



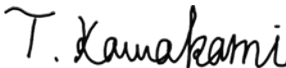
RADIO TEST REPORT

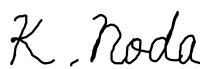
Test Report No. : 1372221S-C-R1

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)

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
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.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
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 1372221S-C. 1372221S-C is replaced with this report.

Date of test: August 11 to 31, 2021

Representative test engineer: 
Takahiro Kawakami
Engineer

Approved by: 
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".

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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	MCS	Modulation and Coding Scheme
AC	Alternating Current	MRA	Mutual Recognition Arrangement
AFH	Adaptive Frequency Hopping	N/A	Not Applicable
AM	Amplitude Modulation	NIST	National Institute of Standards and Technology
Amp, AMP	Amplifier	NS	No signal detect.
ANSI	American National Standards Institute	NSA	Normalized Site Attenuation
Ant, ANT	Antenna	NVLAP	National Voluntary Laboratory Accreditation Program
AP	Access Point	OBW	Occupied Band Width
ASK	Amplitude Shift Keying	OFDM	Orthogonal Frequency Division Multiplexing
Atten., ATT	Attenuator	P/M	Power meter
AV	Average	PCB	Printed Circuit Board
BPSK	Binary Phase-Shift Keying	PER	Packet Error Rate
BR	Bluetooth Basic Rate	PHY	Physical Layer
BT	Bluetooth	PK	Peak
BT LE	Bluetooth Low Energy	PN	Pseudo random Noise
BW	BandWidth	PRBS	Pseudo-Random Bit Sequence
Cal Int	Calibration Interval	PSD	Power Spectral Density
CCK	Complementary Code Keying	QAM	Quadrature Amplitude Modulation
Ch., CH	Channel	QP	Quasi-Peak
CISPR	Comite International Special des Perturbations Radioelectriques	QPSK	Quadri-Phase Shift Keying
CW	Continuous Wave	RBW	Resolution Band Width
DBPSK	Differential BPSK	RDS	Radio Data System
DC	Direct Current	RE	Radio Equipment
D-factor	Distance factor	RF	Radio Frequency
DFS	Dynamic Frequency Selection	RMS	Root Mean Square
DQPSK	Differential QPSK	RSS	Radio Standards Specifications
DSSS	Direct Sequence Spread Spectrum	Rx	Receiving
EDR	Enhanced Data Rate	SA, S/A	Spectrum Analyzer
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	SG	Signal Generator
EMC	ElectroMagnetic Compatibility	SVSWR	Site-Voltage Standing Wave Ratio
EMI	ElectroMagnetic Interference	TR	Test Receiver
EN	European Norm	Tx	Transmitting
ERP, e.r.p.	Effective Radiated Power	VBW	Video BandWidth
EU	European Union	Vert.	Vertical
EUT	Equipment Under Test	WLAN	Wireless LAN
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		

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CONTENTS	PAGE
SECTION 1: Customer information.....	5
SECTION 2: Equipment under test (EUT).....	5
SECTION 3: Test specification, procedures & results.....	7
SECTION 4: Operation of EUT during testing.....	10
SECTION 5: Radiated Spurious Emission and Band Edge Compliance.....	15
SECTION 6: Antenna Terminal Conducted Tests.....	18
APPENDIX 1: Test data	19
99 % Occupied Bandwidth	19
6 dB Bandwidth	23
Maximum Conducted Output Power	27
Maximum Power Spectral Density	34
Radiated Spurious Emission	40
Conducted Spurious Emission	54
APPENDIX 2: Test instruments	55
APPENDIX 3: Photographs of test setup	57
Radiated Spurious Emission	57
Antenna Terminal Conducted Tests.....	58

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, $\pi/4$ -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	☐ B1I 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)

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

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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 $k = 2$.

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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 %

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3.5 Test Location

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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.	

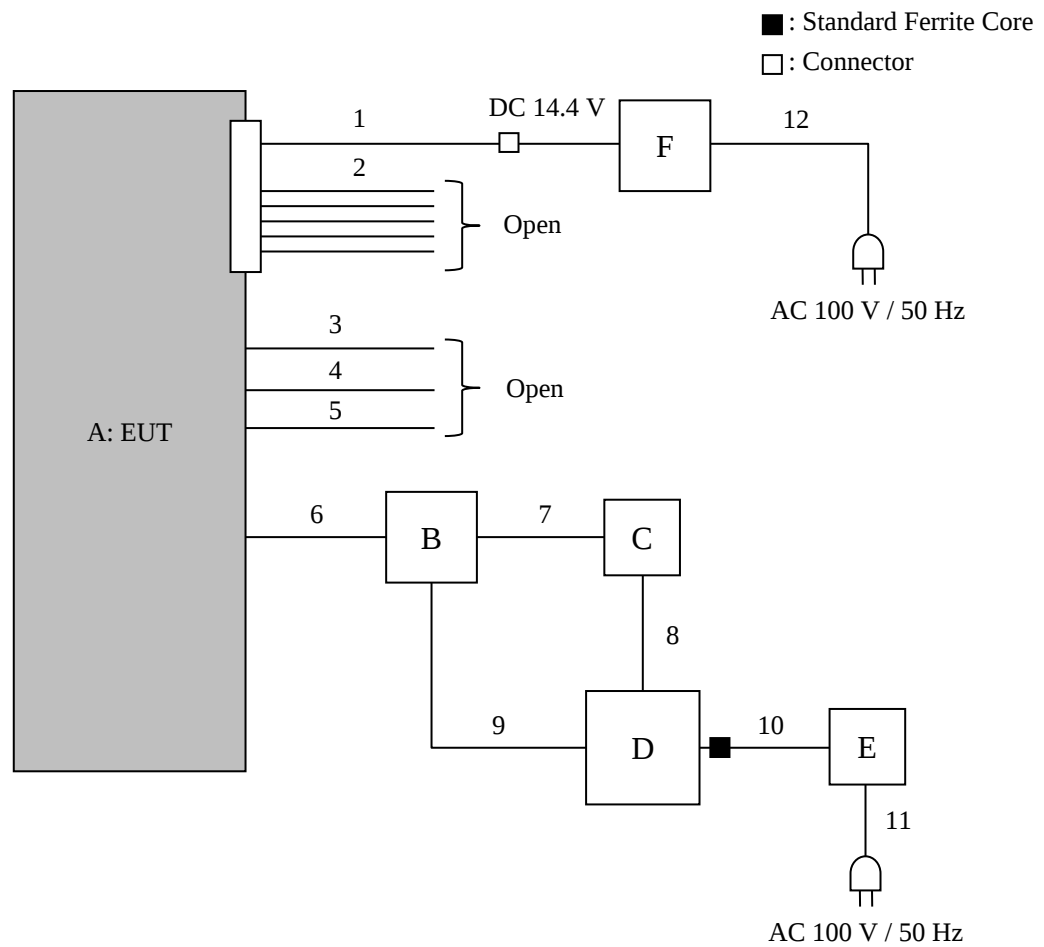
*The details of Operation mode(s)

