RADIO TEST REPORT

Test Report No. : 13722221S-C-R1

Applicant	:	**ALPS ALPINE CO., LTD.**
Type of EUT	:	**Display Audio**
Model Number of EUT	:	**Music Halo**
FCC ID	:	**A269ZUA164**
Test regulation	:	**FCC Part 15 Subpart E: 2021**
Test result	:	**Complied (Refer to SECTION 3)**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
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7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13722221S-C. 13722221S-C is replaced with this report.

Date of test: August 11 to 31, 2021

Representative test engineer: T. Kawakami
Takahiro Kawakami
Engineer

Approved by: K. Noda
Kazuya Noda
Leader

CERTIFICATE 1266.03

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

REVISION HISTORY

Original Test Report No.: 13722221S-C

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13722221S-C	September 24, 2021	-	-
1	13722221S-C-R1	September 29, 2021	P.5	Correction of Size From: 178 x 167.26 x 100 (Width x Length x Height (mm)) To: DISPLAY SIZE: 171 x 17.7 x 96 (Width x Length x Height (mm)) CHASSIS SIZE: 178 x 149.6 x 50 (Width x Length x Height (mm))
			P.6	Correction of Frequency of Operation. - WLAN 2.4GHz (IEEE802.11b/g/n-20) From: 2412 MHz - 2472 MHz To: 2412 MHz - 2462 MHz
			P.6	Correction of Antenna type - Bluetooth - Bluetooth Low Energy - WLAN 2.4 GHz - WLAN 5 GHz From: Internal Chip Antenna To: Multilayer Chip Antenna

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer information

Company Name	:	ALPS ALPINE CO., LTD.
Address	:	20-1 Yoshima-Industrial Park, Iwaki, Fukushima Prefecture 970-1192 Japan
Telephone Number	:	+81-246-36-4111

The information provided from the customer is as follows;
- Applicant, Type of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (EUT) other than the Receipt 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

Type	:	Display Audio
Model Number	:	Music Halo
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 14.4 V
Receipt Date	:	June 21, 2021
Condition	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Size	:	DISPLAY SIZE: 171 x 17.7 x 96 (Width x Length x Height (mm)) CHASSIS SIZE: 178 x 149.6 x 50 (Width x Length x Height (mm))
Modification	:	No Modification by the test lab.

2.2 Product Description

Model: Music Halo (referred to as the EUT in this report) is a Display Audio.

General Specification

Clock frequency(ies) in the system	:	1400 MHz (Max)
Operating Temperature	:	-20 deg. C - +60 deg. C

Radio Specification

Bluetooth

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Antenna type	:	Multilayer Chip Antenna
Modulation	:	FHSS (GFSK, π/4-DQPSK, 8DPSK)
Antenna Gain	:	-3.0 dBi

Bluetooth Low Energy

Equipment Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480MHz
Antenna type	:	Multilayer Chip Antenna
Type of Modulation	:	GFSK
Antenna Gain	:	-3.0 dBi

WLAN 2.4 GHz (IEEE802.11b/g/n-20)

Radio Type	:	Transceiver
Frequency of Operation	:	2412 MHz - 2462 MHz
Antenna type	:	Multilayer Chip Antenna
Modulation	:	DSSS (CCK, DQPSK, DBPSK) OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Gain	:	-0.2 dBi

WLAN 5 GHz (IEEE802.11a/n-20/ac-20)

Radio Type	:	Transceiver
Frequency of Operation	:	5745 MHz - 5825 MHz
Antenna type	:	Multilayer Chip Antenna
Modulation	:	OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Gain	:	-3.7 dBi

GNSS

Radio Type	:	Receiver
Frequency of Operation	:	See table below.
Antenna type	:	External Patch Antenna
Antenna Gain	:	32.5 dBi

Supported GNSS and GNSS signals

GNSS	RNSS Frequency Band / Frequency [MHz]		
	1559 to 1610	1215 to 1300	1164 to 1215
BDS	☐B1l 1561.098	-	-
Galileo	☒E1 1575.42	☐E6 1278.75	☐E5a 1176.45 ☐E5b 1207.14
GLONASS	☒G1 1598.0625 - 1605.375	☐G2 1242.9375 - 1248.625	-
GPS	☒L1 1575.42	☐L2 1227.6	☐L5 1176.45
SBAS	☒L1 1575.42	-	☐L5 1176.45

☒ Supported GNSS signal
☐ Not supported GNSS signal

Broadcast

Frequency of Operation	:	AM :	530 kHz to 1710 kHz (Analog) 530 kHz to 1710 kHz (Digital)
		FM :	87.7 MHz to 107.9 MHz(Analog) 87.9 MHz to 107.9 MHz(Digital)

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart E
FCC Part 15 final revised on May 3, 2021 and effective July 2, 2021

Title : FCC 47 CFR Part 15 Radio Frequency Device Subpart E
Unlicensed National Information Infrastructure Devices
Section 15.407 General technical requirements

* Also the EUT complies with FCC Part 15 Subpart B.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013	**FCC:** 15.407 (b) (6) / 15.207	N/A	N/A	*1)
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
26 dB Emission Bandwidth	**FCC:** KDB Publication Number 789033	**FCC:** 15.407 (a) (1) (2) (3)	See data	N/A	*2)
	ISED: -	**ISED:** -			
Maximum Conducted Output Power	**FCC:** KDB Publication Number 789033	**FCC:** 15.407 (a) (1) (2) (3)		Complied a)	Conducted
	ISED: -	**ISED:** RSS-247 6.2.1.1 6.2.2.1 6.2.3.1 6.2.4.1			
Maximum Power Spectral Density	**FCC:** KDB Publication Number 789033	**FCC :** 15.407 (a) (1) (2) (3)		Complied b)	Conducted
	ISED: -	**ISED:** RSS-247 6.2.1.1 6.2.2.1 6.2.3.1 6.2.4.1			
Spurious Emission Restricted Band Edge	**FCC:** ANSI C63.10-2013 KDB Publication Number 789033	**FCC:** 15.407 (b), 15.205 and 15.209	5.6 dB 712,702 MHz, QP, Hori. Mode: Tx 11a 5825 MHz	Complied# c) / d)	Conducted (< 30 MHz) / Radiated (> 30 MHz) *3)
	ISED: -	**ISED:** RSS-247 6.2.1.2 6.2.2.2 6.2.3.2 6.2.4.2			
6 dB Emission Bandwidth	**FCC:** ANSI C63.10-2013	**FCC:** 15.407 (e)	See data	Complied e)	Conducted
	ISED: -	**ISED:** RSS-247 6.2.4.1			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) The test is not applicable since the EUT does not have AC Mains.
*2) The test is not applicable since the EUT support only U-NII-3 band.
*3) Radiated test was selected over 30 MHz based on FCC 15.407 (b) and KDB 789033 D02 G.3.b).

aa) Refer to APPENDIX 1 (data of Maximum Conducted Output Power)
b) Refer to APPENDIX 1 (data of Maximum Power Spectral Density)
c) Refer to APPENDIX 1 (data of Radiated Spurious Emission)
d) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
e) Refer to APPENDIX 1 (data of 6 dB Bandwidth)

Symbols:
Complied The data of this test item has enough margin, more than the measurement uncertainty.
Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

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

FCC Part 15.31 (e)
The EUT provides stable voltage constantly to the RF Part regardless of input voltage. Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

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

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Band Width	**ISED:** RSS-Gen 6.7	**ISED:** -	N/A	- f)	Conducted
f) Refer to APPENDIX 1 (data of 26 dB Emission Bandwidth and 99 % Occupied Bandwidth)					

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

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

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

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)		
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.56dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	2.7 dB	2.7 dB
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.0 dB
	1 GHz-6 GHz	4.8 dB	4.8 dB	4.8 dB
	6 GHz-18 GHz	5.4 dB	5.4 dB	5.4 dB
	18 GHz-40 GHz	5.3 dB	5.3 dB	5.3 dB
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.7 dB	5.7 dB	5.7 dB
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	1.4 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.6 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.2 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	0.91 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.2 dB
Spurious emission (Conducted) below 1GHz	0.87 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.96 dB
Spurious emission (Conducted) 3 GHz-18 GHz	3.0 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.2 dB
Bandwidth Measurement	0.012 %
Duty cycle and Time Measurement	0.27 %
Temperature_SCH-01	0.87 deg.C.
Humidity_SCH-01	4.3 %
Temperature_SCH-02	2.0 deg.C.
Humidity_SCH-02	6.6 %
Voltage	0.86 %

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, Facsimile: +81 463 50 6401
A2LA Certificate Number: 1266.03
(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 Shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

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

Mode	Remarks*
IEEE 802.11a (11a)	6 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 0, PN9
IEEE 802.11ac 20 MHz BW (11ac-20)	MCS 0, PN9
*The worst condition was determined based on the test result of Maximum Conducted Output Power.	
*Power of the EUT was set by the software as follows; Power settings: 11a: 12 dBm, 11n-20/11ac-20: 11 dBm Software: Dut labtool Version 2.0.0.96 (Date: 2017.5.2, Storage location: Driven by or EUT memory) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

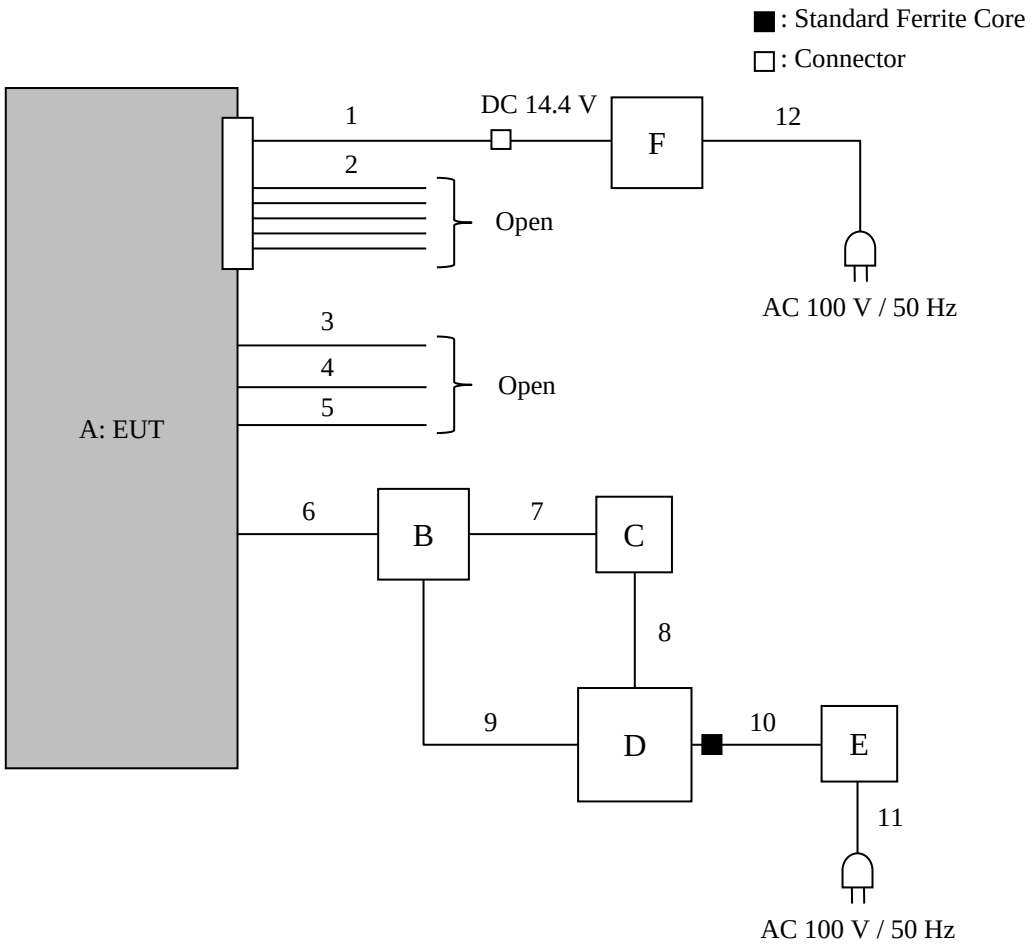
*The details of Operation mode(s)

Test Item	Operating Mode	Tested Frequency			
		Lower Band	Middle Band	Additional Band	Upper Band
99 % Occupied Bandwidth, Maximum Conducted Output Power, Maximum Power Spectral Density	11a Tx 11n-20 Tx 11ac-20 Tx	-	-	-	5745 MHz 5785 MHz 5825 MHz
6 dB Bandwidth	11a Tx 11n-20 Tx 11ac-20 Tx	-	-	-	5745 MHz 5785 MHz 5825 MHz
Radiated Spurious Emission (Below 1 GHz)	11a Tx *1)	-	-	-	5825 MHz
Radiated Spurious Emission (Above 1 GHz)	11a/11n-20/11ac-20 Tx	-	-	-	5745 MHz 5785 MHz 5825 MHz
Conducted Spurious Emission	11a Tx *1)	-	-	-	5825 MHz

*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.

