Engineer	Makoto Hosaka	Hiromasa Sato	Makoto Hosaka
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11b 2462 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	47.82	27.89	14.64	41.64	1.83	50.54	73.9	23.3	219	113	-
Hori.	4924.000	PK	51.92	31.61	7.26	42.89	1.83	49.73	73.9	24.1	161	78	-
Hori.	7386.000	PK	48.84	37.36	8.79	43.46	1.83	53.36	73.9	20.5	150	0	-
Hori.	9848.000	PK	48.24	39.06	9.98	42.94	1.83	56.17	73.9	17.7	150	0	-
Hori.	2483.500	AV	34.56	27.89	14.64	41.64	1.83	37.28	53.9	16.6	219	113	VBW:500 Hz
Hori.	4924.000	AV	39.31	31.61	7.26	42.89	1.83	37.12	53.9	16.7	161	78	VBW:500 Hz
Hori.	7386.000	AV	35.32	37.36	8.79	43.46	1.83	39.84	53.9	14.0	150	0	VBW:500 Hz, Floor noise
Hori.	9848.000	AV	34.89	39.06	9.98	42.94	1.83	42.82	53.9	**11.0**	150	0	VBW:500 Hz, Floor noise
Vert.	2483.500	PK	47.90	27.89	14.64	41.64	1.83	50.62	73.9	23.2	344	103	-
Vert.	4924.000	PK	52.51	31.61	7.26	42.89	1.83	50.32	73.9	23.5	271	140	-
Vert.	7386.000	PK	48.86	37.36	8.79	43.46	1.83	53.38	73.9	20.5	150	0	-
Vert.	9848.000	PK	48.78	39.06	9.98	42.94	1.83	56.71	73.9	17.1	150	0	-
Vert.	2483.500	AV	34.46	27.89	14.64	41.64	1.83	37.18	53.9	16.7	344	103	VBW:500 Hz
Vert.	4924.000	AV	40.45	31.61	7.26	42.89	1.83	38.26	53.9	15.6	271	140	VBW:500 Hz
Vert.	7386.000	AV	35.26	37.36	8.79	43.46	1.83	39.78	53.9	14.1	150	0	VBW:500 Hz, Floor noise
Vert.	9848.000	AV	34.86	39.06	9.98	42.94	1.83	42.79	53.9	11.1	150	0	VBW:500 Hz, Floor noise

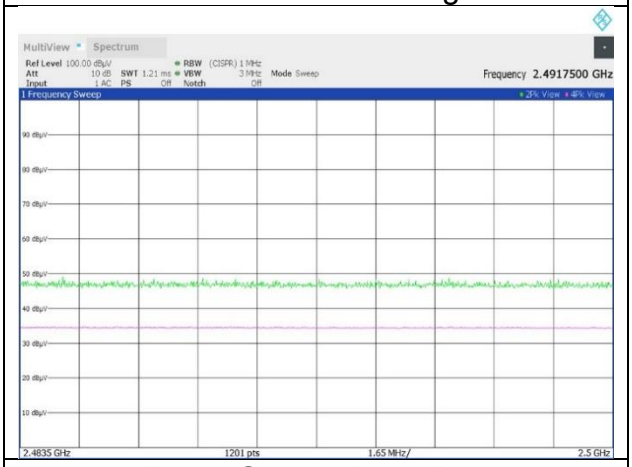
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.70 m / 3.0 m) = 1.83 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	SAC3
Date	November 10, 2023
Temperature / Humidity	24 deg.C, 45 %RH
Engineer	Makoto Hosaka
Mode	Tx 11b 2462 MHz

Horizontal

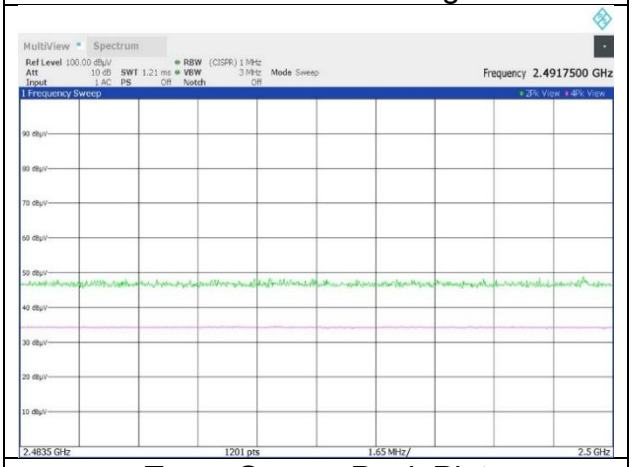
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	SAC3	SAC3	SAC3
Date	November 10, 2023	November 14, 2023	November 15, 2023
Temperature / Humidity	24 deg.C, 45 %RH	22 deg.C, 35 %RH	22 deg.C, 38 %RH
Engineer	Makoto Hosaka	Hiromasa Sato	Makoto Hosaka
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11g 2412 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	49.65	27.98	14.53	41.61	1.83	52.38	73.9	21.5	323	121	-
Hori.	4824.000	PK	55.11	31.41	7.19	42.87	1.83	52.67	73.9	21.2	155	109	-
Hori.	7236.000	PK	49.35	37.15	8.47	43.36	1.83	53.44	73.9	20.4	150	0	-
Hori.	9648.000	PK	49.95	38.72	9.65	43.09	1.83	57.06	73.9	16.8	150	0	-
Hori.	2390.000	AV	35.23	27.98	14.53	41.61	1.83	37.96	53.9	15.9	323	121	VBW:500 Hz
Hori.	4824.000	AV	40.81	31.41	7.19	42.87	1.83	38.37	53.9	15.5	155	109	VBW:500 Hz
Hori.	7236.000	AV	35.34	37.15	8.47	43.36	1.83	39.43	53.9	14.4	150	0	VBW:500 Hz, Floor noise
Hori.	9648.000	AV	35.64	38.72	9.65	43.09	1.83	42.75	53.9	**11.1**	150	0	VBW:500 Hz, Floor noise
Vert.	2390.000	PK	49.18	27.98	14.53	41.61	1.83	51.91	73.9	21.9	119	83	-
Vert.	4824.000	PK	55.23	31.41	7.19	42.87	1.83	52.79	73.9	21.1	217	113	-
Vert.	7236.000	PK	49.45	37.15	8.47	43.36	1.83	53.54	73.9	20.3	150	0	-
Vert.	9648.000	PK	49.38	38.72	9.65	43.09	1.83	56.49	73.9	17.4	150	0	-
Vert.	2390.000	AV	35.03	27.98	14.53	41.61	1.83	37.76	53.9	16.1	119	83	VBW:500 Hz
Vert.	4824.000	AV	40.85	31.41	7.19	42.87	1.83	38.41	53.9	15.4	217	113	VBW:500 Hz
Vert.	7236.000	AV	35.37	37.15	8.47	43.36	1.83	39.46	53.9	14.4	150	0	VBW:500 Hz, Floor noise
Vert.	9648.000	AV	35.48	38.72	9.65	43.09	1.83	42.59	53.9	11.3	150	0	VBW:500 Hz, Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.70 m / 3.0 m) = 1.83 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