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.

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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.

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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:

$$E = \frac{1000000 \sqrt{30P}}{3} \text{ (uV/m)} \quad : P \text{ is the e.i.r.p. (Watts)}$$

Test Antennas are used as below;

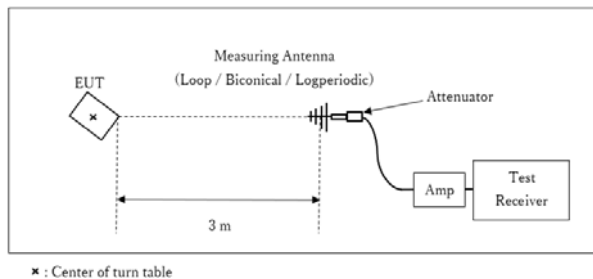
Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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".

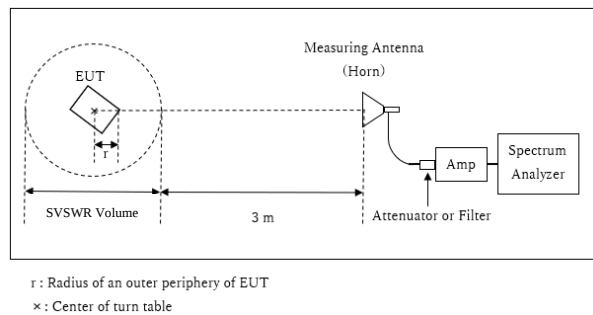
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

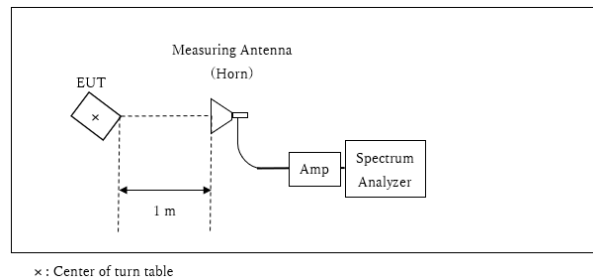
1 GHz - 10 GHz



Distance Factor: $20 \times \log (3.88 \text{ m} / 3.0 \text{ m}) = 2.24 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.88 \text{ m}$

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

10 GHz - 40 GHz



Distance Factor: $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$
*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

UL Japan, Inc.

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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 150 kHz – 30 MHz	200 Hz 10 kHz	620 Hz 30 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

* 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 ($10 \log(500 \text{ kHz} / 100 \text{ kHz})$) 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 Ohms. 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

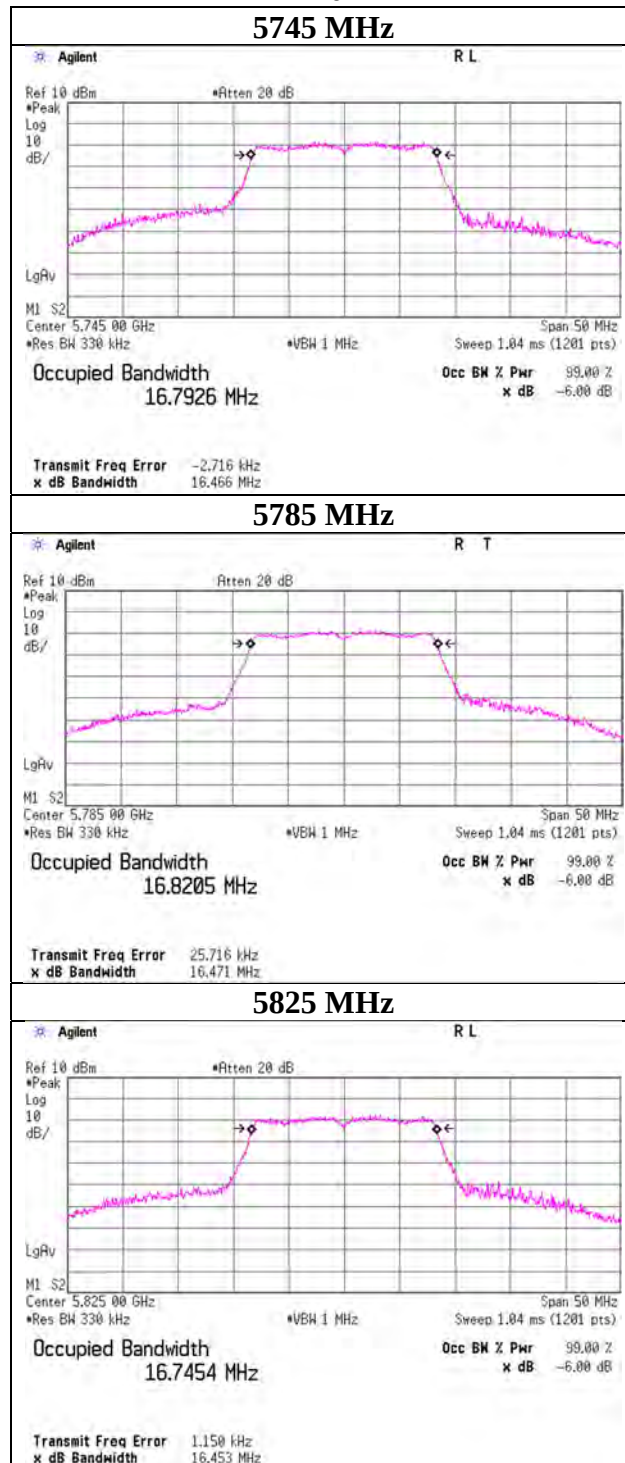
mode	Tested Frequency [MHz]	99 % Occupied Bandwidth [kHz]
11a	5745	16792.6
	5785	16820.5
	5825	16745.4