4.2 Configuration and peripherals

<for Antenna terminal Conducted test>



Description of EUT and Support equipment

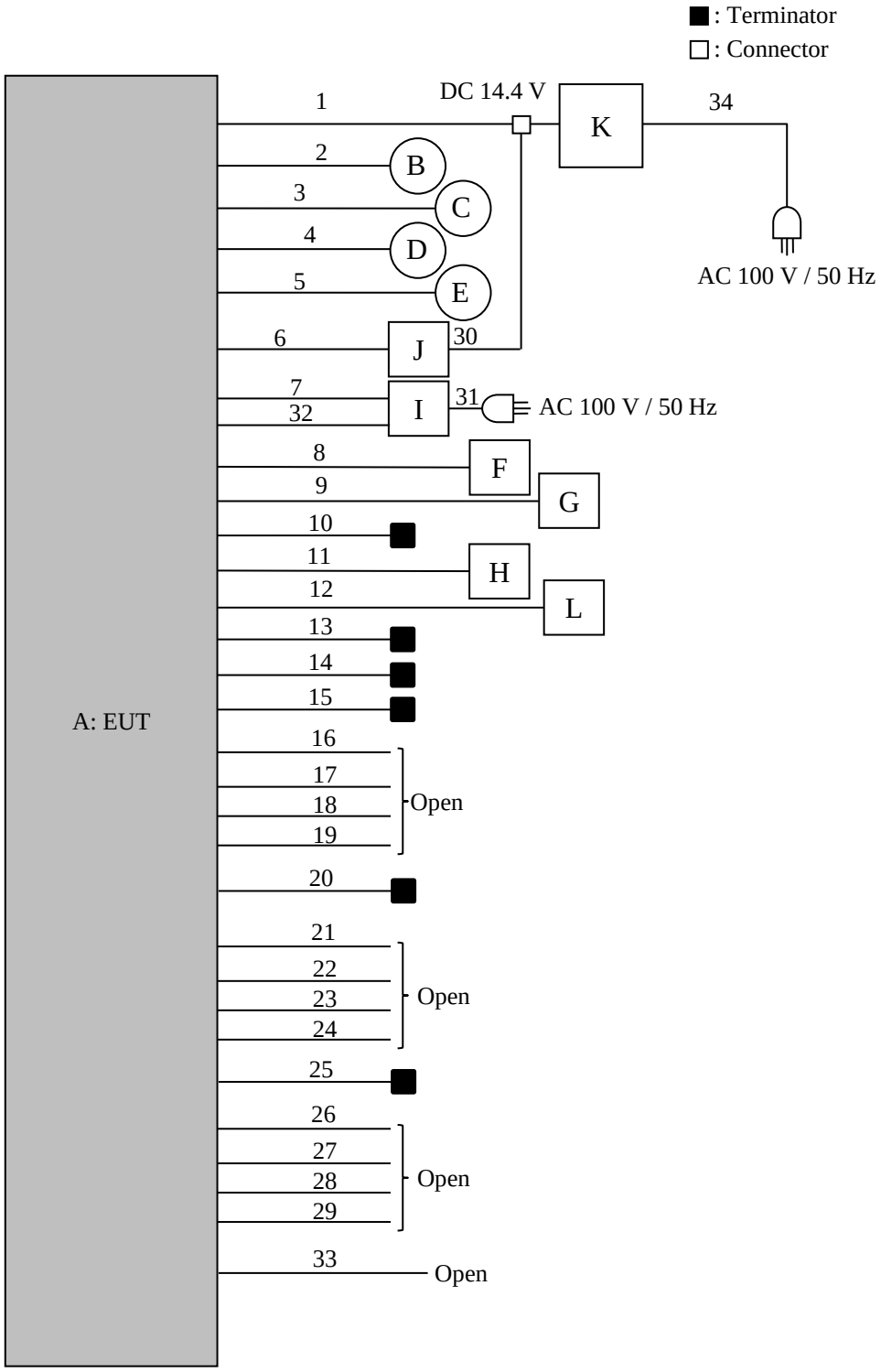
No.	Item	Model number	Serial number	Manufacturer	Remark
A	Display Audio	Music Halo	3	ALPS ALPINE	EUT
B	Debug board	-	-	-	-
C	LAN USB Adapter	EDC-FUA2-B	9BL213400922A	ELECOM	-
D	Laptop Computer	7666-77J	LV-B8R1X 08/05	Lenovo	-
E	AC Adapter	42T4422	11S92P1154Z1DXF1DBFDN	Lenovo	-
F	Power Supply(DC)	PAN35-10A	ML002085	KIKUSUI	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC	0.45 + 1.0	Unshielded	Unshielded	-
2	Signal	0.2	Unshielded	Unshielded	-
3	USB	1.0	Shielded	Shielded	-
4	USB	1.0	Shielded	Shielded	-
5	FM	0.15	Shielded	Shielded	-
6	Signal	0.2	Unshielded	Unshielded	*1)
7	LAN	1.0	Unshielded	Unshielded	-
8	USB	0.15	Shielded	Shielded	-
9	USB	0.8	Shielded	Shielded	-
10	DC	1.8	Unshielded	Unshielded	Laptop Computer
11	AC	0.9	Unshielded	Unshielded	Laptop Computer
12	AC	1.0	Unshielded	Unshielded	-

*1) This cable is for testing and is not included with products.

<for Radiated emission test>



Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Display Audio	Music Halo	2	ALPS ALPINE CO., LTD.	EUT
B	Speaker	KFC-RS160	-	KENWOOD	-
C	Speaker	KFC-RS160	-	KENWOOD	-
D	Speaker	KFC-RS160	-	KENWOOD	-
E	Speaker	KFC-RS160	-	KENWOOD	-
F	USB Memory	USM16GU	-	Sony	-
G	Smart Phone	A1332	87124GKWE00	Apple	-
H	GPS Antenna	YOP-5270AL04	-	YOKOWO	-
I	Blu-ray Player	BDP-120	IHDL019601 JP	Pioneer	-
J	12.8 Inch WXGA Rear Vision	PXH12X-R-B	PXH12XRBR80920 412	ALPS ALPINE CO., LTD.	-
K	Power Supply (DC)	PAN35-10A	NA000955	KIKUSUI	-
L	SiriusXM Tuner	SXV100A	-	Fusion	

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC	2.2	Unshielded	Unshielded	-
2	Speaker (Front R)	2.0 + 1.9	Unshielded	Unshielded	-
3	Speaker (Front L)	2.0 + 1.9	Unshielded	Unshielded	-
4	Speaker (Rear R)	2.0 + 1.9	Unshielded	Unshielded	-
5	Speaker (Rear L)	2.0 + 1.9	Unshielded	Unshielded	-
6	HDMI OUT	4.8	Shielded	Shielded	-
7	HDMI IN	1.8	Shielded	Shielded	-
8	USB	1.0	Shielded	Shielded	-
9	USB	1.0 + 1.0	Shielded	Shielded	-
10	Radio Antenna	0.15 + 1.1	Shielded	Shielded	-
11	GPS Antenna	2.5	Shielded	Shielded	-
12	Sirius	0.6 + 0.2	Shielded	Shielded	-
13	Front out	0.3 + 1.5	Unshielded	Unshielded	-
14	Rear out	0.2 + 1.5	Unshielded	Unshielded	-
15	SUBW	0.15 + 1.5	Unshielded	Unshielded	-
16	HDMI-REM-OUT	2.1	Unshielded	Unshielded	-
17	AUX-REM-OUT	2.1	Unshielded	Unshielded	-
18	STEERING REMOTE	0.1 + 1.0	Unshielded	Unshielded	-
19	AUX-REM-IN	0.2 + 1.5	Unshielded	Unshielded	-
20	AUX 2	3.2	Unshielded	Unshielded	-
21	AMP REMO	2.2	Unshielded	Unshielded	-
22	P.ANT	2.2	Unshielded	Unshielded	-
23	REVERSE	2.2	Unshielded	Unshielded	-
24	SPEED SENSOR	2.0	Unshielded	Unshielded	-
25	MIC IN	0.2+1.5	Unshielded	Unshielded	-
26	LIN	2.0	Unshielded	Unshielded	-
27	REAR CAMERA	2.0	Unshielded	Unshielded	-
28	FRONT CAMERA	2.0	Unshielded	Unshielded	-
29	CONNECT2 I/F	2.0	Unshielded	Unshielded	-
30	DC	0.2 + 5.6	Unshielded	Unshielded	-
31	AC	2	Unshielded	Unshielded	-
32	AUX IN	3	Unshielded	Unshielded	-
33	signal	0.2	Unshielded	Unshielded	*1)
34	AC	2	Unshielded	Unshielded	-

*1) This cable is for testing and is not included with products.

SECTION 5: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

< Below 1GHz >
EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

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

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

< Below 1GHz >
The result also satisfied with the general limits specified in section 15.209 (a).

< Above 1GHz >
Inside of restricted bands (Section 15.205):
Apply to limit in the Section 15.209 (a).

Outside of the restricted bands:
Apply to limit 68.2 dBuV/m, 3 m (-27 dBm e.i.r.p.*) in the Section 15.407 (b) (1) (2) (3).

For U-NII-3 Bandedge
-27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge in the section 15.407(b)(4)(i).

Restricted band edge:
Apply to limit in the Section 15.209 (a).
Since this limit is severer than the limit of the inside of restricted bands.

*Electric field strength to e.i.r.p. conversion:

$$E = \frac{1000000\sqrt{30P}}{3} \text{ (uV/m)}$$

:P is the e.i.r.p. (Watts)

Test Antennas are used as below;

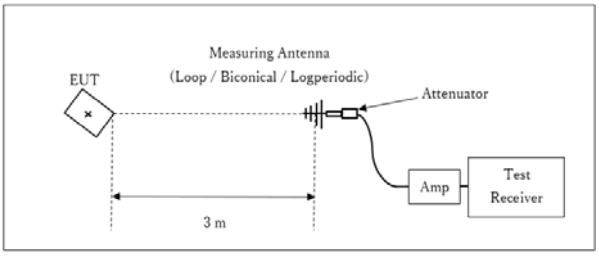
Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

Frequency	Below 1 GHz	Above 1 GHz	
Instrument used	Test Receiver	Spectrum Analyzer	
Detector	QP	Peak	Average
IF Bandwidth	BW: 120 kHz	RBW: 1 MHz VBW: 3 MHz	Method VB *1) RBW: 1 MHz VBW: 1/T MHz (T: Burst length, refer to Burst rate confirmation sheet) Detector: Peak Trace mode: Max hold

*1) The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E".

Figure 2: Test Setup

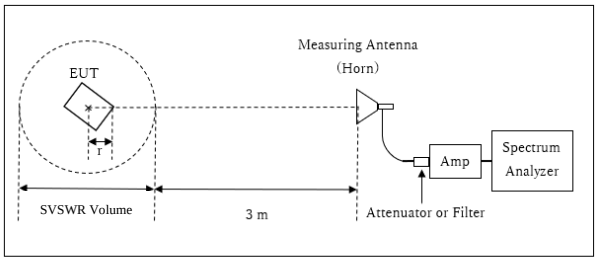
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz

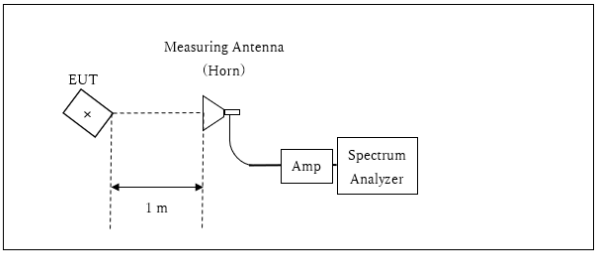


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.88 m / 3.0 m) = 2.24 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.88 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.12 m

10 GHz - 40 GHz



× : Center of turn table

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

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

Antenna polarization	Carrier	Spurious (30 MHz - 1 GHz)	Spurious (1 GHz - 2.8 GHz)	Spurious (2.8 GHz - 10 GHz)	Spurious (10 GHz - 18 GHz)	Spurious (18 GHz - 26.5 GHz)	Spurious (26.5 GHz - 40 GHz)
Horizontal	0 deg.	0 deg.	0 deg.	0 deg.	30 deg.	0 deg.	0 deg.
Vertical	0 deg.	0 deg.	0 deg.	0 deg.	30 deg.	0 deg.	0 deg.

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

Measurement range : 30 MHz - 40 GHz
Test data : APPENDIX
Test result : Pass

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 and Test method
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 % to 5 % of OBW	≥ 3 RBW	Auto	Peak	Max Hold	Spectrum Analyzer
6 dB Bandwidth	Enough to capture the emission	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Conducted Output Power	-	-	-	Auto	Average	-	Power Meter (Sensor: 160 MHz BW) (Method PM)
Maximum Power Spectral Density	Encompass the entire EBW	100 kHz *2)	≥ 3 RBW	Auto	RMS Power Averaging (100 times)	Clear Write	Spectrum Analyzer
Conducted Spurious Emission*3) *4)	9 kHz – 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz – 30 MHz	10 kHz	30 kHz				

* The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E".