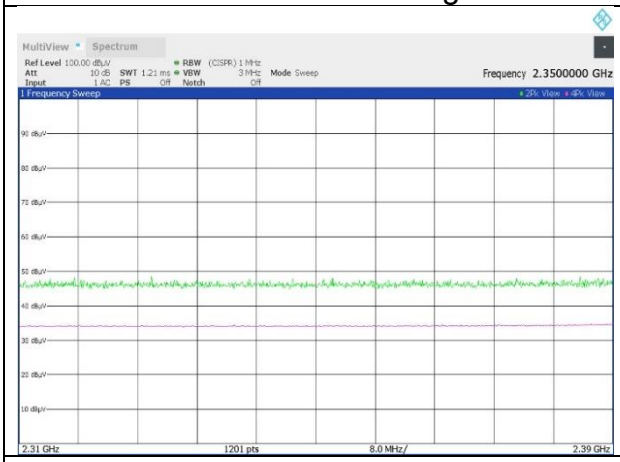
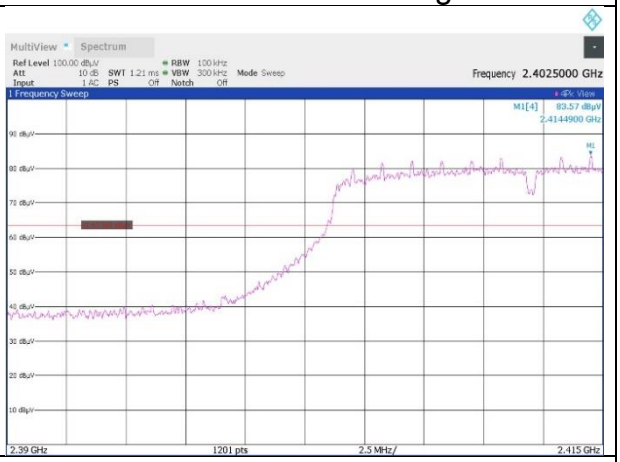
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

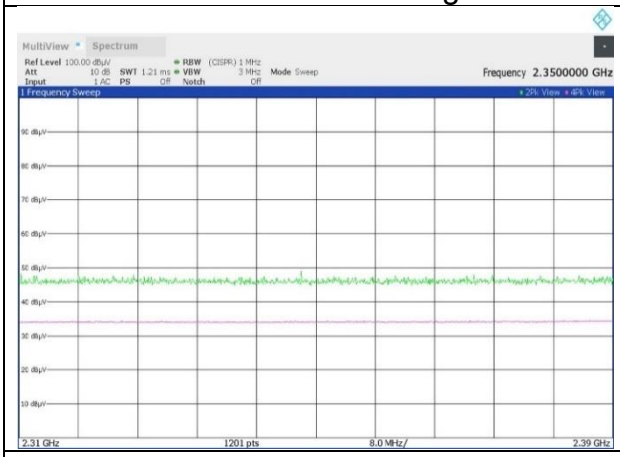
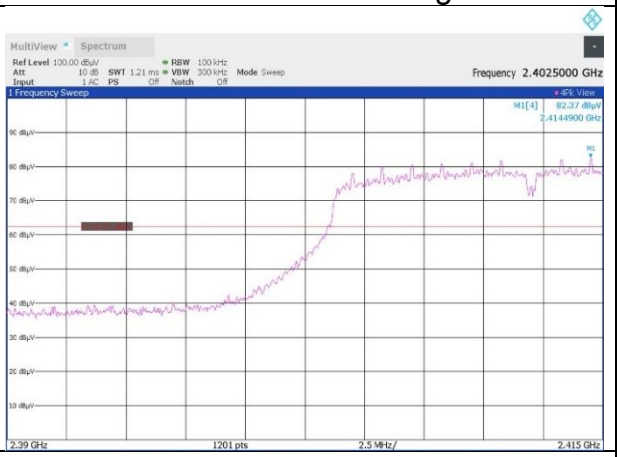
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	83.58	27.95	14.56	41.61	1.83	86.31	-	-	Carrier
Hori.	2400.000	PK	44.66	27.97	14.54	41.61	1.83	47.39	66.3	18.9	-
Vert.	2412.000	PK	82.37	27.95	14.56	41.61	1.83	85.10	-	-	Carrier
Vert.	2400.000	PK	43.69	27.97	14.54	41.61	1.83	46.42	65.1	18.6	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.70 m / 3.0 m) = 1.83 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	SAC3
Date	November 10, 2023
Temperature / Humidity	24 deg.C, 45 %RH
Engineer	Makoto Hosaka
Mode	Tx 11g 2412 MHz

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

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

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	SAC3	SAC3	SAC3
Date	November 10, 2023	November 14, 2023	November 15, 2023
Temperature / Humidity	24 deg.C, 45 %RH	22 deg.C, 35 %RH	22 deg.C, 38 %RH
Engineer	Makoto Hosaka	Hiromasa Sato	Makoto Hosaka
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11g 2437 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	54.50	31.50	7.22	42.88	1.83	52.17	73.9	21.7	163	100	-
Hori.	7311.000	PK	49.03	37.24	8.52	43.41	1.83	53.21	73.9	20.6	150	0	-
Hori.	9748.000	PK	49.34	39.00	9.68	43.02	1.83	56.83	73.9	17.0	150	0	-
Hori.	4874.000	AV	40.32	31.50	7.22	42.88	1.83	37.99	53.9	15.9	163	100	VBW:500 Hz
Hori.	7311.000	AV	35.17	37.24	8.52	43.41	1.83	39.35	53.9	14.5	150	0	VBW:500 Hz, Floor noise
Hori.	9748.000	AV	35.34	39.00	9.68	43.02	1.83	42.83	53.9	**11.0**	150	0	VBW:500 Hz, Floor noise
Vert.	4874.000	PK	54.65	31.50	7.22	42.88	1.83	52.32	73.9	21.5	128	127	-
Vert.	7311.000	PK	48.97	37.24	8.52	43.41	1.83	53.15	73.9	20.7	150	0	-
Vert.	9748.000	PK	49.04	39.00	9.68	43.02	1.83	56.53	73.9	17.3	150	0	-
Vert.	4874.000	AV	40.40	31.50	7.22	42.88	1.83	38.07	53.9	15.8	128	127	VBW:500 Hz
Vert.	7311.000	AV	35.23	37.24	8.52	43.41	1.83	39.41	53.9	14.4	150	0	VBW:500 Hz, Floor noise
Vert.	9748.000	AV	35.32	39.00	9.68	43.02	1.83	42.81	53.9	**11.0**	150	0	VBW:500 Hz, Floor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.70 m / 3.0 m) = 1.83 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	SAC3	SAC3	SAC3
Date	November 10, 2023	November 14, 2023	November 15, 2023
Temperature / Humidity	24 deg.C, 45 %RH	22 deg.C, 35 %RH	22 deg.C, 38 %RH
Engineer	Makoto Hosaka	Hiromasa Sato	Makoto Hosaka
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11g 2462 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.63	27.89	14.64	41.64	1.83	52.35	73.9	21.5	181	115	-
Hori.	4924.000	PK	52.20	31.61	7.26	42.89	1.83	50.01	73.9	23.8	156	112	-
Hori.	7386.000	PK	49.41	37.36	8.56	43.46	1.83	53.70	73.9	20.2	150	0	-
Hori.	9848.000	PK	48.90	39.06	9.72	42.94	1.83	56.57	73.9	17.3	150	0	-
Hori.	2483.500	AV	35.29	27.89	14.64	41.64	1.83	38.01	53.9	15.8	181	115	VBW:500 Hz
Hori.	4924.000	AV	38.34	31.61	7.26	42.89	1.83	36.15	53.9	17.7	156	112	VBW:500 Hz
Hori.	7386.000	AV	35.39	37.36	8.56	43.46	1.83	39.68	53.9	14.2	150	0	VBW:500 Hz, Floor noise
Hori.	9848.000	AV	35.27	39.06	9.72	42.94	1.83	42.94	53.9	**10.9**	150	0	VBW:500 Hz, Floor noise
Vert.	2483.500	PK	49.05	27.89	14.64	41.64	1.83	51.77	73.9	22.1	235	94	-
Vert.	4924.000	PK	51.67	31.61	7.26	42.89	1.83	49.48	73.9	24.4	211	168	-
Vert.	7386.000	PK	49.73	37.36	8.56	43.46	1.83	54.02	73.9	19.8	150	0	-
Vert.	9848.000	PK	49.13	39.06	9.72	42.94	1.83	56.80	73.9	17.1	150	0	-
Vert.	2483.500	AV	34.97	27.89	14.64	41.64	1.83	37.69	53.9	16.2	235	94	VBW:500 Hz
Vert.	4924.000	AV	38.02	31.61	7.26	42.89	1.83	35.83	53.9	18.0	211	168	VBW:500 Hz
Vert.	7386.000	AV	35.37	37.36	8.56	43.46	1.83	39.66	53.9	14.2	150	0	VBW:500 Hz, Floor noise
Vert.	9848.000	AV	35.16	39.06	9.72	42.94	1.83	42.83	53.9	11.0	150	0	VBW:500 Hz, Floor noise