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



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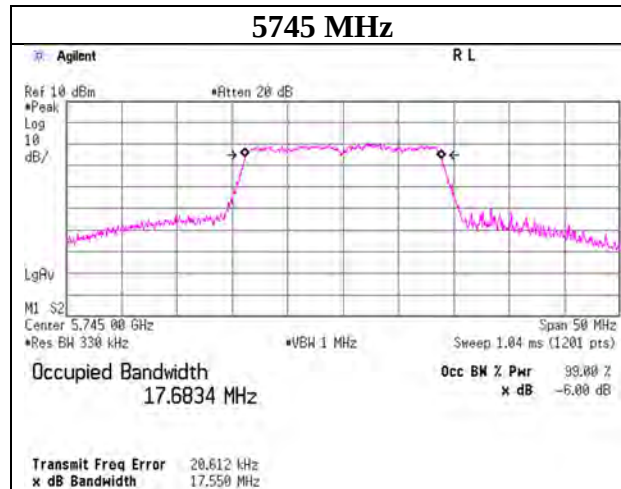
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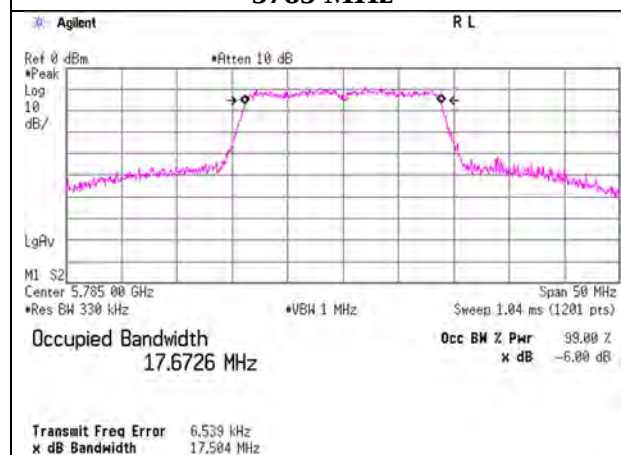
99 % Occupied Bandwidth