*1) Peak hold was applied as Worst-case measurement.
*2) KDB 789033 D02 says that RBW is set to be 500 kHz for 5.725 GHz-5.850 GHz, but it is not possible with spectrum analyzer, so RBW Correction Factor (10 log(500 kHz / 100 kHz)) was added to the test result.
*3) In the frequency range below 30 MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz-150 kHz: RBW = 200 Hz, 150 kHz-30 MHz: RBW = 10 kHz)
*4) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohmes. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to 45.5 – 51.5 = -6.0 dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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

Test data : **APPENDIX**
Test result : **Pass**

APPENDIX 1: Test data

99 % Occupied Bandwidth

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 12, 2021
Temperature / Humidity	25 deg. C / 52 % RH
Engineer	Yosuke Murakami
Mode	Tx

mode	Tested Frequency [MHz]	99 % Occupied Bandwidth [kHz]
11a	5745	16792.6
	5785	16820.5
	5825	16745.4

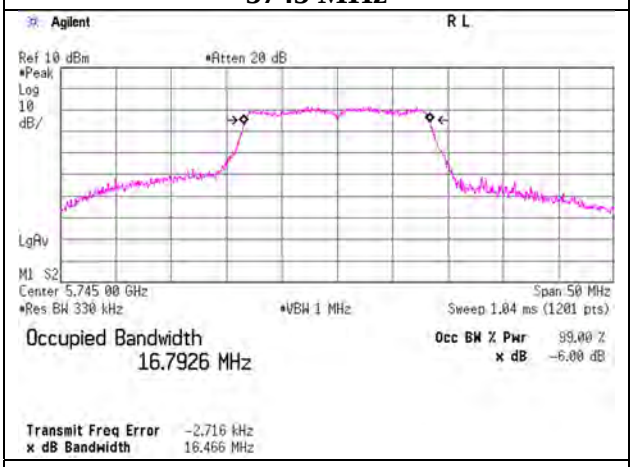
mode	Tested Frequency [MHz]	99 % Occupied Bandwidth [kHz]
11n-20	5745	17683.4
	5785	17672.6
	5825	17692.0

mode	Tested Frequency [MHz]	99 % Occupied Bandwidth [kHz]
11ac-20	5745	17681.2
	5785	17669.9
	5825	17690.9

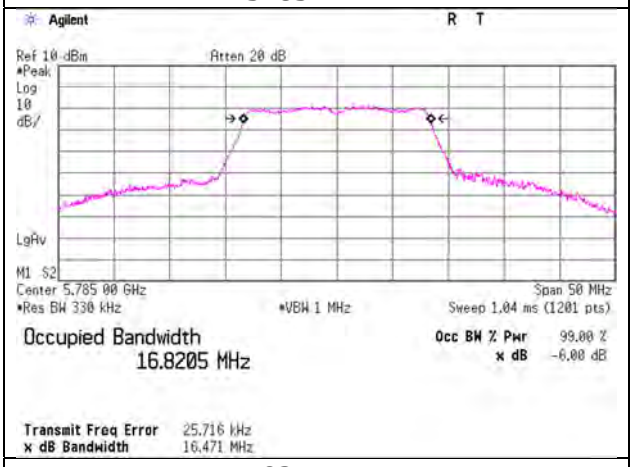
99 % Occupied Bandwidth

11a

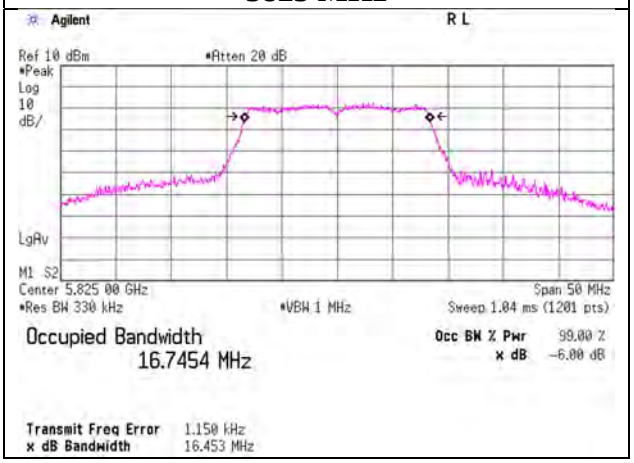
5745 MHz



5785 MHz



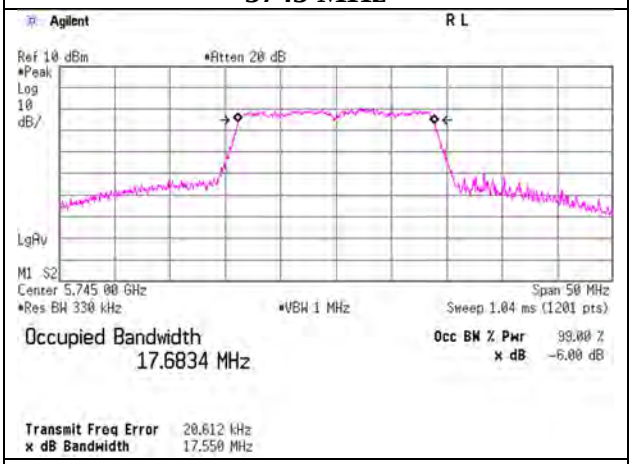
5825 MHz



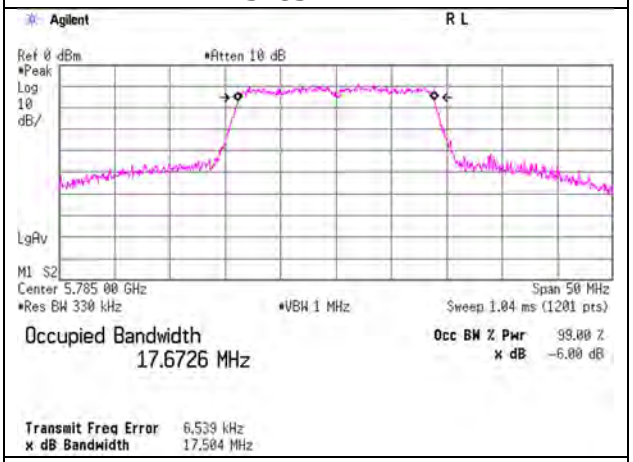
99 % Occupied Bandwidth

11n-20

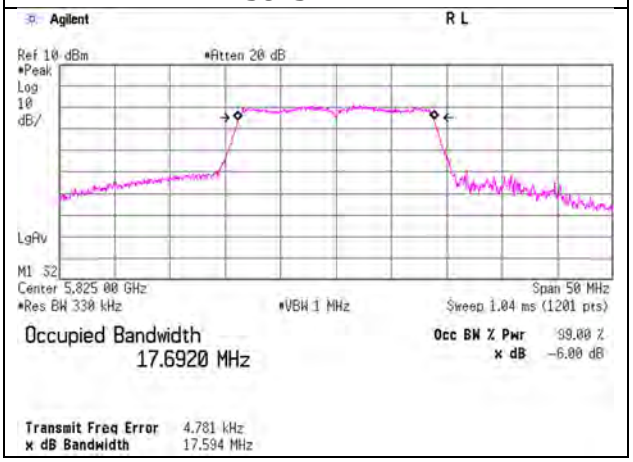
5745 MHz



5785 MHz



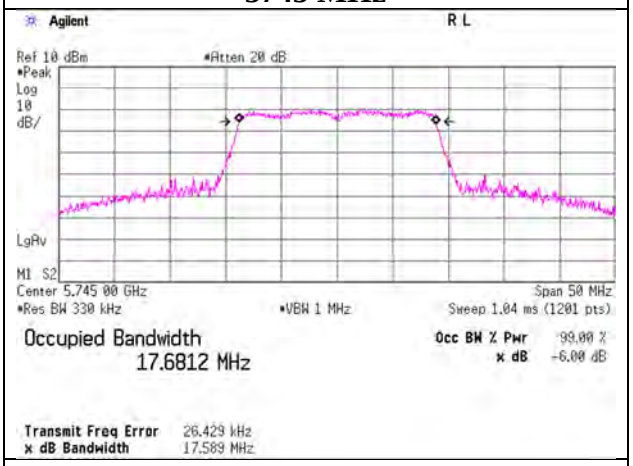
5825 MHz



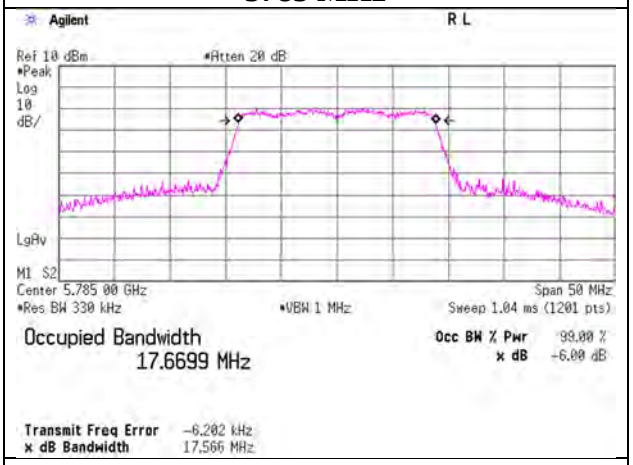
99 % Occupied Bandwidth

11ac-20

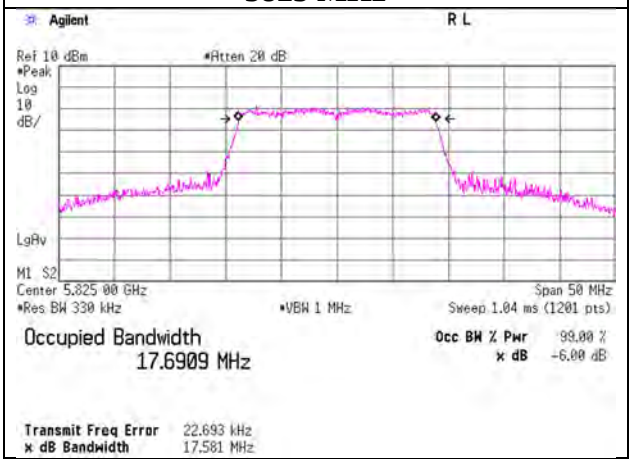
5745 MHz



5785 MHz



5825 MHz



6 dB Bandwidth

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 12, 2021
Temperature / Humidity	25 deg. C / 52 % RH
Engineer	Yosuke Murakami
Mode	Tx

mode	Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
11a	5745	16.372	> 0.500
	5785	16.378	> 0.500
	5825	16.372	> 0.500

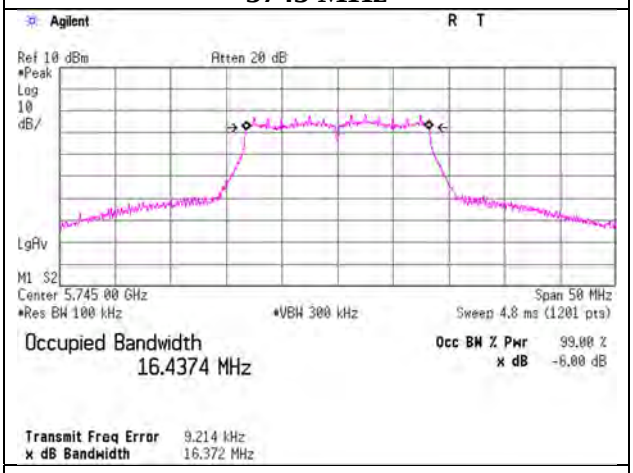
mode	Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
11n-20	5745	17.358	> 0.500
	5785	17.341	> 0.500
	5825	17.348	> 0.500

mode	Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
11ac-20	5745	17.331	> 0.500
	5785	17.350	> 0.500
	5825	17.339	> 0.500