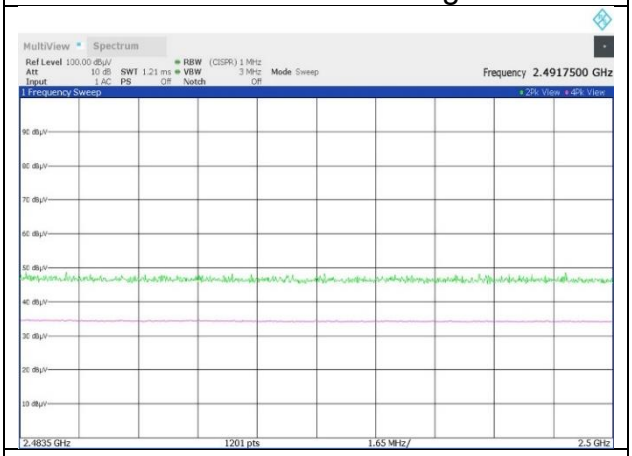
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.70 m / 3.0 m) = 1.83 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	SAC3
Date	November 10, 2023
Temperature / Humidity	24 deg.C, 45 %RH
Engineer	Makoto Hosaka
Mode	Tx 11g 2462 MHz

Horizontal

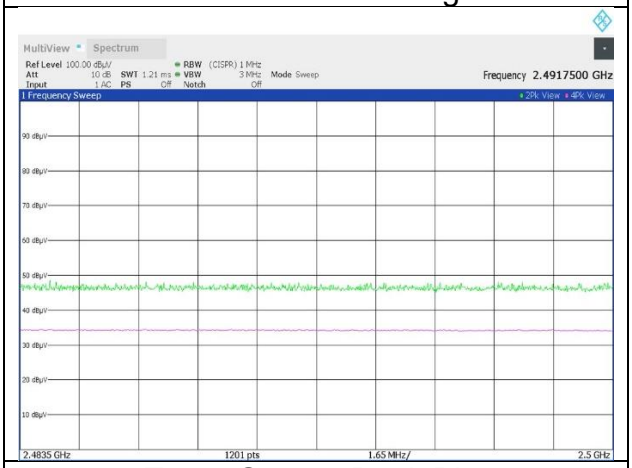
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	SAC3	SAC3	SAC3	SAC3
Date	November 17, 2023	November 10, 2023	November 14, 2023	November 15, 2023
Temperature / Humidity	22 deg.C, 44 %RH	24 deg.C, 45 %RH	22 deg.C, 35 %RH	22 deg.C, 38 %RH
Engineer	Hiromasa Sato (30 MHz to 1 GHz)	Makoto Hosaka (1 GHz to 10 GHz)	Hiromasa Sato (10 GHz to 18 GHz)	Makoto Hosaka (18 GHz to 26.5 GHz)
Mode	Tx 11n-20 (SDM) 2412 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	30.893	QP	22.10	18.69	6.62	32.20	0.00	15.21	40.0	24.7	200	194	-
Hori.	549.997	QP	30.10	17.83	9.69	32.00	0.00	25.62	46.0	20.3	175	294	-
Hori.	749.998	QP	20.00	20.13	10.46	31.75	0.00	18.84	46.0	27.1	170	291	-
Hori.	850.001	QP	31.20	21.58	10.80	31.36	0.00	32.22	46.0	13.7	101	214	-
Hori.	900.000	QP	31.95	21.98	10.96	31.06	0.00	33.83	46.0	12.1	100	246	-
Hori.	949.998	QP	29.70	21.99	11.12	30.73	0.00	32.08	46.0	13.9	153	213	-
Hori.	2390.000	PK	50.06	27.98	14.53	41.61	1.83	52.79	73.9	21.1	131	115	-
Hori.	4824.000	PK	54.37	31.41	7.19	42.87	1.83	51.93	73.9	21.9	151	120	-
Hori.	7236.000	PK	49.56	37.15	8.47	43.36	1.83	53.65	73.9	20.2	150	0	-
Hori.	9648.000	PK	49.22	38.72	9.65	43.09	1.83	56.33	73.9	17.5	150	0	-
Hori.	2390.000	AV	36.03	27.98	14.53	41.61	1.83	38.76	53.9	15.1	131	115	VBW:2 kHz
Hori.	4824.000	AV	40.64	31.41	7.19	42.87	1.83	38.20	53.9	15.7	151	120	VBW:2 kHz
Hori.	7236.000	AV	36.13	37.15	8.47	43.36	1.83	40.22	53.9	13.6	150	0	VBW:2 kHz, Fllor noise
Hori.	9648.000	AV	36.20	38.72	9.65	43.09	1.83	43.31	53.9	**10.5**	150	0	VBW:2 kHz, Fllor noise
Vert.	161.351	QP	28.50	15.30	7.75	32.09	0.00	19.46	43.5	24.0	100	51	-
Vert.	199.874	QP	27.80	16.58	8.01	32.07	0.00	20.32	43.5	23.1	100	1	-
Vert.	749.996	QP	29.30	20.13	10.46	31.75	0.00	28.14	46.0	17.8	101	344	-
Vert.	849.998	QP	27.80	21.58	10.80	31.36	0.00	28.82	46.0	17.1	143	8	-
Vert.	900.000	QP	30.79	21.98	10.96	31.06	0.00	32.67	46.0	13.3	170	228	-
Vert.	2390.000	PK	51.50	27.98	14.53	41.61	1.83	54.23	73.9	19.6	319	96	-
Vert.	4824.000	PK	54.09	31.41	7.19	42.87	1.83	51.65	73.9	22.2	256	114	-
Vert.	7236.000	PK	49.37	37.15	8.47	43.36	1.83	53.46	73.9	20.4	150	0	-
Vert.	9648.000	PK	49.13	38.72	9.65	43.09	1.83	56.24	73.9	17.6	150	0	-
Vert.	2390.000	AV	36.36	27.98	14.53	41.61	1.83	39.09	53.9	14.8	319	96	VBW:2 kHz
Vert.	4824.000	AV	40.77	31.41	7.19	42.87	1.83	38.33	53.9	15.5	256	114	VBW:2 kHz
Vert.	7236.000	AV	36.06	37.15	8.47	43.36	1.83	40.15	53.9	13.7	150	0	VBW:2 kHz, Fllor noise
Vert.	9648.000	AV	36.11	38.72	9.65	43.09	1.83	43.22	53.9	10.6	150	0	VBW:2 kHz, Fllor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.70 m / 3.0 m) = 1.83 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