11n-20

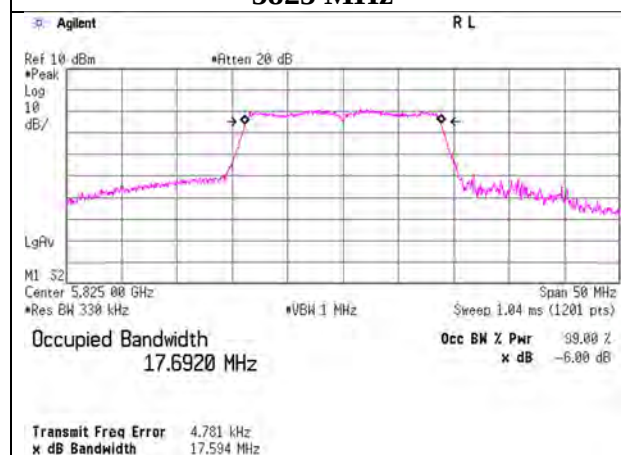
5745 MHz



5785 MHz



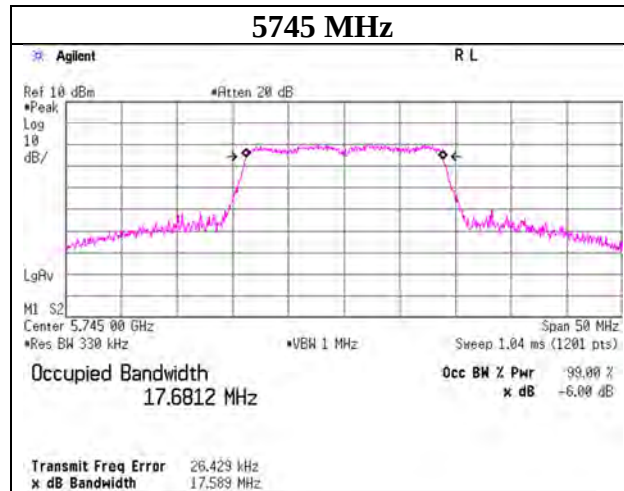
5825 MHz



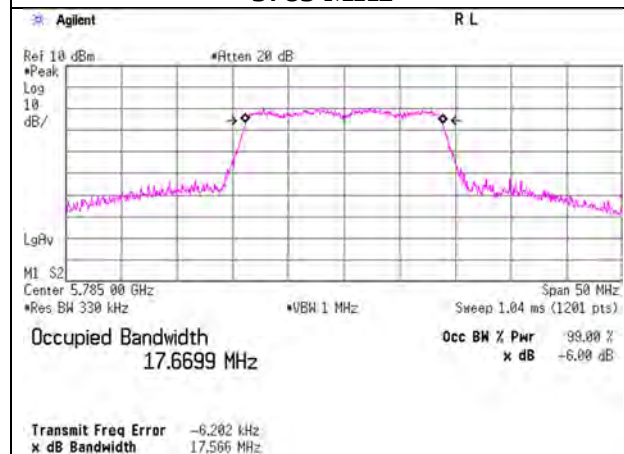
99 % Occupied Bandwidth

11ac-20

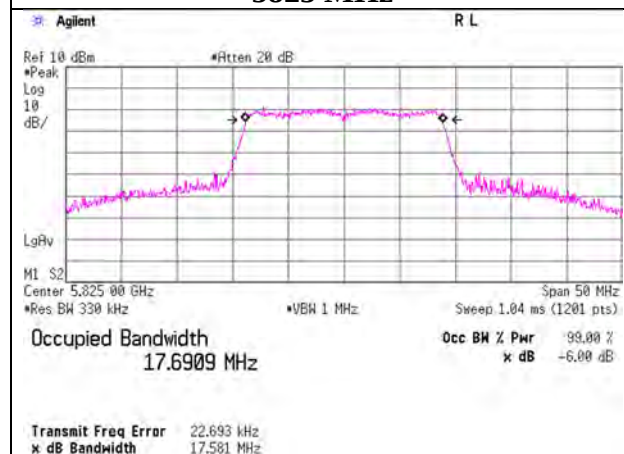
5745 MHz



5785 MHz



5825 MHz



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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

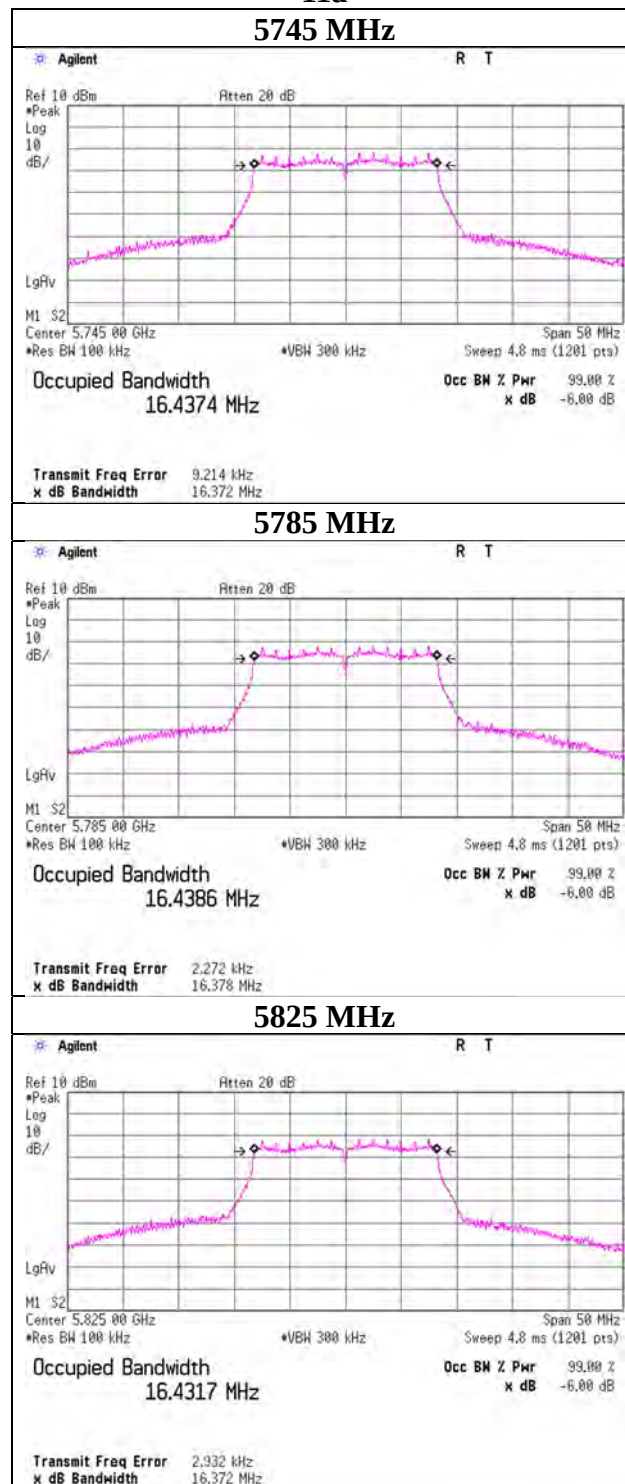
mode	Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
11a	5745	16.372	> 0.500
	5785	16.378	> 0.500
	5825	16.372	> 0.500

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



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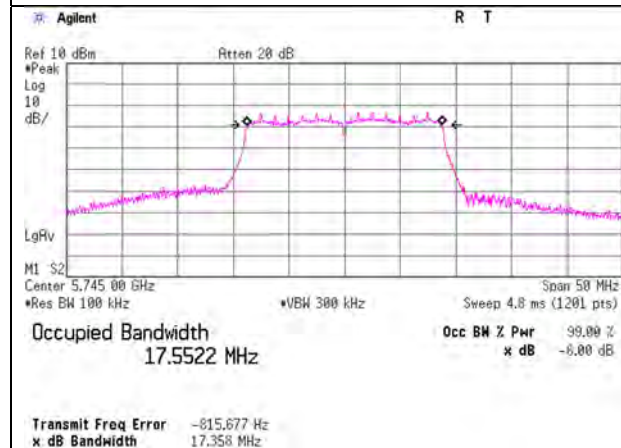
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