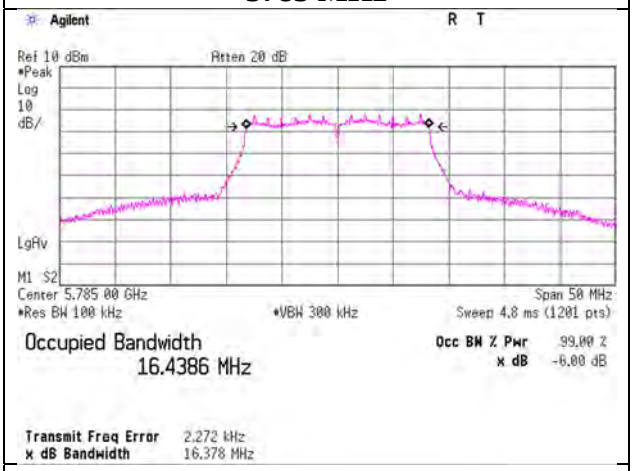
6 dB Bandwidth

11a

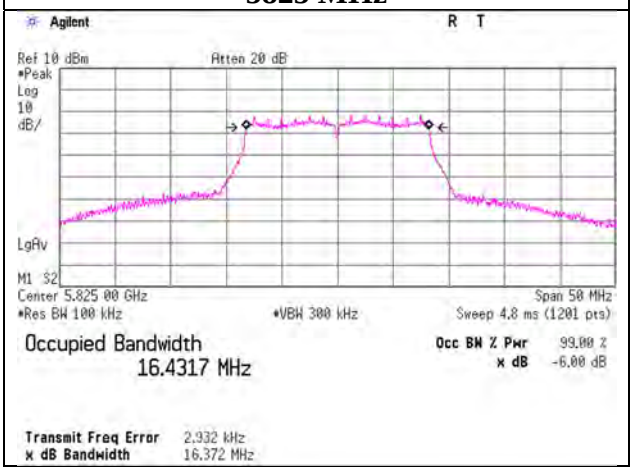
5745 MHz



5785 MHz



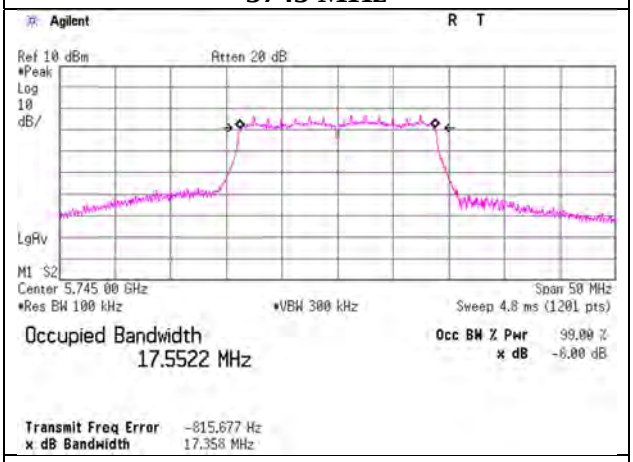
5825 MHz



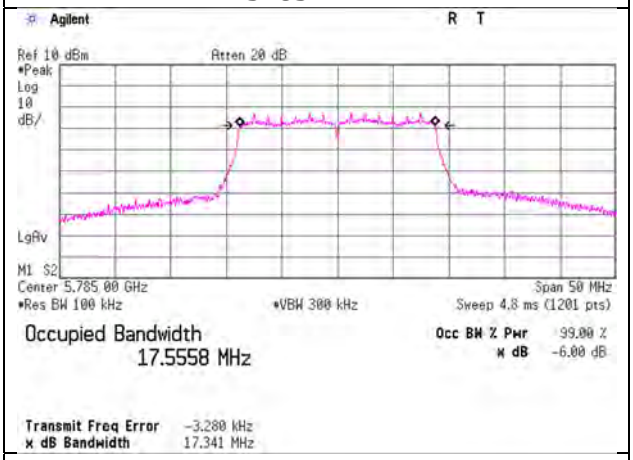
6 dB Bandwidth

11n-20

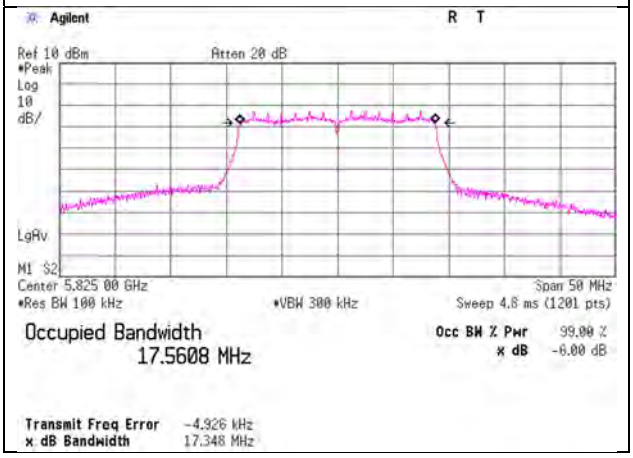
5745 MHz



5785 MHz



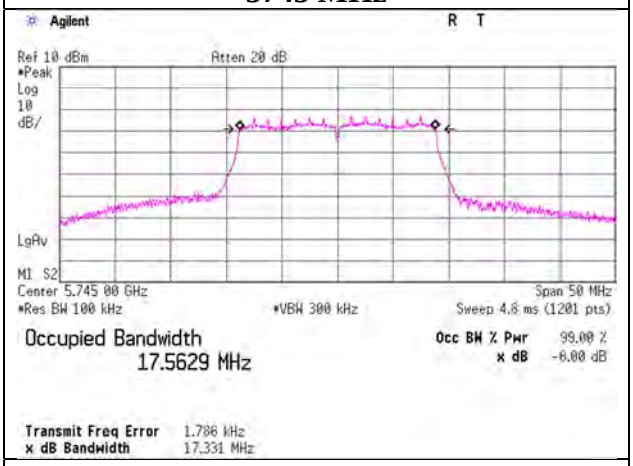
5825 MHz



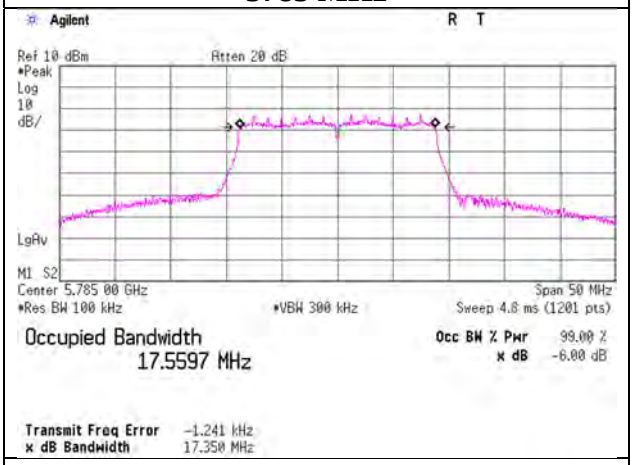
6 dB Bandwidth

11ac-20

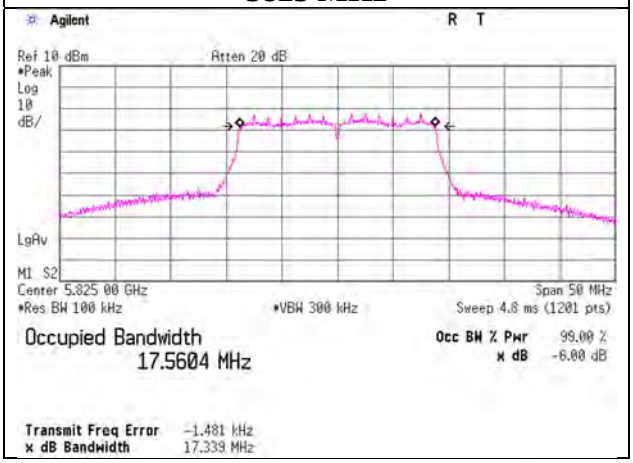
5745 MHz



5785 MHz



5825 MHz



Maximum Conducted Output Power

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 17, 2021
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Yosuke Murakami
Mode	Tx 11a

11a Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	26 dB EBW (B for FCC) [MHz]	99% OBW (B for IC) [MHz]	Conducted Power Result [dBm]	Conducted Power Result [mW]	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	e.i.r.p. Result [dBm]	e.i.r.p. Result [mW]	e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
5745	-1.77	2.71	10.02	0.16	-3.7	-	16.793	11.12	12.94	30.00	18.88	7.42	5.52	36.00	28.58
5785	-1.63	2.71	10.02	0.16	-3.7	-	16.821	11.26	13.37	30.00	18.74	7.56	5.70	36.00	28.44
5825	-1.61	2.71	10.02	0.16	-3.7	-	16.745	11.28	13.43	30.00	18.72	7.58	5.73	36.00	28.42

Sample Calculation:
Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor
e.i.r.p. Result = Conducted Power Result + Antenna Gain
Conducted Power Limit (5725 MHz-5850 MHz) = 1W

Maximum Conducted Output Power

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 17, 2021
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Yosuke Murakami
Mode	Tx 11n-20

11n-20 Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	26 dB EBW (B for FCC) [MHz]	99% OBW (B for IC) [MHz]	Conducted Power Result [dBm]	Conducted Power Result [mW]	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	e.i.r.p. Result [dBm]	e.i.r.p. Result [mW]	e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
5745	-3.04	2.71	10.02	0.18	-3.7	-	17.683	9.87	9.71	30.00	20.13	6.17	4.14	36.00	29.83
5785	-2.57	2.71	10.02	0.18	-3.7	-	17.673	10.34	10.81	30.00	19.66	6.64	4.61	36.00	29.36
5825	-2.27	2.71	10.02	0.18	-3.7	-	17.692	10.64	11.59	30.00	19.36	6.94	4.94	36.00	29.06

Sample Calculation:
Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor
e.i.r.p. Result = Conducted Power Result + Antenna Gain
Conducted Power Limit (5725 MHz-5850 MHz) = 1W

Maximum Conducted Output Power

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 17, 2021
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Yosuke Murakami
Mode	Tx 11ac-20

11ac-20 Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	26 dB EBW (B for FCC) [MHz]	99% OBW (B for IC) [MHz]	Conducted Power Result [dBm]	Conducted Power Result [mW]	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	e.i.r.p. Result [dBm]	e.i.r.p. Result [mW]	e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
5745	-3.20	2.71	10.02	0.17	-3.7	-	17.681	9.70	9.33	30.00	20.30	6.00	3.98	36.00	30.00
5785	-2.76	2.71	10.02	0.17	-3.7	-	17.670	10.14	10.33	30.00	19.86	6.44	4.41	36.00	29.56
5825	-2.70	2.71	10.02	0.17	-3.7	-	17.691	10.20	10.47	30.00	19.80	6.50	4.47	36.00	29.50

Sample Calculation:
Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor
e.i.r.p. Result = Conducted Power Result + Antenna Gain
Conducted Power Limit (5725 MHz-5850 MHz) = 1W

Maximum Conducted Output Power

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 17, 2021
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Yosuke Murakami
Mode	Tx 11a

5745 MHz

Mode	Rate Mbps	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11a	6	-1.77	0.16	-1.61	*
	9	-1.88	0.25	-1.63	-
	12	-2.00	0.33	-1.67	-
	18	-2.11	0.46	-1.65	-
	24	-2.36	0.60	-1.76	-
	36	-2.61	0.86	-1.75	-
	48	-2.80	1.07	-1.73	-
	54	-2.87	1.18	-1.69	-

* Worst rate

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

All comparison were carried out on same frequency and measurement factors.

Maximum Conducted Output Power

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 17, 2021
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Yosuke Murakami
Mode	Tx 11n-20

5745 MHz

Mode	MCS Number	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11n-20	0	-3.04	0.18	-2.86	*
	1	-3.27	0.33	-2.94	-
	2	-3.42	0.47	-2.95	-
	3	-3.59	0.62	-2.97	-
	4	-3.80	0.85	-2.95	-
	5	-4.02	1.07	-2.95	-
	6	-4.14	1.15	-2.99	-
	7	-4.22	1.24	-2.98	-

* Worst rate

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

All comparison were carried out on same frequency and measurement factors.

Maximum Conducted Output Power

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 17, 2021
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Yosuke Murakami
Mode	Tx 11ac-20

5745 MHz

Mode	MCS Number	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11ac-20	0	-3.20	0.17	-3.03	*
	1	-3.41	0.33	-3.08	-
	2	-3.54	0.48	-3.06	-
	3	-3.66	0.62	-3.04	-
	4	-3.89	0.85	-3.04	-
	5	-4.12	1.05	-3.07	-
	6	-4.18	1.13	-3.05	-
	7	-4.27	1.23	-3.04	-
	8	-4.51	1.36	-3.15	-

* Worst rate

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

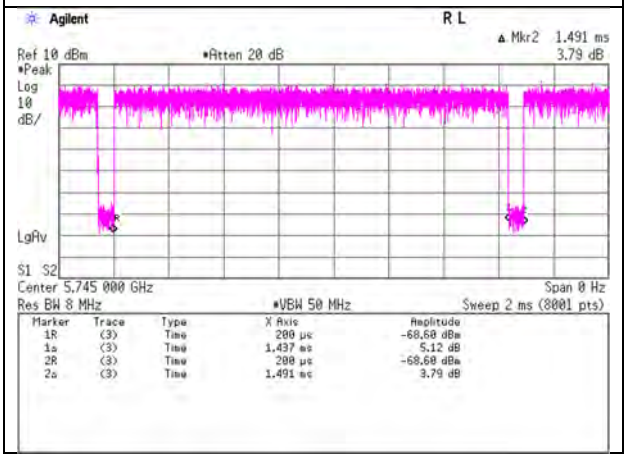
All comparison were carried out on same frequency and measurement factors.