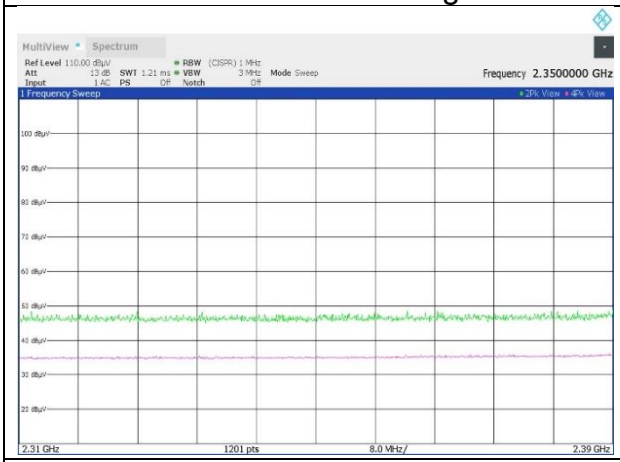
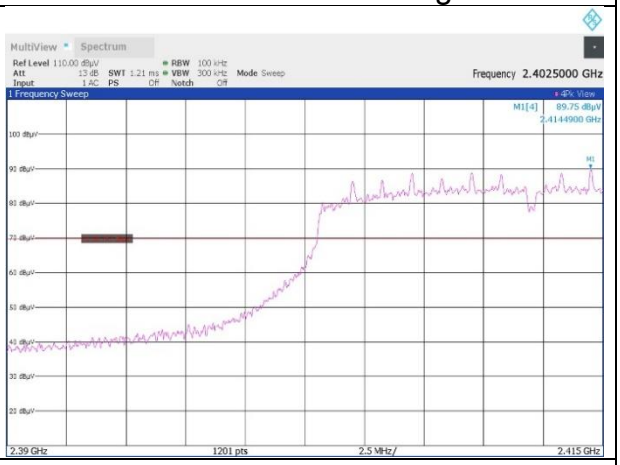
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

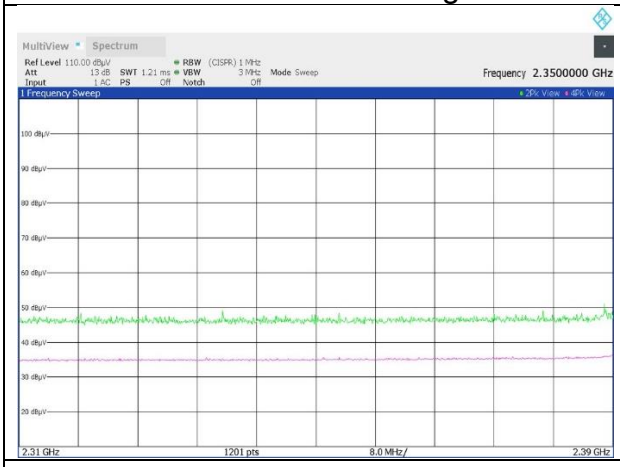
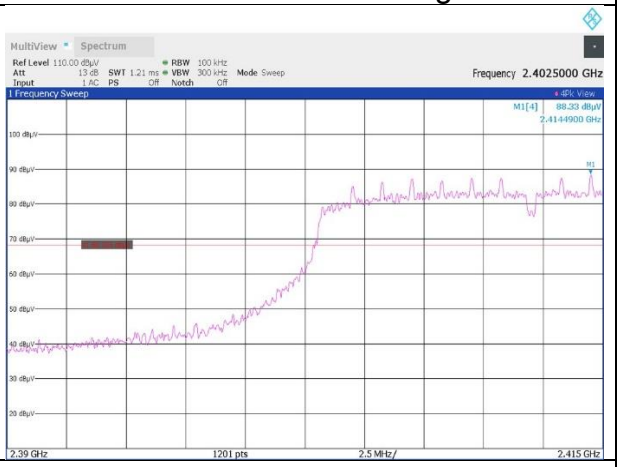
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	89.75	27.95	14.56	41.61	1.83	92.48	-	-	Carrier
Hori.	2400.000	PK	49.02	27.97	14.54	41.61	1.83	51.75	72.4	20.6	-
Vert.	2412.000	PK	88.33	27.95	14.56	41.61	1.83	91.06	-	-	Carrier
Vert.	2400.000	PK	50.41	27.97	14.54	41.61	1.83	53.14	71.0	17.8	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.70 m / 3.0 m) = 1.83 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	SAC3
Date	November 10, 2023
Temperature / Humidity	24 deg.C, 45 %RH
Engineer	Makoto Hosaka
Mode	Tx 11n-20 (SDM) 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 and authorized band edge were shown in tabular data.

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	SAC3	SAC3	SAC3
Date	November 10, 2023	November 14, 2023	November 15, 2023
Temperature / Humidity	24 deg.C, 45 %RH	22 deg.C, 35 %RH	22 deg.C, 38 %RH
Engineer	Makoto Hosaka	Hiromasa Sato	Makoto Hosaka
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11n-20 (SDM) 2437 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	53.81	31.50	7.22	42.88	1.83	51.48	73.9	22.4	181	99	-
Hori.	7311.000	PK	50.13	37.24	8.52	43.41	1.83	54.31	73.9	19.5	150	0	-
Hori.	9748.000	PK	49.29	39.00	9.68	43.02	1.83	56.78	73.9	17.1	150	0	-
Hori.	4874.000	AV	40.40	31.50	7.22	42.88	1.83	38.07	53.9	15.8	181	99	VBW:2 kHz
Hori.	7311.000	AV	35.85	37.24	8.52	43.41	1.83	40.03	53.9	13.8	150	0	VBW:2 kHz, Fllor noise
Hori.	9748.000	AV	36.20	39.00	9.68	43.02	1.83	43.69	53.9	**10.2**	150	0	VBW:2 kHz, Fllor noise
Vert.	4874.000	PK	53.87	31.50	7.22	42.88	1.83	51.54	73.9	22.3	205	169	-
Vert.	7311.000	PK	49.11	37.24	8.52	43.41	1.83	53.29	73.9	20.6	150	0	-
Vert.	9748.000	PK	49.19	39.00	9.68	43.02	1.83	56.68	73.9	17.2	150	0	-
Vert.	4874.000	AV	39.57	31.50	7.22	42.88	1.83	37.24	53.9	16.6	205	169	VBW:2 kHz
Vert.	7311.000	AV	35.83	37.24	8.52	43.41	1.83	40.01	53.9	13.8	150	0	VBW:2 kHz, Fllor noise
Vert.	9748.000	AV	36.04	39.00	9.68	43.02	1.83	43.53	53.9	10.3	150	0	VBW:2 kHz, Fllor noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.70 m / 3.0 m) = 1.83 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	SAC3	SAC3	SAC3
Date	November 10, 2023	November 14, 2023	November 15, 2023
Temperature / Humidity	24 deg.C, 45 %RH	22 deg.C, 35 %RH	22 deg.C, 38 %RH
Engineer	Makoto Hosaka	Hiromasa Sato	Makoto Hosaka
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11n-20 (SDM) 2462 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	55.78	27.89	14.64	41.64	1.83	58.50	73.9	15.4	127	118	-
Hori.	4924.000	PK	51.48	31.61	7.26	42.89	1.83	49.29	73.9	24.6	281	82	-
Hori.	7386.000	PK	49.93	37.36	8.56	43.46	1.83	54.22	73.9	19.6	150	0	-
Hori.	9848.000	PK	49.18	39.06	9.72	42.94	1.83	56.85	73.9	17.0	150	0	-
Hori.	2483.500	AV	37.57	27.89	14.64	41.64	1.83	40.29	53.9	13.6	127	118	VBW:2 kHz
Hori.	4924.000	AV	39.33	31.61	7.26	42.89	1.83	37.14	53.9	16.7	281	82	VBW:2 kHz
Hori.	7386.000	AV	35.99	37.36	8.56	43.46	1.83	40.28	53.9	13.6	150	0	VBW:2 kHz, Fllor noise
Hori.	9848.000	AV	35.86	39.06	9.72	42.94	1.83	43.53	53.9	10.3	150	0	VBW:2 kHz, Fllor noise
Vert.	2483.500	PK	55.86	27.89	14.64	41.64	1.83	58.58	73.9	15.3	325	96	-
Vert.	4924.000	PK	53.02	31.61	7.26	42.89	1.83	50.83	73.9	23.0	217	168	-
Vert.	7386.000	PK	49.05	37.36	8.56	43.46	1.83	53.34	73.9	20.5	150	0	-
Vert.	9848.000	PK	48.78	39.06	9.72	42.94	1.83	56.45	73.9	17.4	150	0	-
Vert.	2483.500	AV	37.49	27.89	14.64	41.64	1.83	40.21	53.9	13.6	325	96	VBW:2 kHz
Vert.	4924.000	AV	39.70	31.61	7.26	42.89	1.83	37.51	53.9	16.3	217	168	VBW:2 kHz
Vert.	7386.000	AV	36.17	37.36	8.56	43.46	1.83	40.46	53.9	13.4	150	0	VBW:2 kHz, Fllor noise
Vert.	9848.000	AV	36.03	39.06	9.72	42.94	1.83	43.70	53.9	**10.2**	150	0	VBW:2 kHz, Fllor noise