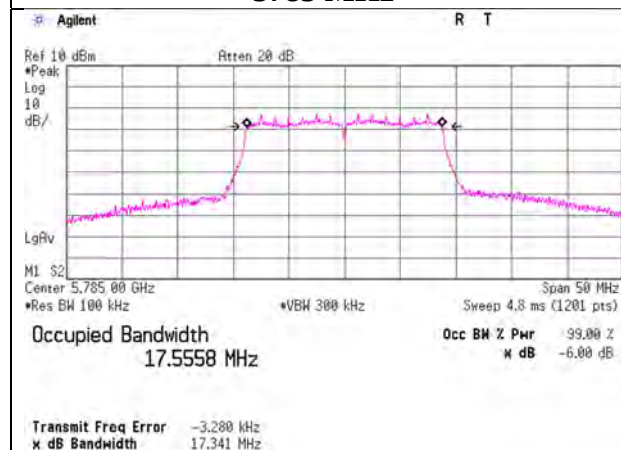
6 dB Bandwidth

11n-20

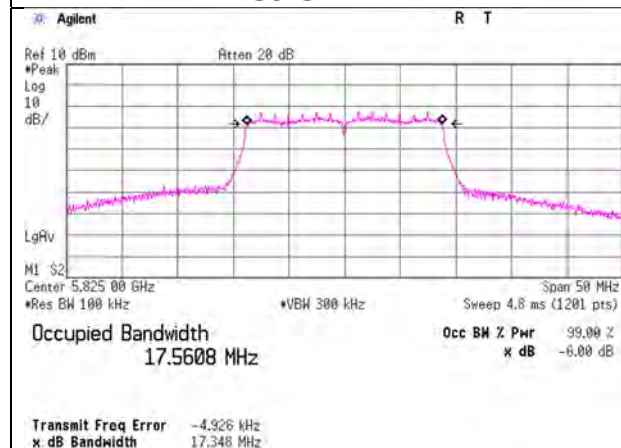
5745 MHz



5785 MHz



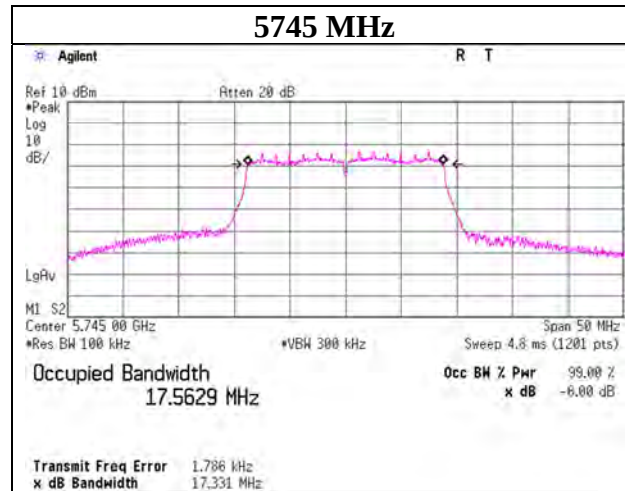
5825 MHz



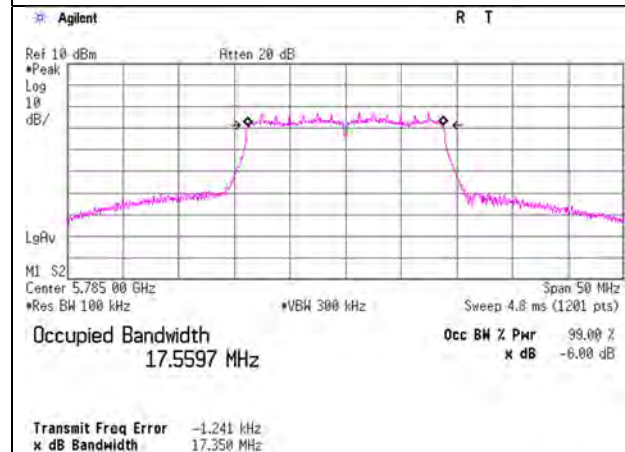
6 dB Bandwidth

11ac-20

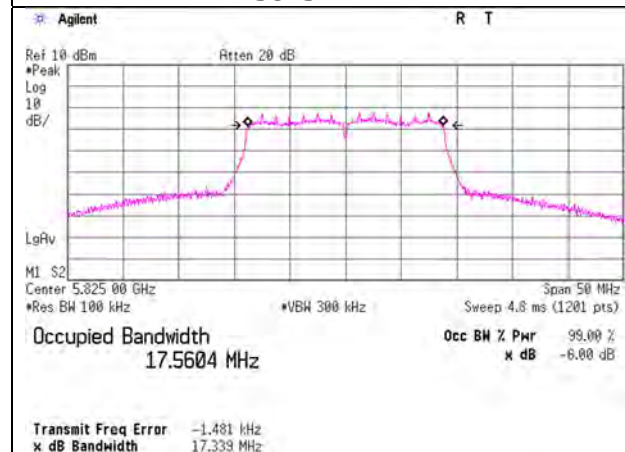
5745 MHz



5785 MHz



5825 MHz



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Telephone : +81 463 50 6400

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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				e.i.r.p.			
								Result	Limit	Margin		Result	Limit	Margin	
								[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[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. 1372221S-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				e.i.r.p.			
								Result	Limit	Margin		Result	Limit	Margin	
								[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[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. 1372221S-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				e.i.r.p.			
								Result	Limit	Margin		Result	Limit	Margin	
								[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[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:

$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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

Maximum Conducted Output Power

Report No. 1372221S-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:

$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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

Maximum Conducted Output Power

Report No. 1372221S-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:

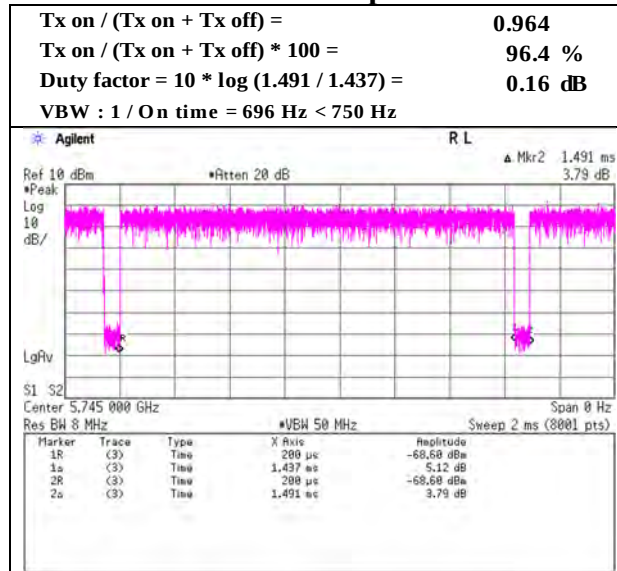
$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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

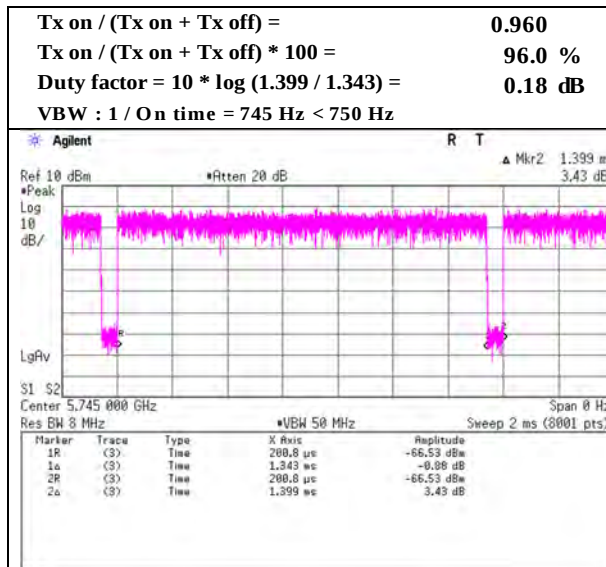
Burst rate confirmation

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

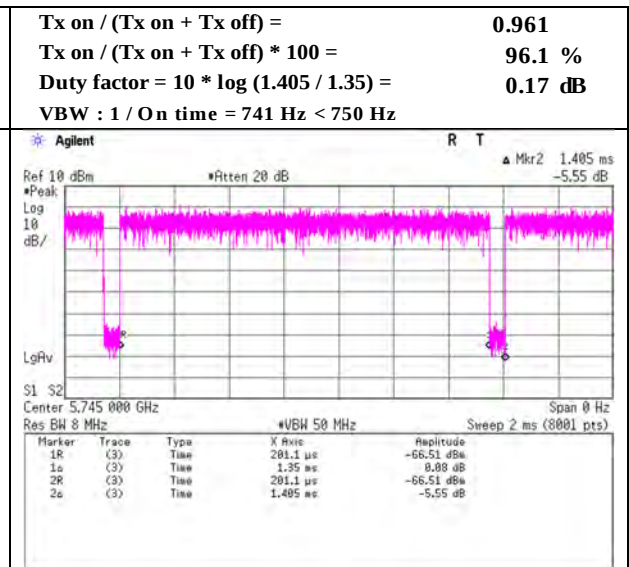
11a 6 Mbps



11n-20 MCS 0



11ac-20 MCS 0



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)			PSD (e.i.r.p.)		
							Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	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 = $10 * \log (\text{Specified bandwidth} / \text{Measured bandwidth})$

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 ISSED)

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)			PSD (e.i.r.p.)		
							Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	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 = $10 * \log (\text{Specified bandwidth} / \text{Measured bandwidth})$

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 ISSED)

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)			PSD (e.i.r.p.)		
							Result [dBm /MHz]	Limit [dBm /MHz]	Margin [dB]	Result [dBm /MHz]	Limit [dBm /MHz]	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 = $10 * \log (\text{Specified bandwidth} / \text{Measured bandwidth})$

PSD Result (Conducted) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor + RBW Correction Factor