Burst rate confirmation

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 11, 2021
Temperature / Humidity	23 deg. C / 59 % RH
Engineer	Takahiro Kawakami
Mode	Tx

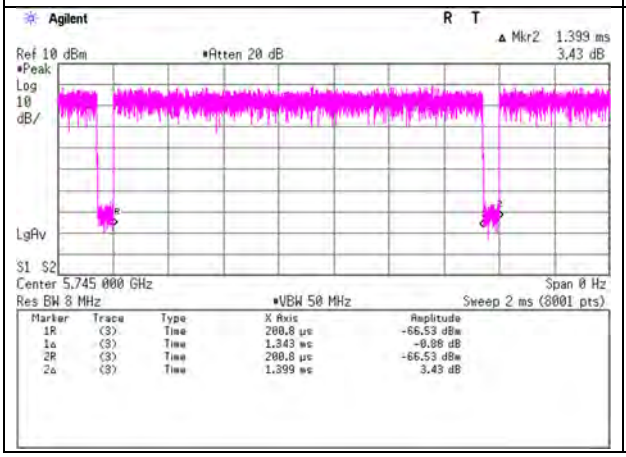
11a 6 Mbps

Tx on / (Tx on + Tx off) =	**0.964**
Tx on / (Tx on + Tx off) * 100 =	**96.4 %**
Duty factor = 10 * log (1.491 / 1.437) =	**0.16 dB**
VBW : 1 / On time = 696 Hz < 750 Hz	



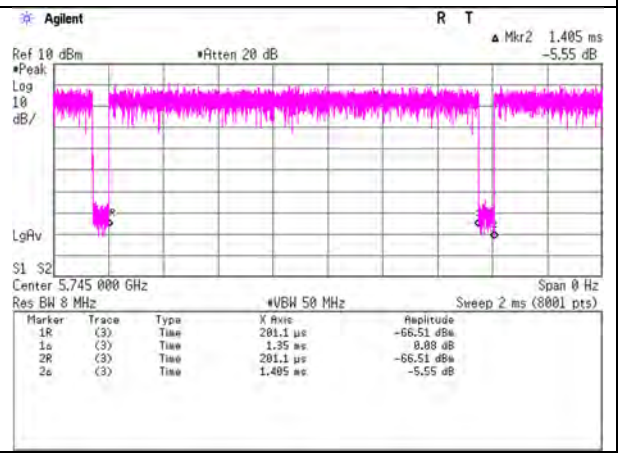
11n-20 MCS 0

Tx on / (Tx on + Tx off) =	**0.960**
Tx on / (Tx on + Tx off) * 100 =	**96.0 %**
Duty factor = 10 * log (1.399 / 1.343) =	**0.18 dB**
VBW : 1 / On time = 745 Hz < 750 Hz	



11ac-20 MCS 0

Tx on / (Tx on + Tx off) =	**0.961**
Tx on / (Tx on + Tx off) * 100 =	**96.1 %**
Duty factor = 10 * log (1.405 / 1.35) =	**0.17 dB**
VBW : 1 / On time = 741 Hz < 750 Hz	



Maximum Power Spectral Density

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 17, 2021
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Yosuke Murakami
Mode	Tx 11a

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	PSD Reading [dBm /MHz]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	RBW Correction Factor [dB]	PSD (Conducted) Result [dBm /MHz]	PSD (Conducted) Limit [dBm /MHz]	PSD (Conducted) Margin [dB]	PSD (e.i.r.p.) Result [dBm /MHz]	PSD (e.i.r.p.) Limit [dBm /MHz]	PSD (e.i.r.p.) Margin [dB]
5745	-21.12	2.71	10.02	0.16	-3.7	6.99	-1.24	30.00	31.24	-4.94	36.00	40.94
5785	-20.77	2.71	10.02	0.16	-3.7	6.99	-0.89	30.00	30.89	-4.59	36.00	40.59
5825	-20.75	2.71	10.02	0.16	-3.7	6.99	-0.87	30.00	30.87	-4.57	36.00	40.57

Sample Calculation:
PSD: Power Spectral Density
The PSD within 5725 MHz to 5825 MHz are based on any 500 kHz band.
RBW Correction Factor = 10 * log (Specified bandwidth / Measured bandwidth)
PSD Result (Conducted) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor + RBW Correction Factor
PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain
The conducted PSD limit was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. (All frequencies for FCC, 5725 MHz-5850 MHz for ISED)

Maximum Power Spectral Density

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 17, 2021
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Yosuke Murakami
Mode	Tx 11n-20

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	PSD Reading [dBm /MHz]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	RBW Correction Factor [dB]	PSD (Conducted) Result [dBm /MHz]	PSD (Conducted) Limit [dBm /MHz]	PSD (Conducted) Margin [dB]	PSD (e.i.r.p.) Result [dBm /MHz]	PSD (e.i.r.p.) Limit [dBm /MHz]	PSD (e.i.r.p.) Margin [dB]
5745	-22.31	2.71	10.02	0.18	-3.7	6.99	-2.41	30.00	32.41	-6.11	36.00	42.11
5785	-21.83	2.71	10.02	0.18	-3.7	6.99	-1.93	30.00	31.93	-5.63	36.00	41.63
5825	-21.62	2.71	10.02	0.18	-3.7	6.99	-1.72	30.00	31.72	-5.42	36.00	41.42

Sample Calculation:
PSD: Power Spectral Density
The PSD within 5725 MHz to 5825 MHz are based on any 500 kHz band.
RBW Correction Factor = 10 * log (Specified bandwidth / Measured bandwidth)
PSD Result (Conducted) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor + RBW Correction Factor
PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain
The conducted PSD limit was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. (All frequencies for FCC, 5725 MHz-5850 MHz for ISED)

Maximum Power Spectral Density

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 17, 2021
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Yosuke Murakami
Mode	Tx 11ac-20

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	PSD Reading [dBm /MHz]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	RBW Correction Factor [dB]	PSD (Conducted) Result [dBm /MHz]	PSD (Conducted) Limit [dBm /MHz]	PSD (Conducted) Margin [dB]	PSD (e.i.r.p.) Result [dBm /MHz]	PSD (e.i.r.p.) Limit [dBm /MHz]	PSD (e.i.r.p.) Margin [dB]
5745	-22.06	2.71	10.02	0.17	-3.7	6.99	-2.17	30.00	32.17	-5.87	36.00	41.87
5785	-21.46	2.71	10.02	0.17	-3.7	6.99	-1.57	30.00	31.57	-5.27	36.00	41.27
5825	-21.74	2.71	10.02	0.17	-3.7	6.99	-1.85	30.00	31.85	-5.55	36.00	41.55

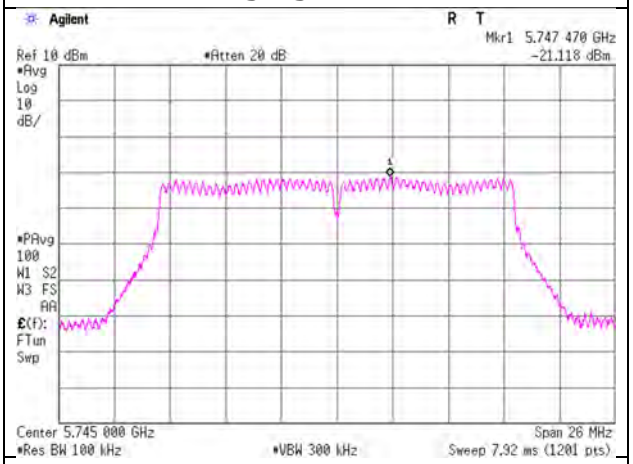
Sample Calculation:
PSD: Power Spectral Density
The PSD within 5725 MHz to 5825 MHz are based on any 500 kHz band.
RBW Correction Factor = 10 * log (Specified bandwidth / Measured bandwidth)
PSD Result (Conducted) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor + RBW Correction Factor
PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain
The conducted PSD limit was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. (All frequencies for FCC, 5725 MHz-5850 MHz for ISED)

Maximum Power Spectral Density

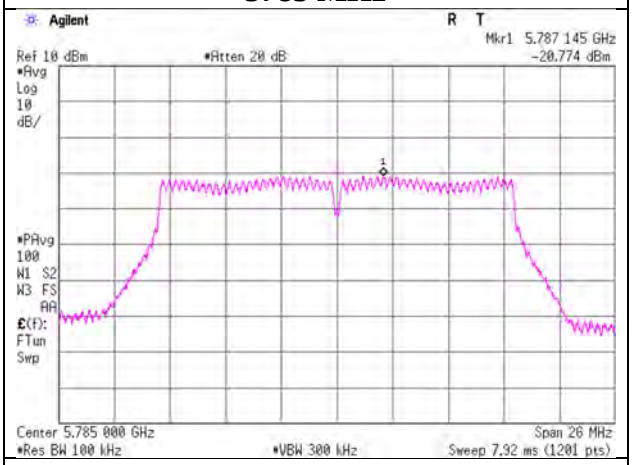
Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 17, 2021
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Yosuke Murakami
Mode	Tx 11a

11a

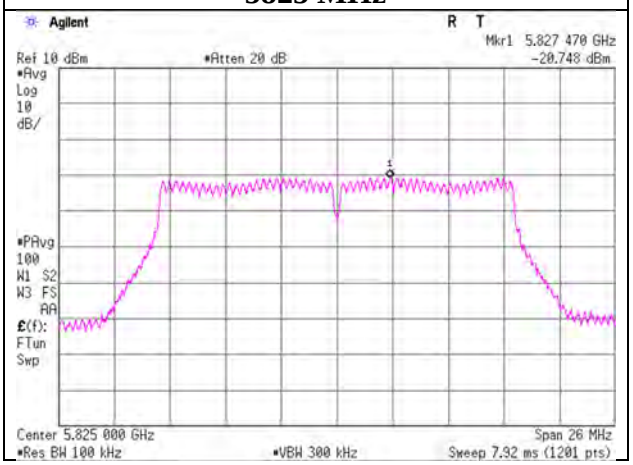
5745 MHz



5785 MHz



5825 MHz

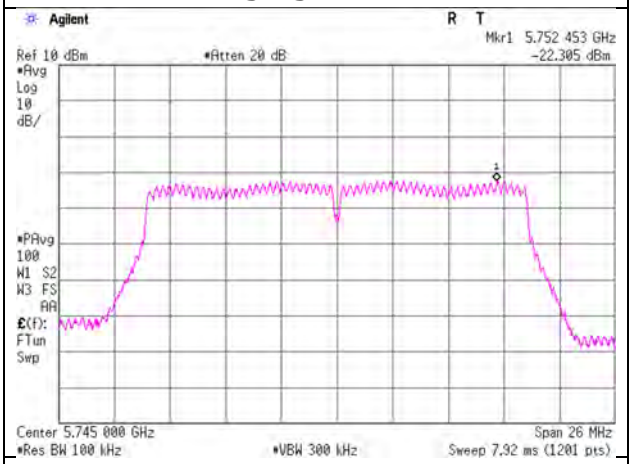


Maximum Power Spectral Density

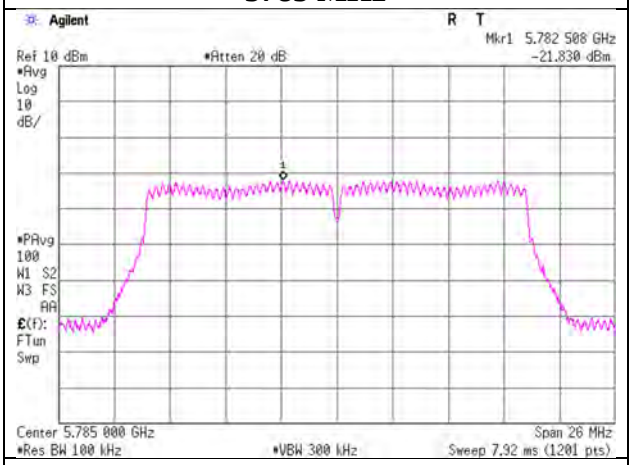
Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 17, 2021
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Yosuke Murakami
Mode	Tx 11n-20

11n-20

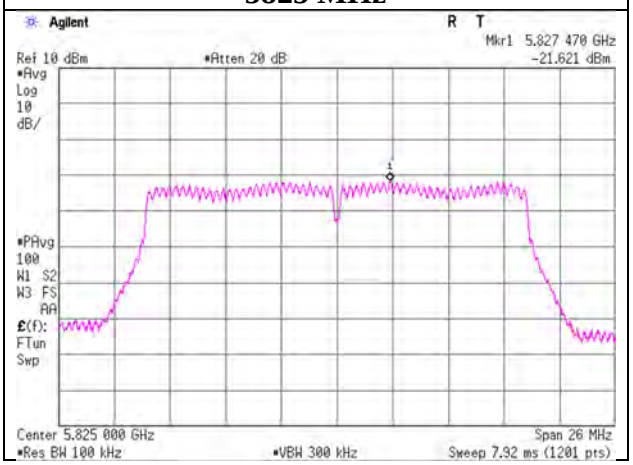
5745 MHz



5785 MHz



5825 MHz

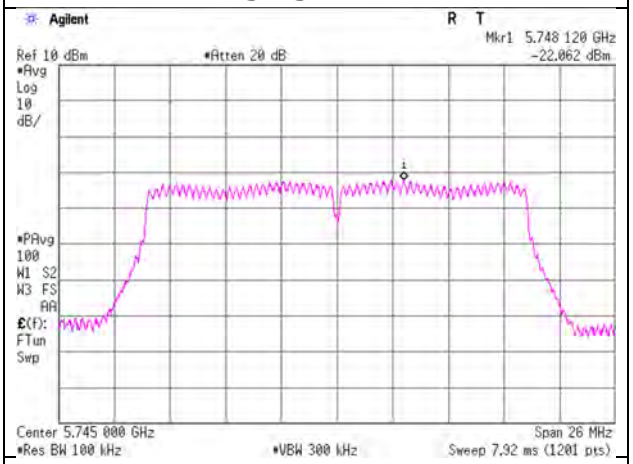


Maximum Power Spectral Density

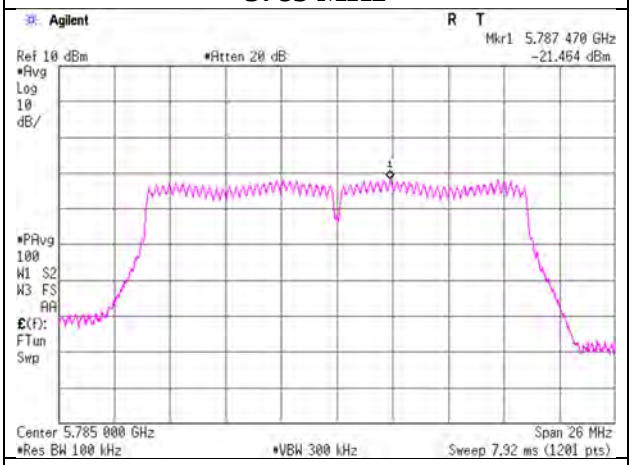
Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 17, 2021
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Yosuke Murakami
Mode	Tx 11ac-20