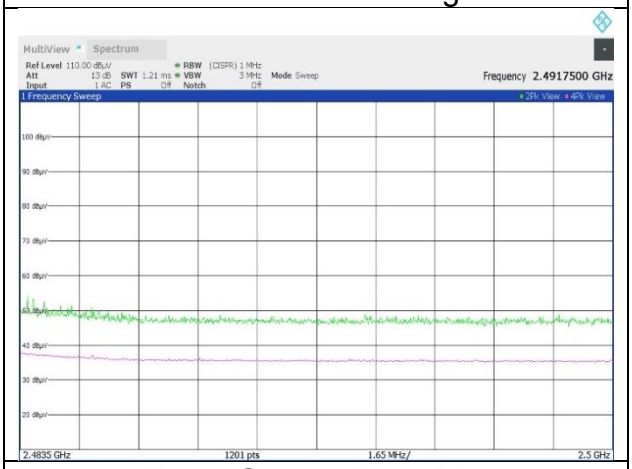
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.70 m / 3.0 m) = 1.83 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	SAC3
Date	November 10, 2023
Temperature / Humidity	24 deg.C, 45 %RH
Engineer	Makoto Hosaka
Mode	Tx 11n-20 (SDM) 2462 MHz

Horizontal

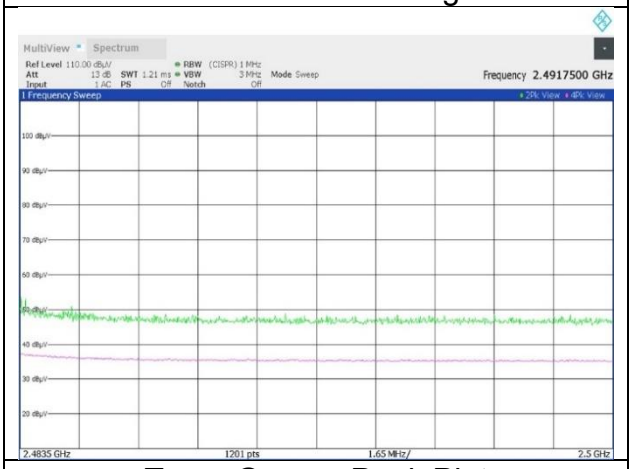
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

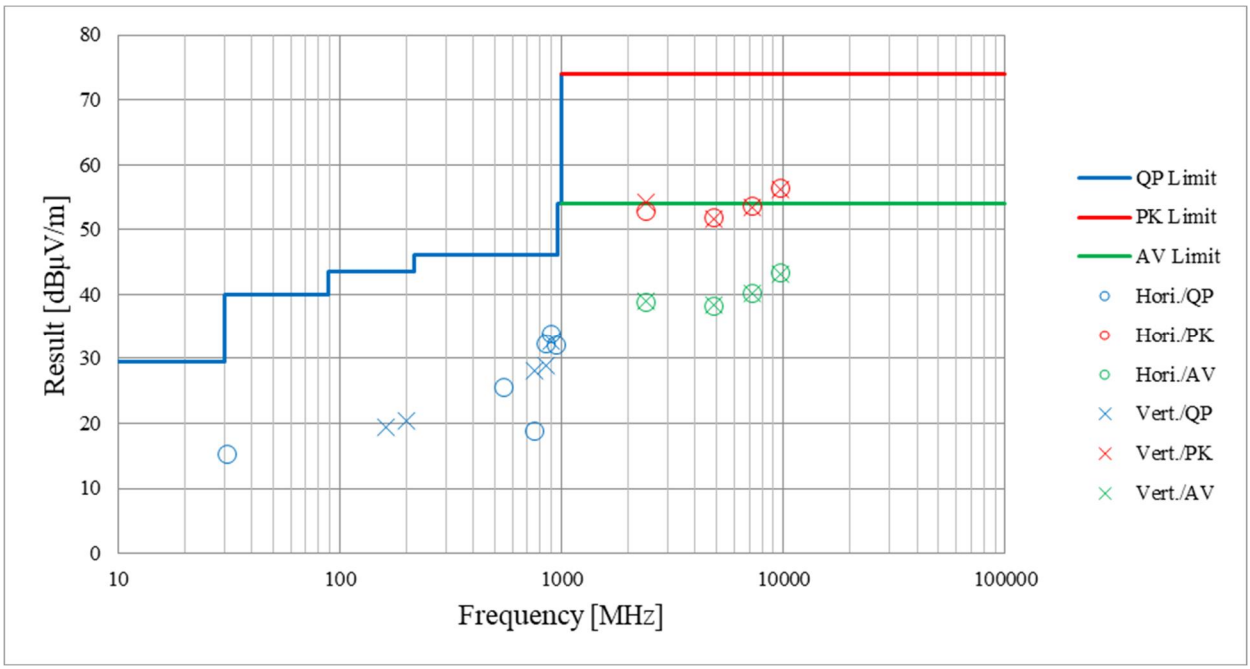


Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case mode for Maximum Peak Output Power)

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	SAC3	SAC3	SAC3	SAC3
Date	November 17, 2023	November 10, 2023	November 14, 2023	November 15, 2023
Temperature / Humidity	22 deg.C, 44 %RH	24 deg.C, 45 %RH	22 deg.C, 35 %RH	22 deg.C, 38 %RH
Engineer	Hiromasa Sato	Makoto Hosaka	Hiromasa Sato	Makoto Hosaka
	(30 MHz to 1 GHz)	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11n-20 (SDM) 2412 MHz			

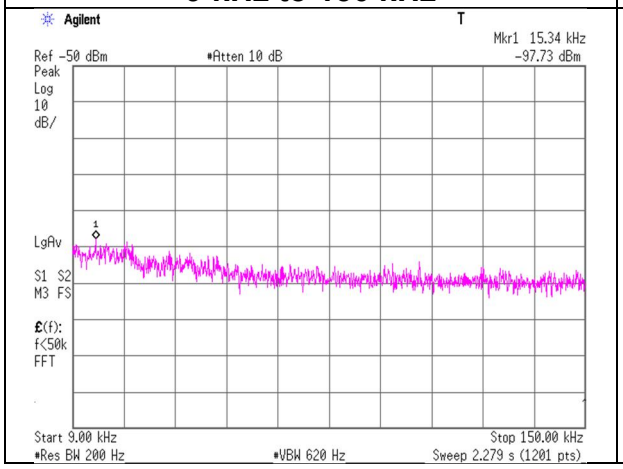


*These plots data contain sufficient number to show the trend of characteristic features for EUT.