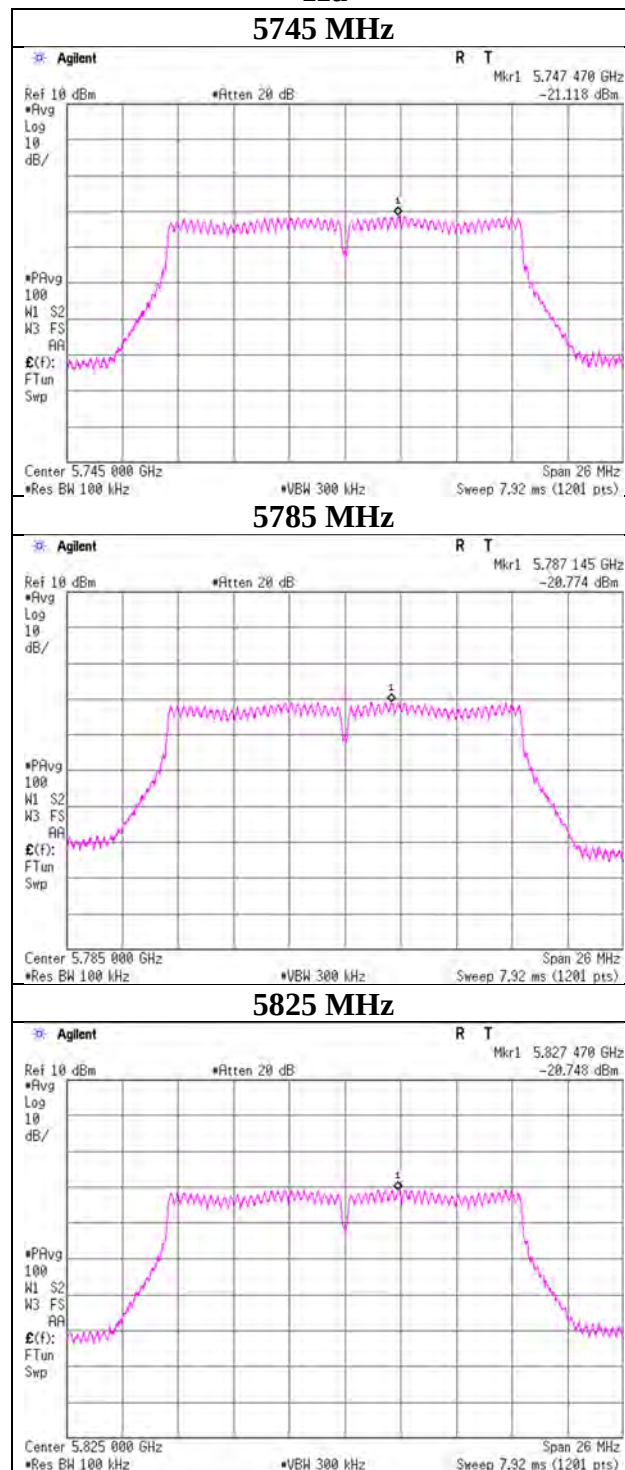
PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain

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 ISSED)

Maximum Power Spectral Density

Report No. 1372221S-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



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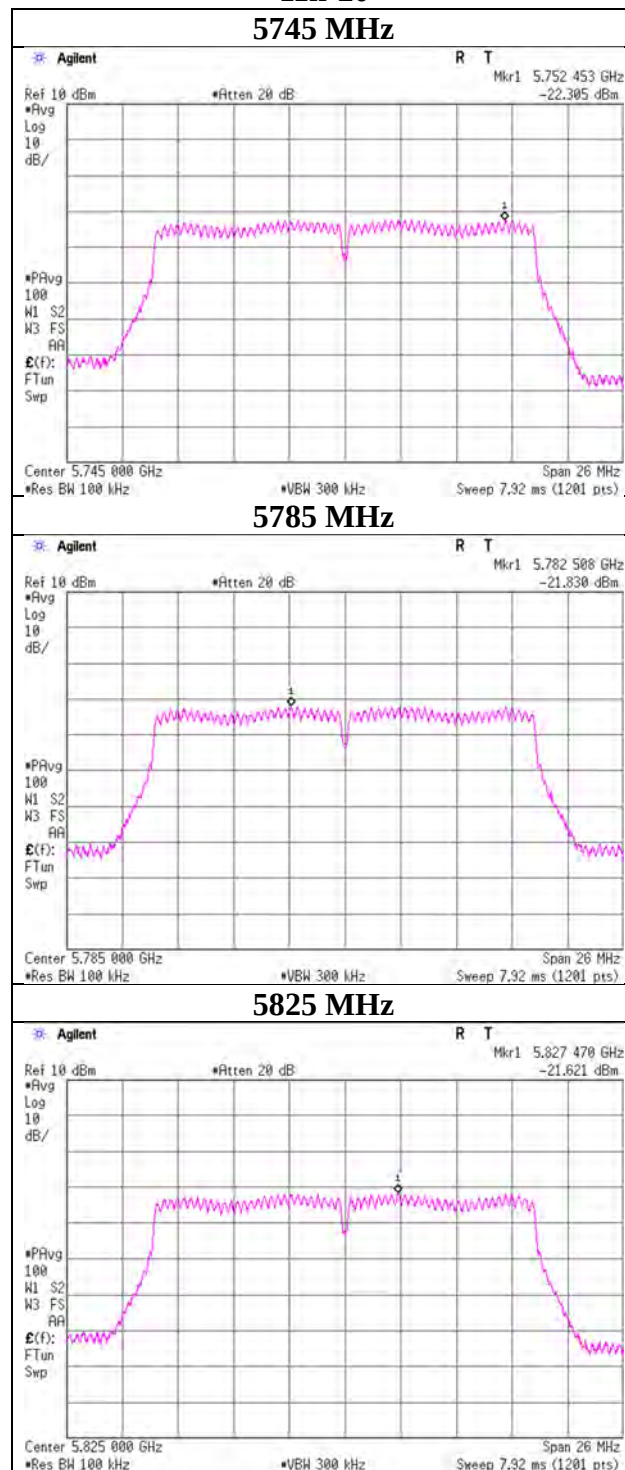
Telephone : +81 463 50 6400

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Maximum Power Spectral Density