11ac-20

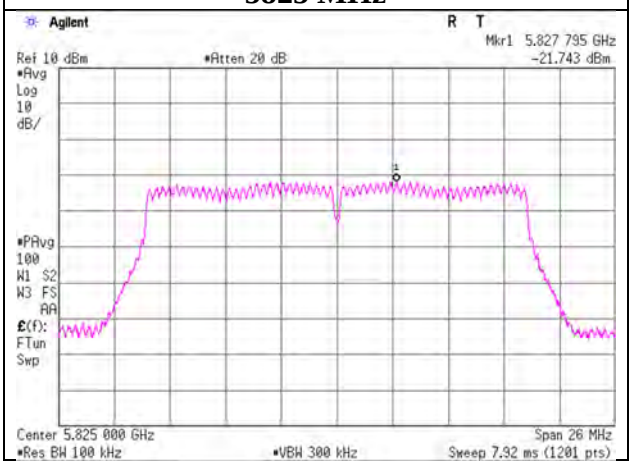
5745 MHz



5785 MHz



5825 MHz



Radiated Spurious Emission

Report No.	13722221S-C-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	1
Date	August 25, 2021	August 31, 2021	August 31, 2021
Temperature / Humidity	22 deg.C, 45 %RH	23 deg.C, 62 %RH	24 deg.C, 56 %RH
Engineer	Akihiro Oda	Takahiro Kawakami	Yusuke Tanikawara
	(1 GHz -6.4 GHz)	(6.4 GHz -26.5 GHz)	(26.5 GHz -40 GHz)
Mode	Tx 11a 5745 MHz		

(above 1 GHz Inside of the restricted band)

(* 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.	11490.000	PK	49.72	37.91	9.79	42.57	-9.54	45.31	73.9	28.5	154	205	-
Hori.	11490.000	AV	38.80	37.91	9.79	42.57	-9.54	34.39	53.9	19.5	154	205	VBW:750 Hz
Vert.	11490.000	PK	49.70	37.91	9.79	42.57	-9.54	45.29	73.9	28.6	145	213	-
Vert.	11490.000	AV	39.37	37.91	9.79	42.57	-9.54	34.96	53.9	18.9	145	213	VBW:750 Hz

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

(Calculation) (above 1 GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	5650.000	PK	48.40	32.74	16.87	43.42	2.24	56.83	-38.40	-27.0	11.4	154	54	-
Hori.	5700.000	PK	48.57	32.87	16.89	43.42	2.24	57.15	-38.08	10.0	48.0	154	54	-
Hori.	5720.000	PK	49.68	32.93	16.90	43.42	2.24	58.33	-36.90	15.6	52.5	154	54	-
Hori.	5725.000	PK	49.90	32.95	16.90	43.42	2.24	58.57	-36.66	27.0	63.6	154	54	-
Hori.	17235.000	PK	46.07	40.03	12.51	40.32	-9.54	48.75	-46.48	-27.0	19.4	100	0	-
Vert.	5650.000	PK	48.60	32.74	16.87	43.42	2.24	57.03	-38.20	-27.0	**11.2**	210	188	-
Vert.	5700.000	PK	48.50	32.87	16.89	43.42	2.24	57.08	-38.15	10.0	48.1	210	188	-
Vert.	5720.000	PK	49.43	32.93	16.90	43.42	2.24	58.08	-37.15	15.6	52.7	210	188	-
Vert.	5725.000	PK	50.69	32.95	16.90	43.42	2.24	59.36	-35.87	27.0	62.8	210	188	-
Vert.	17235.000	PK	45.91	40.03	12.51	40.32	-9.54	48.59	-46.64	-27.0	19.6	100	0	-

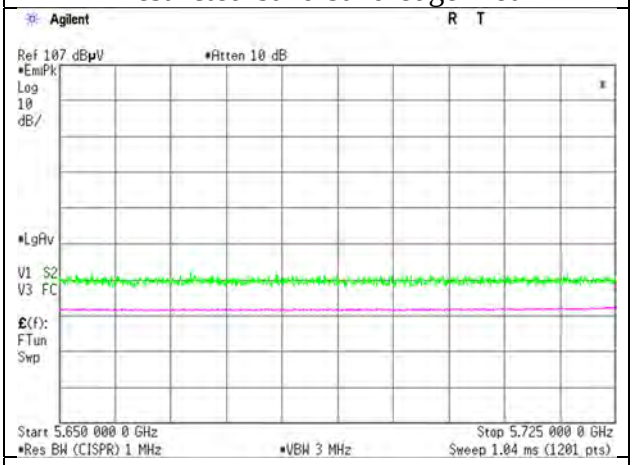
Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Result (EIRP [dBm]) = 10 * LOG ((10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance : 3 [m]) ^ 2 / 30 * 10 ^ 3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	August 25, 2021
Temperature / Humidity	22 deg.C, 45 %RH
Engineer	Akihiro Oda
Mode	Tx 11a 5745 MHz

Horizontal

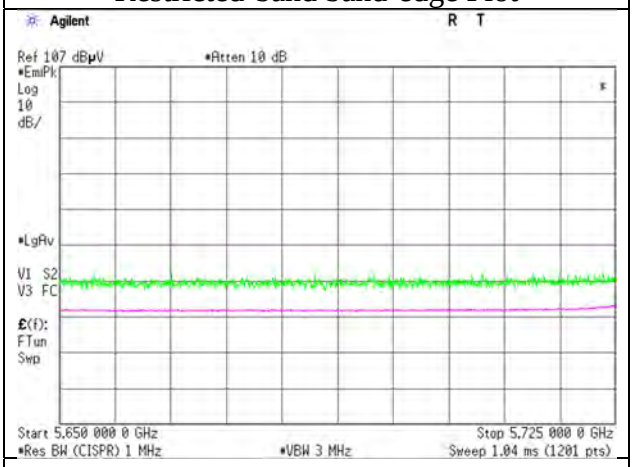
Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

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

Radiated Spurious Emission

Report No.	13722221S-C-R1		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	1
Date	August 25, 2021	August 31, 2021	August 31, 2021
Temperature / Humidity	22 deg.C, 45 %RH	23 deg.C, 62 %RH	24 deg.C, 56 %RH
Engineer	Akihiro Oda	Takahiro Kawakami	Yusuke Tanikawara
	(1 GHz -6.4 GHz)	(6.4 GHz -26.5 GHz)	(26.5 GHz -40 GHz)
Mode	Tx 11a 5785 MHz		

(above 1 GHz Inside of the restricted band)

(* 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.	11570.000	PK	48.93	37.98	9.84	42.56	-9.54	44.65	73.9	29.2	148	233	-
Hori.	11570.000	AV	38.16	37.98	9.84	42.56	-9.54	33.88	53.9	20.0	148	233	VBW:750 Hz
Vert.	11570.000	PK	50.01	37.98	9.84	42.56	-9.54	45.73	73.9	28.1	144	214	-
Vert.	11570.000	AV	39.68	37.98	9.84	42.56	-9.54	35.40	53.9	18.5	144	214	VBW:750 Hz

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

(Calculation) (above 1 GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	17355.000	PK	47.07	40.19	12.55	40.31	-9.54	49.96	-45.27	-27.0	**18.2**	150	0	-
Vert.	17355.000	PK	46.44	40.19	12.55	40.31	-9.54	49.33	-45.90	-27.0	18.9	150	0	-

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Result (EIRP [dBm]) = 10 * LOG ((10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance : 3 [m]) ^ 2 / 30 * 10 ^ 3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13722221S-C-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	3	3	1
Date	August 23, 2021	August 25, 2021	August 31, 2021	August 31, 2021
Temperature / Humidity	24 deg.C, 56 %RH	22 deg.C, 45 %RH	23 deg.C, 62 %RH	24 deg.C, 56 %RH
Engineer	Yosuke Murakami	Akihiro Oda	Takahiro Kawakami	Yusuke Tanikawara
	(30 MHz -1 GHz)	(1 GHz -6.4 GHz)	(6.4 GHz -26.5 GHz)	(26.5 GHz -40 GHz)
Mode	Tx 11a 5825 MHz			

(below 1 GHz and above 1 GHz Inside of the restricted band)

(* 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.	171.649	QP	40.50	15.72	8.77	31.80	0.00	33.19	43.5	10.3	201	1	-
Hori.	222.752	QP	50.80	11.33	5.87	31.75	0.00	36.25	46.0	9.7	148	209	-
Hori.	400.000	QP	48.30	15.93	7.10	31.64	0.00	39.69	46.0	6.3	100	139	-
Hori.	445.497	QP	46.40	16.64	7.42	31.63	0.00	38.83	46.0	7.1	100	193	-
Hori.	688.126	QP	38.50	19.75	8.68	31.55	0.00	35.38	46.0	10.6	100	98	-
Hori.	712.702	QP	43.00	20.07	8.80	31.51	0.00	40.36	46.0	**5.6**	100	101	-
Hori.	737.277	QP	36.80	20.23	8.93	31.49	0.00	34.47	46.0	11.5	100	17	-
Hori.	844.349	QP	36.80	21.46	9.44	31.15	0.00	36.55	46.0	9.4	145	0	-
Hori.	11650.000	PK	48.78	37.98	9.89	42.57	-9.54	44.54	73.9	29.3	147	165	-
Hori.	11650.000	AV	38.10	37.98	9.89	42.57	-9.54	33.86	53.9	20.0	147	165	VBW:750 Hz
Vert.	184.897	QP	36.00	16.21	8.77	31.79	0.00	29.19	43.5	14.3	100	334	-
Vert.	203.522	QP	44.10	11.55	5.71	31.78	0.00	29.58	43.5	13.9	100	245	-
Vert.	400.000	QP	44.70	15.93	7.10	31.64	0.00	36.09	46.0	9.9	100	268	-
Vert.	712.701	QP	41.60	20.07	8.80	31.51	0.00	38.96	46.0	7.0	100	45	-
Vert.	11650.000	PK	50.68	37.98	9.89	42.57	-9.54	46.44	73.9	27.4	148	174	-
Vert.	11650.000	AV	40.43	37.98	9.89	42.57	-9.54	36.19	53.9	17.7	148	174	VBW:750 Hz

Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

(Calculation) (above 1 GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	5850.000	PK	48.72	33.26	16.98	43.43	2.24	57.77	-37.46	27.0	64.4	214	55	-
Hori.	5855.000	PK	50.74	33.27	16.98	43.43	2.24	59.80	-35.43	15.6	51.0	214	55	-
Hori.	5875.000	PK	49.19	33.31	17.01	43.43	2.24	58.32	-36.91	10.0	46.9	214	55	-
Hori.	5925.000	PK	50.20	33.43	17.03	43.43	2.24	59.47	-35.76	-27.0	8.7	214	55	-
Hori.	17475.000	PK	47.18	40.34	12.59	40.30	-9.54	50.27	-44.96	-27.0	17.9	150	0	-
Vert.	5850.000	PK	49.51	33.26	16.98	43.43	2.24	58.56	-36.67	27.0	63.6	212	190	-
Vert.	5855.000	PK	49.26	33.27	16.98	43.43	2.24	58.32	-36.91	15.6	52.5	212	190	-
Vert.	5875.000	PK	48.29	33.31	17.01	43.43	2.24	57.42	-37.81	10.0	47.8	212	190	-
Vert.	5925.000	PK	48.66	33.43	17.03	43.43	2.24	57.93	-37.30	-27.0	10.3	212	190	-
Vert.	17475.000	PK	47.57	40.34	12.59	40.30	-9.54	50.66	-44.57	-27.0	17.5	150	0	-