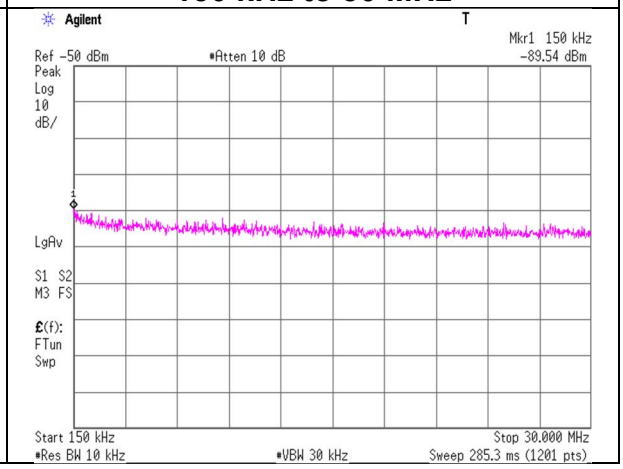
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	November 21, 2023
Temperature / Humidity	25 deg. C / 30 % RH
Engineer	Hiromasa Sato
Mode	Tx 11n-20 (SDM) 2412 MHz Antenna port: 2, MCS 8

9 kHz to 150 kHz



150 kHz to 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
0.01534	-97.73	0.04	9.88	2.0	2	-82.8	300	6.0	-21.5	103.8	125.3	
0.15	-89.54	0.04	9.88	2.0	2	-74.6	300	6.0	-13.4	84.0	97.4	

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

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

N: Number of output

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

Power Density

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	November 15, 2023
Temperature / Humidity	25 deg. C / 36 % RH
Engineer	Kouki Yamada
Mode	Tx

11b Antenna: Ant1

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2412	2412.000	-23.17	3.49	9.94	-9.74	8.00	17.74
2437	2436.276	-24.10	3.50	9.94	-10.66	8.00	18.66
2462	2461.087	-23.57	3.51	9.94	-10.12	8.00	18.12

11g Antenna: Ant2

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2412	2410.741	-26.93	3.49	9.94	-13.50	8.00	21.50
2437	2439.812	-26.27	3.50	9.94	-12.83	8.00	20.83
2462	2460.741	-26.34	3.51	9.94	-12.89	8.00	20.89

11n-20 (SISO) Antenna: Ant2

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2412	2412.267	-27.80	3.49	9.94	-14.37	8.00	22.37
2437	2431.059	-28.42	3.50	9.94	-14.98	8.00	22.98
2462	2455.726	-27.69	3.51	9.94	-14.24	8.00	22.24

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

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

Power Density

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	November 15, 2023
Temperature / Humidity	25 deg. C / 36 % RH
Engineer	Kouki Yamada
Mode	Tx 11n-20 SDM

Antenna 1 + 2

Freq. [MHz]	Antenna 1 Result [mW / 3 kHz]	Antenna 2 Result [mW / 3 kHz]	Result [dBm / 3 kHz]	Result [mW / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2412	0.07	0.04	***-9.41***	***0.11***	8.00	17.41
2437	0.05	0.05	-10.12	0.10	8.00	18.12
2462	0.05	0.05	-9.74	0.11	8.00	17.74

Sample Calculation:
Result = Antenna 1 + 2

Antenna 1

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Result [mW / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2412	-25.00	3.49	9.94	-11.57	0.07	8.00	19.57
2437	-26.58	3.50	9.94	-13.14	0.05	8.00	21.14
2462	-26.28	3.51	9.94	-12.83	0.05	8.00	20.83

Antenna 2

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Result [mW / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2412	-26.90	3.49	9.94	-13.47	0.04	8.00	21.47
2437	-26.57	3.50	9.94	-13.13	0.05	8.00	21.13
2462	-26.12	3.51	9.94	-12.67	0.05	8.00	20.67

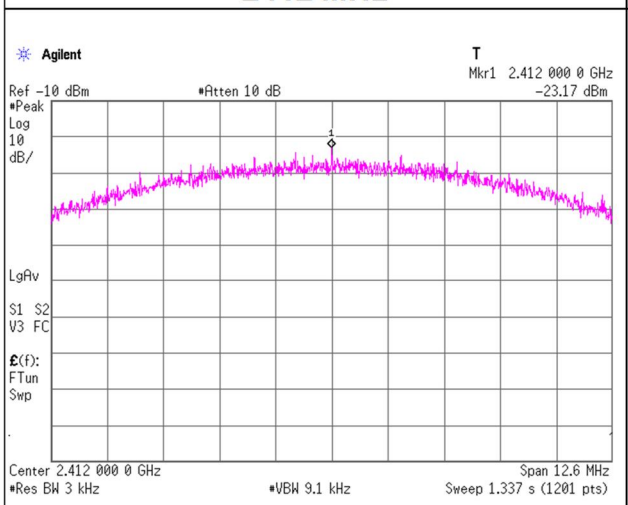
Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