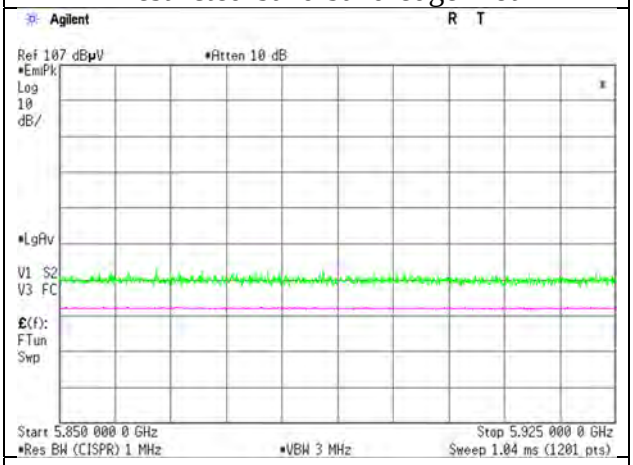
Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Result (EIRP [dBm]) = 10 * LOG ((10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance : 3 [m]) ^ 2 / 30 * 10 ^ 3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	August 25, 2021
Temperature / Humidity	22 deg.C, 45 %RH
Engineer	Akihiro Oda
Mode	Tx 11a 5825 MHz

Horizontal

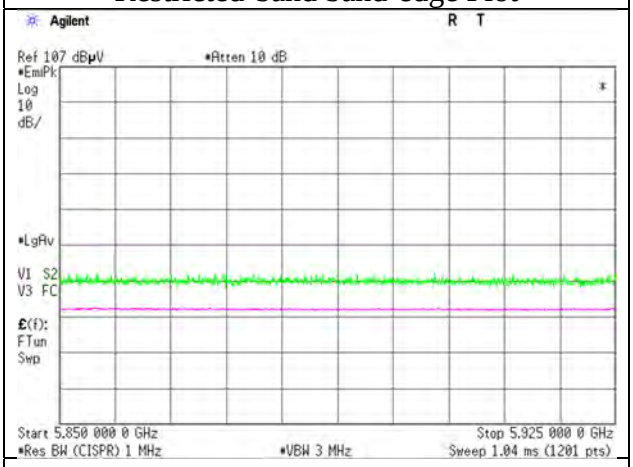
Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

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

Radiated Spurious Emission

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	August 25, 2021
Temperature / Humidity	22 deg.C, 45 %RH
Engineer	Akihiro Oda (1 GHz -6.4 GHz)
Mode	Tx 11n-20 5745 MHz

(Calculation) (above 1 GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	5650.000	PK	49.04	32.74	16.87	43.42	2.24	57.47	-37.76	-27.0	**10.7**	147	50	-
Hori.	5700.000	PK	48.42	32.87	16.89	43.42	2.24	57.00	-38.23	10.0	48.2	147	50	-
Hori.	5720.000	PK	48.53	32.93	16.90	43.42	2.24	57.18	-38.05	15.6	53.6	147	50	-
Hori.	5725.000	PK	49.85	32.95	16.90	43.42	2.24	58.52	-36.71	27.0	63.7	147	50	-
Vert.	5650.000	PK	49.00	32.74	16.87	43.42	2.24	57.43	-37.80	-27.0	10.8	193	190	-
Vert.	5700.000	PK	48.33	32.87	16.89	43.42	2.24	56.91	-38.32	10.0	48.3	193	190	-
Vert.	5720.000	PK	48.96	32.93	16.90	43.42	2.24	57.61	-37.62	15.6	53.2	193	190	-
Vert.	5725.000	PK	51.17	32.95	16.90	43.42	2.24	59.84	-35.39	27.0	62.3	193	190	-

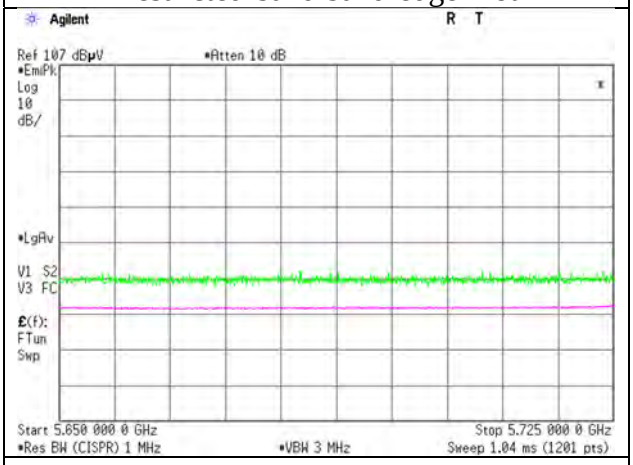
Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Result (EIRP [dBm]) = 10 * LOG ((10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance : 3 [m]) ^ 2 / 30 * 10 ^ 3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	August 25, 2021
Temperature / Humidity	22 deg.C, 45 %RH
Engineer	Akihiro Oda
Mode	Tx 11n-20 5745 MHz

Horizontal

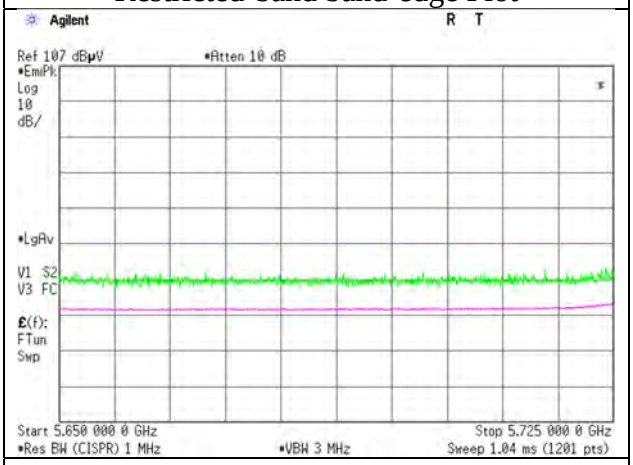
Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

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

Radiated Spurious Emission

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	August 25, 2021
Temperature / Humidity	22 deg.C, 45 %RH
Engineer	Akihiro Oda (1 GHz -6.4 GHz)
Mode	Tx 11n-20 5825 MHz

(Calculation) (above 1 GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	5850.000	PK	48.21	33.26	16.98	43.43	2.24	57.26	-37.97	27.0	64.9	199	54	-
Hori.	5855.000	PK	49.70	33.27	16.98	43.43	2.24	58.76	-36.47	15.6	52.0	199	54	-
Hori.	5875.000	PK	49.09	33.31	17.01	43.43	2.24	58.22	-37.01	10.0	47.0	199	54	-
Hori.	5925.000	PK	48.52	33.43	17.03	43.43	2.24	57.79	-37.44	-27.0	10.4	199	54	-
Vert.	5850.000	PK	48.21	33.26	16.98	43.43	2.24	57.26	-37.97	27.0	64.9	215	197	-
Vert.	5855.000	PK	48.59	33.27	16.98	43.43	2.24	57.65	-37.58	15.6	53.1	215	197	-
Vert.	5875.000	PK	48.56	33.31	17.01	43.43	2.24	57.69	-37.54	10.0	47.5	215	197	-
Vert.	5925.000	PK	49.62	33.43	17.03	43.43	2.24	58.89	-36.34	-27.0	**9.3**	215	197	-

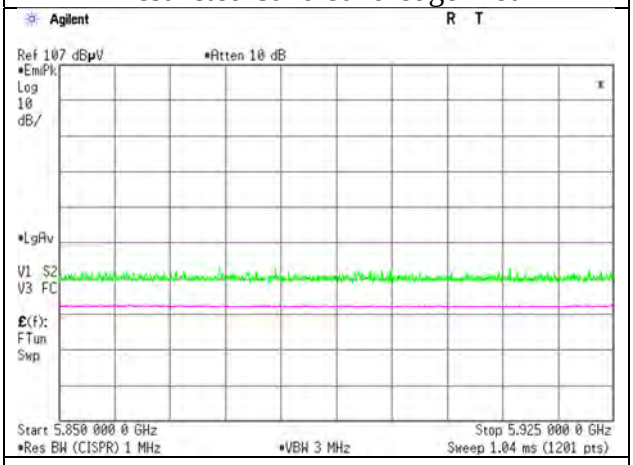
Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Result (EIRP [dBm]) = 10 * LOG ((10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance : 3 [m]) ^ 2 / 30 * 10 ^ 3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	August 25, 2021
Temperature / Humidity	22 deg.C, 45 %RH
Engineer	Akihiro Oda
Mode	Tx 11n-20 5825 MHz

Horizontal

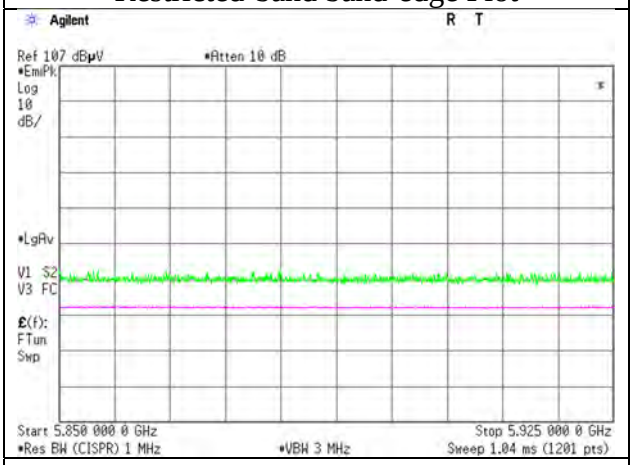
Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

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

Radiated Spurious Emission

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	August 25, 2021
Temperature / Humidity	22 deg.C, 45 %RH
Engineer	Akihiro Oda (1 GHz -6.4 GHz)
Mode	Tx 11ac-20 5745 MHz

(Calculation) (above 1 GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	5650.000	PK	48.88	32.74	16.87	43.42	2.24	57.31	-37.92	-27.0	**10.9**	197	60	-
Hori.	5700.000	PK	49.23	32.87	16.89	43.42	2.24	57.81	-37.42	10.0	47.4	197	60	-
Hori.	5720.000	PK	47.86	32.93	16.90	43.42	2.24	56.51	-38.72	15.6	54.3	197	60	-
Hori.	5725.000	PK	48.73	32.95	16.90	43.42	2.24	57.40	-37.83	27.0	64.8	197	60	-
Vert.	5650.000	PK	48.86	32.74	16.87	43.42	2.24	57.29	-37.94	-27.0	**10.9**	209	190	-
Vert.	5700.000	PK	48.52	32.87	16.89	43.42	2.24	57.10	-38.13	10.0	48.1	209	190	-
Vert.	5720.000	PK	50.33	32.93	16.90	43.42	2.24	58.98	-36.25	15.6	51.8	209	190	-
Vert.	5725.000	PK	49.85	32.95	16.90	43.42	2.24	58.52	-36.71	27.0	63.7	209	190	-

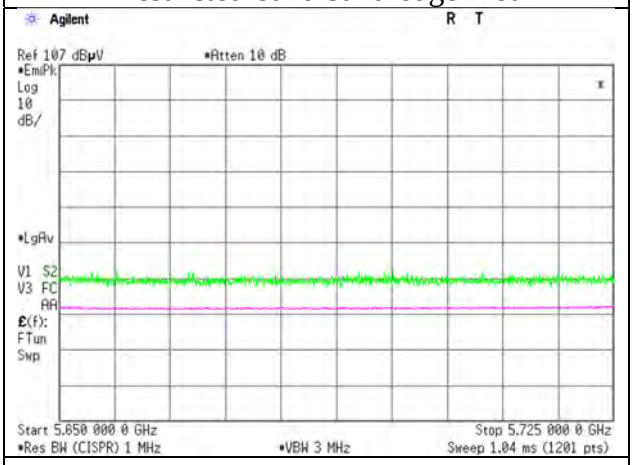
Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Result (EIRP [dBm]) = 10 * LOG ((10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance : 3 [m]) ^ 2 / 30 * 10 ^ 3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	August 25, 2021
Temperature / Humidity	22 deg.C, 45 %RH
Engineer	Akihiro Oda
Mode	Tx 11ac-20 5745 MHz

Horizontal

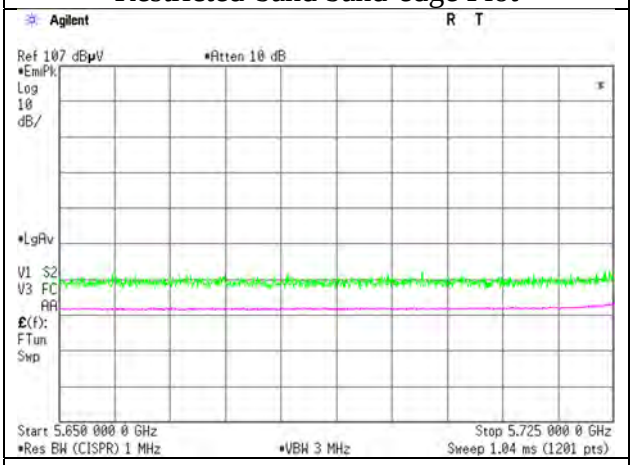
Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

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

Radiated Spurious Emission

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	August 25, 2021
Temperature / Humidity	22 deg.C, 45 %RH
Engineer	Akihiro Oda (1 GHz -6.4 GHz)
Mode	Tx 11ac-20 5825 MHz

(Calculation) (above 1 GHz Outside of the restricted band)

(* 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]	Result (EIRP) [dBm]	Limit [dBm]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	5850.000	PK	48.92	33.26	16.98	43.43	2.24	57.97	-37.26	27.0	64.2	194	63	-
Hori.	5855.000	PK	48.67	33.27	16.98	43.43	2.24	57.73	-37.50	15.6	53.1	194	63	-
Hori.	5875.000	PK	49.00	33.31	17.01	43.43	2.24	58.13	-37.10	10.0	47.1	194	63	-
Hori.	5925.000	PK	49.77	33.43	17.03	43.43	2.24	59.04	-36.19	-27.0	**9.1**	194	63	-
Vert.	5850.000	PK	48.97	33.26	16.98	43.43	2.24	58.02	-37.21	27.0	64.2	204	187	-
Vert.	5855.000	PK	47.88	33.27	16.98	43.43	2.24	56.94	-38.29	15.6	53.8	204	187	-
Vert.	5875.000	PK	50.01	33.31	17.01	43.43	2.24	59.14	-36.09	10.0	46.0	204	187	-
Vert.	5925.000	PK	49.60	33.43	17.03	43.43	2.24	58.87	-36.36	-27.0	9.3	204	187	-

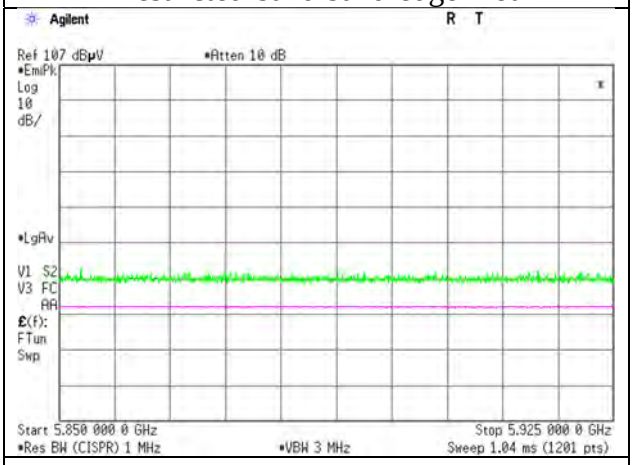
Result [dBuV/m] = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Result (EIRP [dBm]) = 10 * LOG ((10 ^ (Electric Field Strength [dBuV/m] / 20) * 10 ^ (-6) * Distance : 3 [m]) ^ 2 / 30 * 10 ^ 3)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance factor : 1 GHz - 10 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	August 25, 2021
Temperature / Humidity	22 deg.C, 45 %RH
Engineer	Akihiro Oda
Mode	Tx 11ac-20 5825 MHz

Horizontal

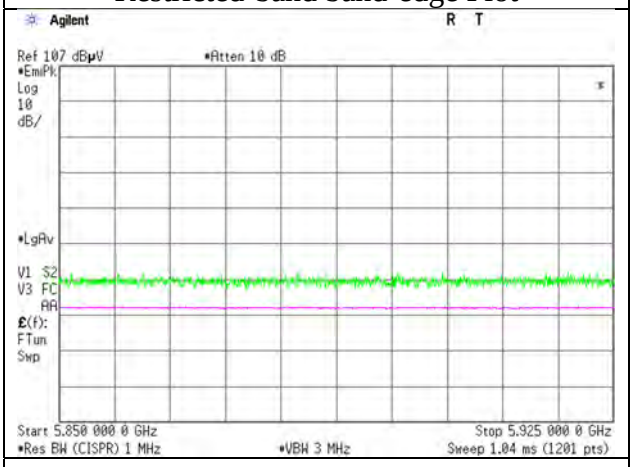
Restricted-band band-edge Plot



Trace Green: Peak Plot
Trace Purple: Average Plot

Vertical

Restricted-band band-edge Plot

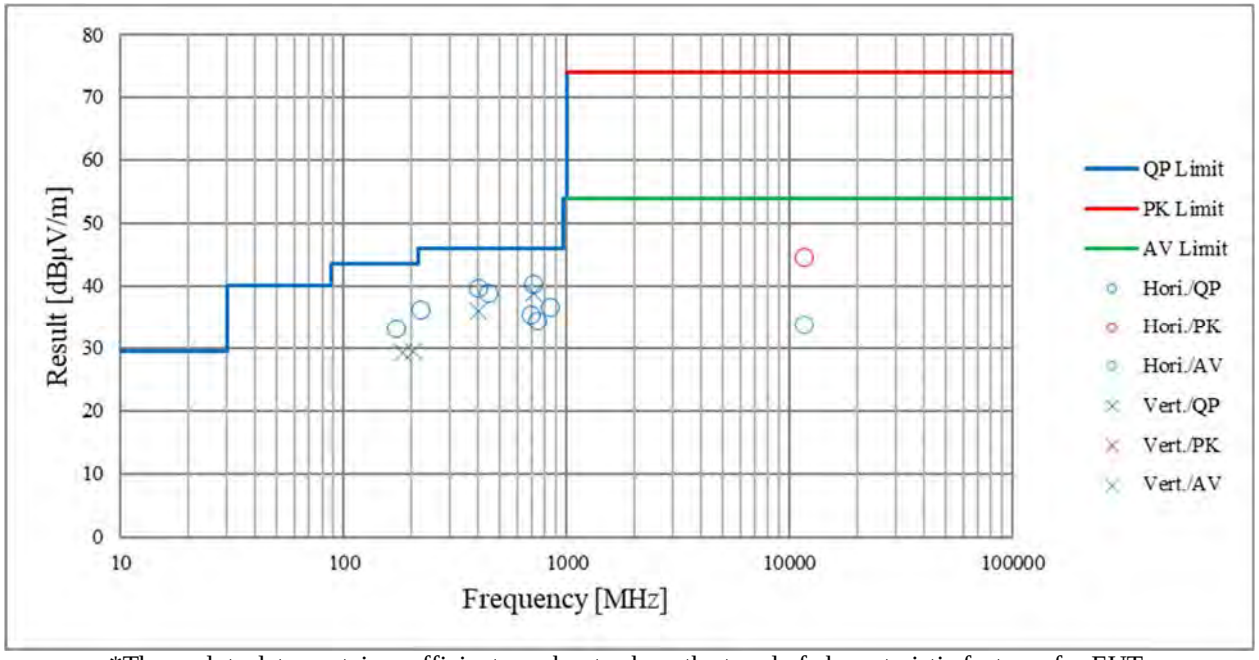


Trace Green: Peak Plot
Trace Purple: Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13722221S-C-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	3	3	1
Date	August 23, 2021	August 25, 2021	August 31, 2021	August 31, 2021
Temperature / Humidity	24 deg.C, 56 %RH	22 deg.C, 45 %RH	23 deg.C, 62 %RH	24 deg.C, 56 %RH
Engineer	Yosuke Murakami (30 MHz -1 GHz)	Akihiro Oda (1 GHz -6.4 GHz)	Takahiro Kawakami (6.4 GHz -26.5 GHz)	Yusuke Tanikawara (26.5 GHz -40 GHz)
Mode	Tx 11a 5825 MHz			

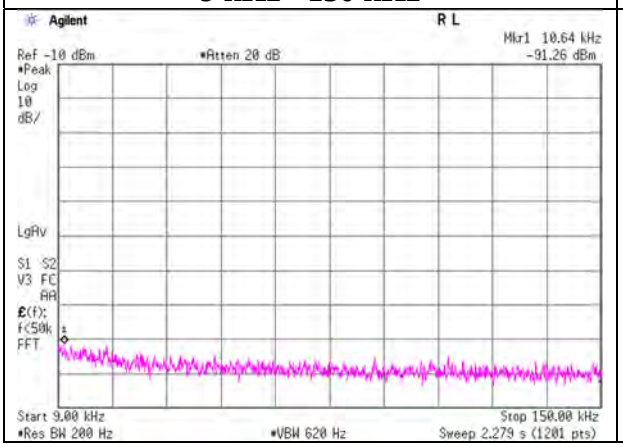


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

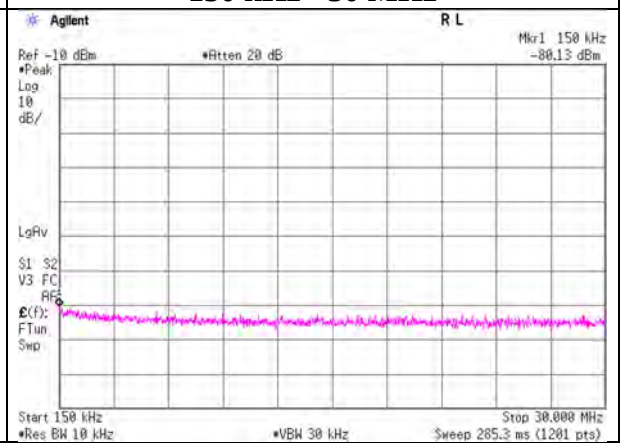
Conducted Spurious Emission

Report No.	13722221S-C-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	August 12, 2021
Temperature / Humidity	25 deg. C / 52 % RH
Engineer	Yosuke Murakami
Mode	Tx 11a 5825 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
10.64	-91.26	1.01	9.83	2.00	1	-78.43	300	6.0	-17.17	47.00	64.1	-
150.00	-80.13	1.01	9.83	2.00	1	-67.30	300	6.0	-6.04	24.00	30.0	-

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

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

N: Number of output

*2.0 dBi was applied to the test result based on KDB 789033 since antenna gain was less than 2.0 dBi.

APPENDIX 2: Test instruments

Test equipment (1/2)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	KTS-07	145111	Digital Tester	SANWA	PC500	7019232	2020/10/21	12
AT	SAT10-24	204928	Attenuator	Weinschel Corp.	54A-10	-	2021/02/09	12
AT	SCC-G65	196942	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803416/2	2021/03/01	12
AT	SOS-19	175823	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2020/10/01	12
AT	SPM-13	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2021/01/25	12
AT	SPSS-06	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2021/01/25	12
AT	STM-06	145763	Terminator	TME	CT-01 BP	-	2020/12/07	12
AT,RE	KSA-08	145089	Spectrum Analyzer	Keysight Technologies Inc	E4446A	MY46180525	2020/11/24	12
RE	COTS-SEMI-5	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3 (RE,CE,ME,PE)	-	-	-
RE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
RE	KJM-09	145929	Measure	KOMELON	KMC-36	-	-	-
RE	SAEC-01 (SVSWR)	145561	Semi-Anechoic Chamber	TDK	SAEC-01(SVSWR)	1	2021/05/09	12
RE	SAEC-02(NSA)	145563	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	2021/03/16	12
RE	SAEC-03 (SVSWR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2021/05/21	12
RE	SAF-02	145004	Pre Amplifier	SONOMA	310N	290212	2021/02/10	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2021/02/08	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2021/03/01	12
RE	SAF-10	145129	Pre Amplifier	Toyo Corporation	HAP26-40W	10	2021/03/01	12
RE	SAT10-06	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2020/10/05	12
RE	SAT3-11	150921	Attenuator	JFW	50HF-003N	-	2021/01/26	12
RE	SAT6-14	167095	Attenuator	JFW	50HF-006N	-	2021/02/10	12
RE	SBA-02	145022	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032665	2021/04/10	12
RE	SCC-B1/B3/B5/B7/B8/B13/SRSE-02	144975	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270 (RF Selector)	2021/04/12	12
RE	SCC-B2/B4/B6/B7/B8/B13/SRSE-02	144976	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270 (RF Selector)	2021/04/12	12

Test equipment (2/2)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	SCC-G15	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2021/03/01	12
RE	SCC-G40	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	2021/01/19	12
RE	SCC-G43	156380	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	SN MY 13406/4E	2021/05/17	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2021/05/18	12
RE	SCC-G58	183047	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	800287/4A	2021/05/17	12
RE	SCC-G70	200010	Coaxial Cable	Huber+Suhner	SUCOFLEX 104	575618/4	2021/07/06	12
RE	SFL-03	145377	Highpass Filter	MICRO-TRONICS	HPM50112	28	2020/10/05	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-739	2021/06/14	12
RE	SHA-04	145512	Horn Antenna	ETS-Lindgren	3160-09	00094868	2021/06/14	12
RE	SHA-06	145514	Horn Antenna	ETS-Lindgren	3160-10	00092383	2021/06/14	12
RE	SHA-10	194685	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	711	2021/03/03	12
RE	SJM-20	207277	Measuring	ASKUL	-	-	-	-
RE	SLA-06	145528	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	195	2021/04/10	12
RE	SOS-20	191837	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
RE	SOS-21	191838	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
RE	SOS-23	191840	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
RE	SSA-02	145800	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250106	2021/04/13	12
RE	STR-07	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2020/09/07	12
RE	STS-01	145792	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997812	2020/10/19	12
RE	STS-02	145793	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997819	2021/04/28	12
RE	STS-03	146210	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997823	2020/10/19	12

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

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

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

Test item:

RE: Radiated Emission
AT: Antenna Terminal Conducted test