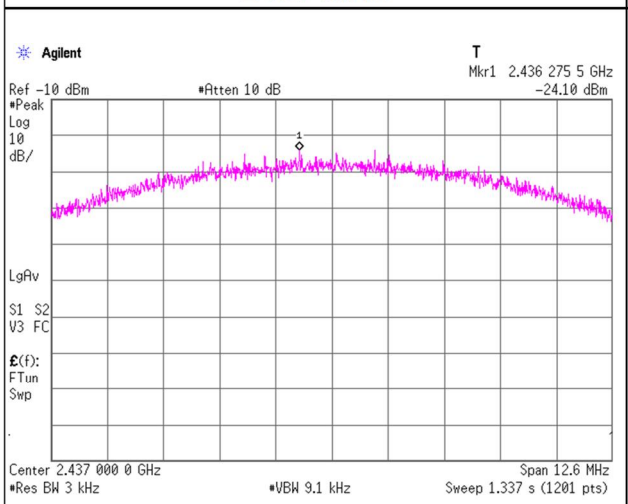
Power Density

11b, 5.5 Mbps Antenna: Ant1

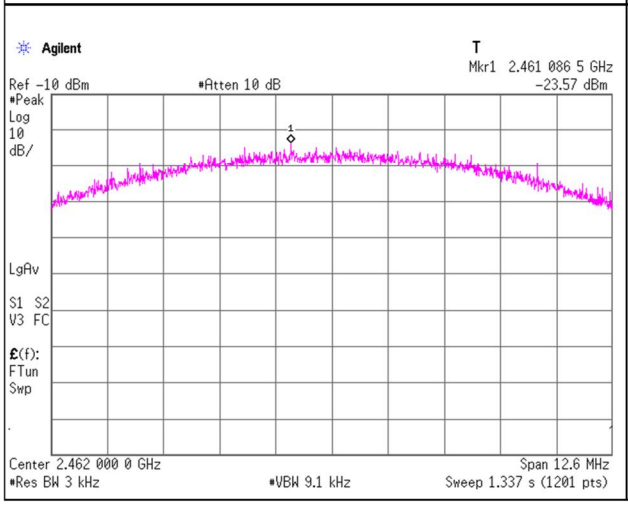
2412 MHz



2437 MHz

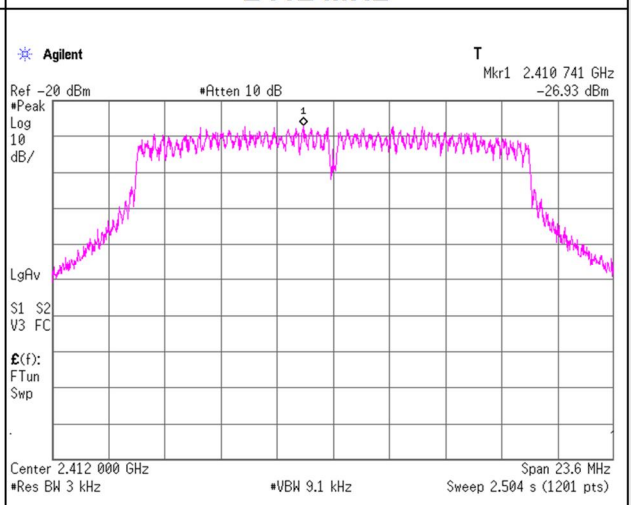


2462 MHz

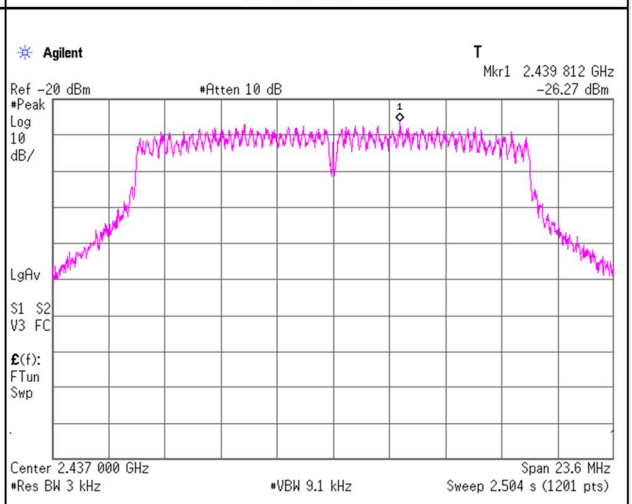


11g, 6 Mbps Antenna: Ant2

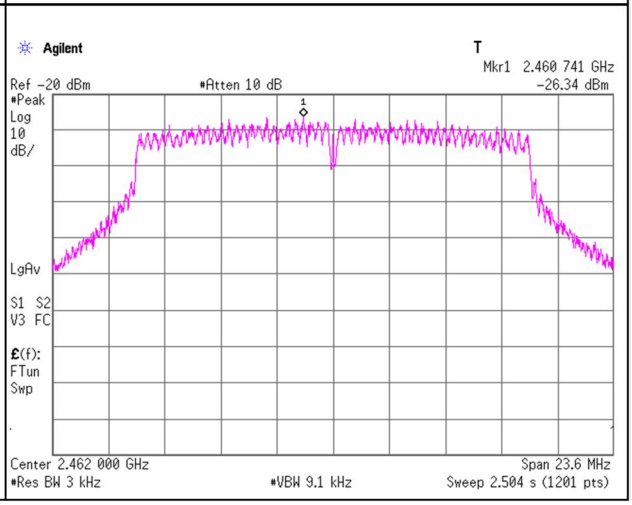
2412 MHz



2437 MHz



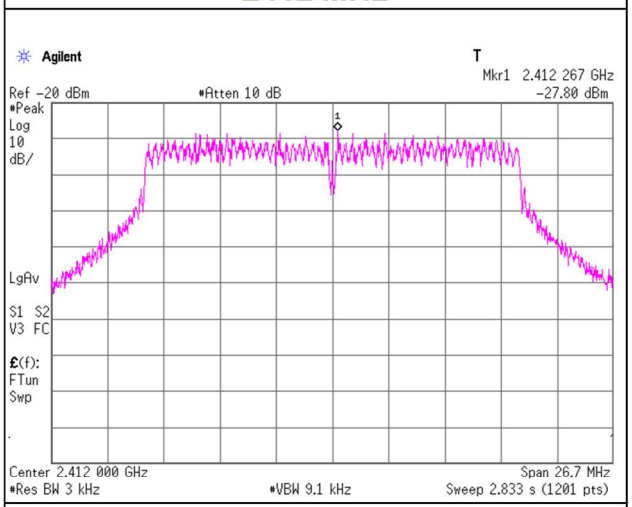
2462 MHz



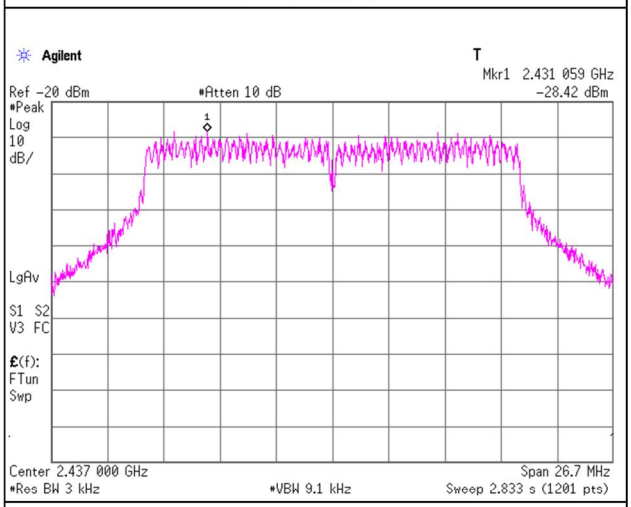
Power Density

11n-20 (SISO), MCS 6 Antenna: Ant2

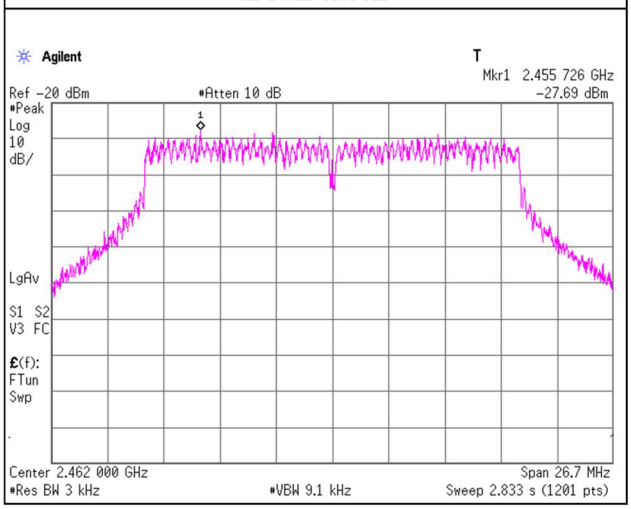
2412 MHz



2437 MHz



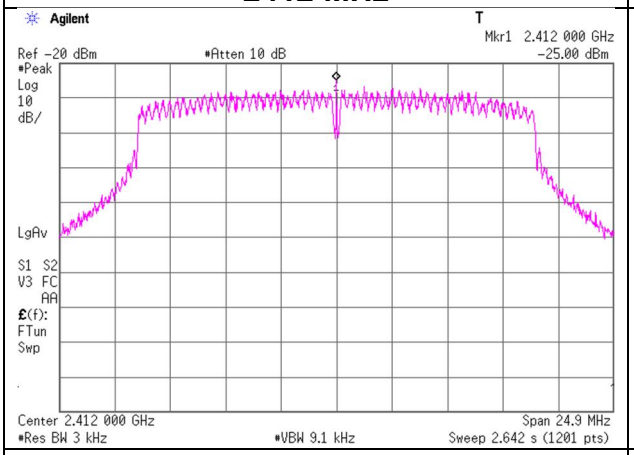
2462 MHz



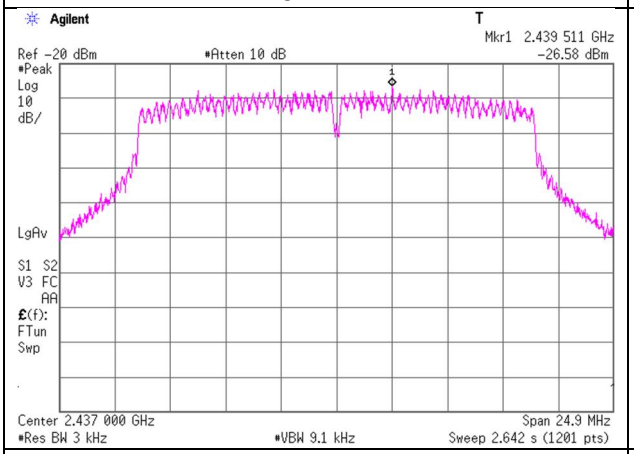
Power Density

11n-20 (SDM) Antenna 1

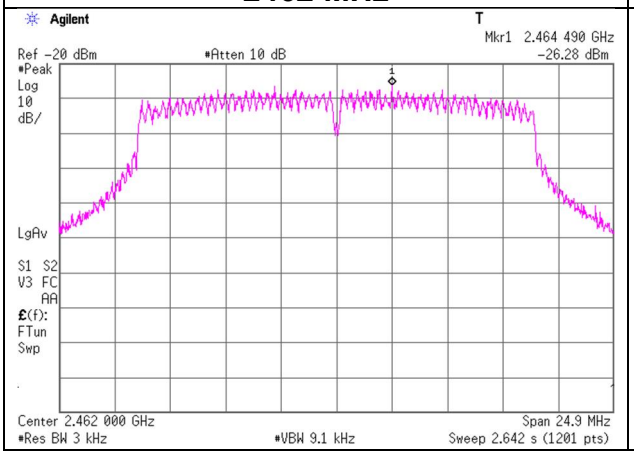
2412 MHz



2437 MHz

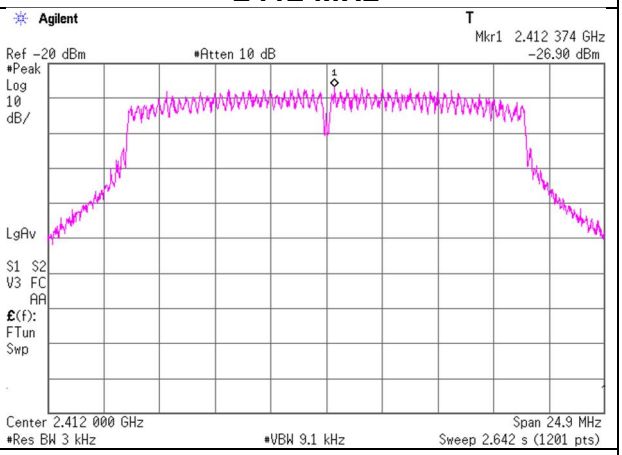


2462 MHz

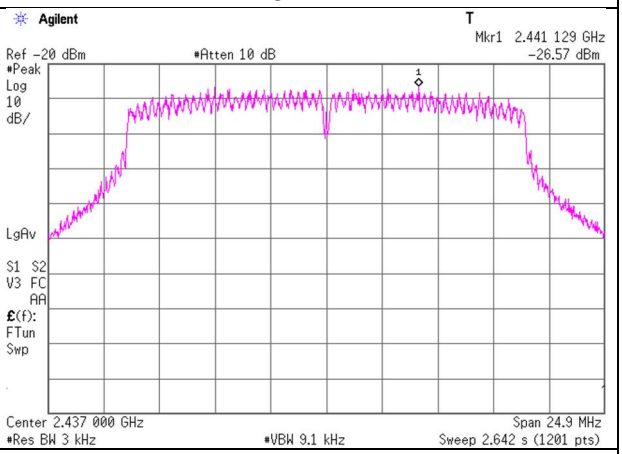


11n-20 (SDM) Antenna 2

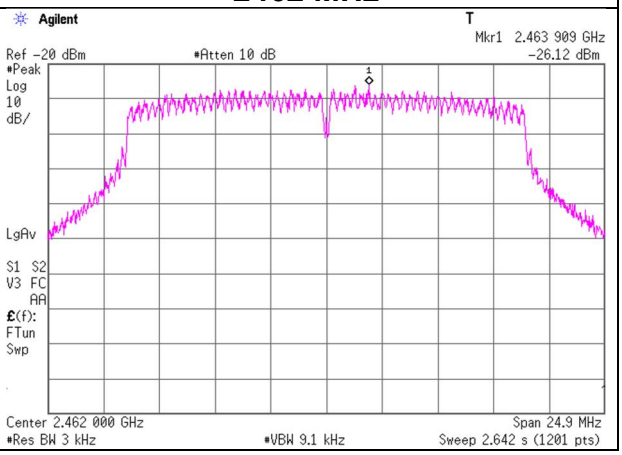
2412 MHz



2437 MHz



2462 MHz



APPENDIX 2: Test Instruments

Test Equipment

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	160899	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46185516	2022/12/09	12 *1)
AT	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2023/09/28	12
AT	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2023/09/28	12
AT	169912	Power sensor	Keysight Technologies Inc	N1923A	MY57290005	2023/09/28	12
AT	175823	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2023/08/01	12
AT	179108	Coaxial Cable	Junkosha	MWX241-03000KMSKMS/B	1901Q033-R	2023/04/05	12
AT	179109	Coaxial Cable	Junkosha	MWX241-03000KMSKMS/B	1901Q034-R	2023/04/05	12
AT	191845	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2023/08/07	12
AT	204923	Terminator	Weinschel - API Technologies Corp	M1459A	110101	2023/02/10	12
AT	204925	Attenuator	Weinschel Corp.	54A-10	109970	2023/02/10	12
AT	204926	Attenuator	Weinschel Corp.	54A-10	109971	2023/02/10	12
AT	235604	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY45300743	2023/05/18	12
RE	144892	Attenuator	Keysight Technologies Inc	8490D 010	6036	2023/10/12	12
RE	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2023/02/02	12
RE	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2023/03/03	12
RE	145023	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032666	2023/05/16	12
RE	145126	Pre Amplifier	SONOMA	310N	290213	2023/02/09	12
RE	145171	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	2023/04/18	12
RE	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2023/08/23	12
RE	145301	Highpass Filter	Micro-Tronics	HPM50111	51	2023/10/13	12
RE	145501	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-739	2023/03/27	12
RE	145512	Horn Antenna	ETS-Lindgren	3160-09	00094868	2023/06/12	12
RE	145529	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	196	2023/05/16	12
RE	145565	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	2023/04/05	12
RE	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2023/05/14	12
RE	146105	Antenna Tilt Jig	Intelligent System Engineering Co., Ltd	Antenna Tilt Jig	T-S003	-	-
RE	146210	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997823	2023/09/25	12
RE	146432	Tape Measure	TAJIMA	GL19-55	-	-	-
RE	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2023/08/25	12
RE	156380	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	SN MY 13406/4E	2023/05/19	12
RE	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	2023/01/12	12
RE	167094	Attenuator	JFW	50HF-006N	-	2023/02/09	12
RE	168300	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	800375/4A	2022/11/10	12
RE	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
RE	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2023/03/03	12
RE	191840	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2023/08/03	12
RE	194685	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	711	2023/03/27	12
RE	200010	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	575618/4	2023/06/06	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:

AT: Antenna Terminal Conducted test
RE: Radiated Emission