Report No. 1372221S-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



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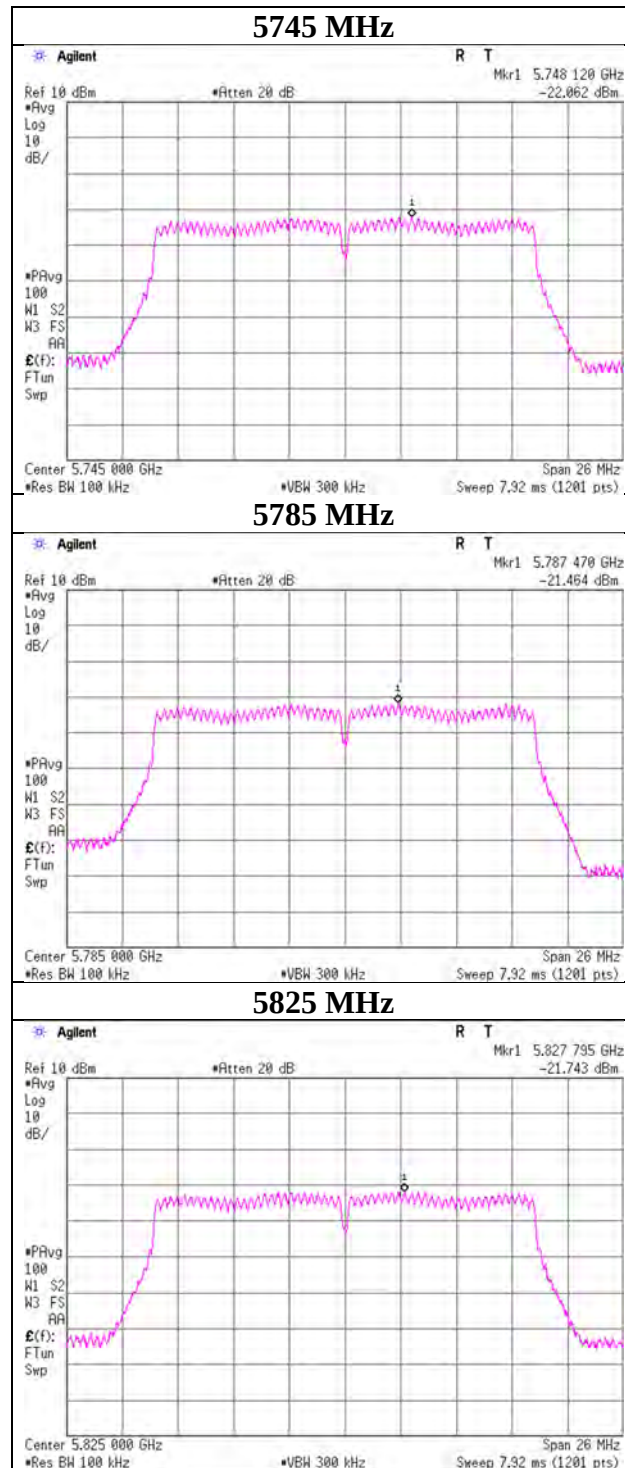
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Maximum Power Spectral Density

Report No. 1372221S-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



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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 : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

(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]) = $10 * \log(10^{\wedge}(\text{Electric Field Strength [dBuV/m]} / 20) * 10^{\wedge}(-6) * \text{Distance : } 3\text{ [m]})^{\wedge}2 / 30 * 10^{\wedge}3)$

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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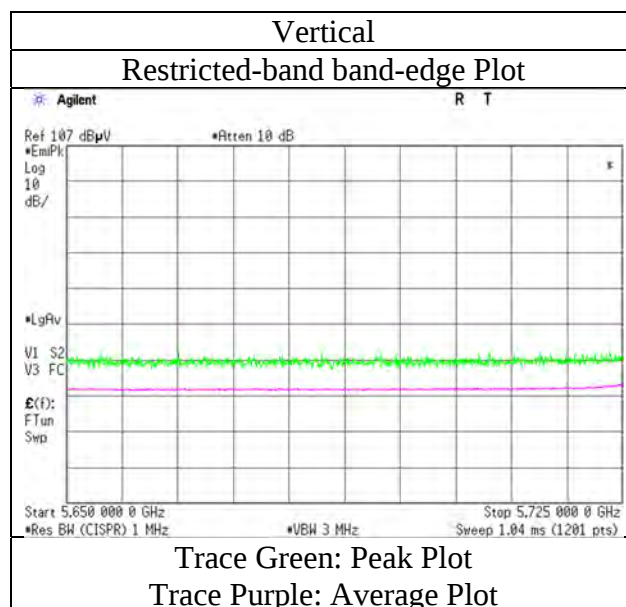
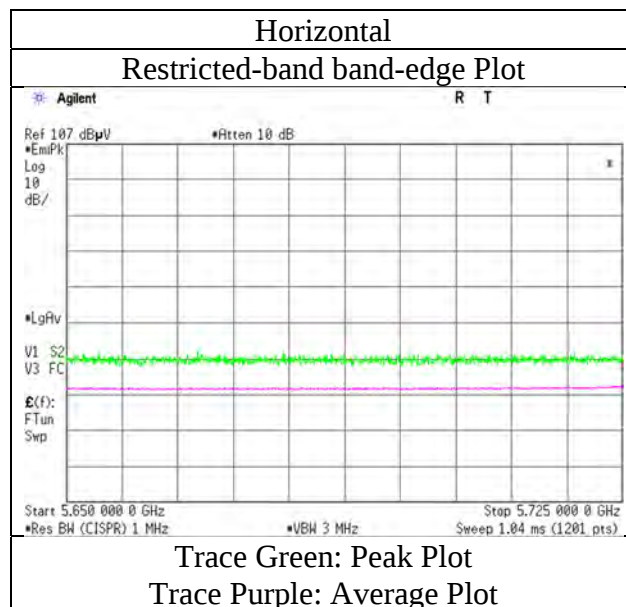
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission

Report No.	1372221S-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



* 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.

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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 : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

(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]) = $10 * \text{LOG}((10^{\wedge}(\text{Electric Field Strength [dBuV/m]} / 20)) * 10^{\wedge}(-6) * \text{Distance} : 3 [\text{m}])^{\wedge}2 / 30 * 10^{\wedge}3)$

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

10 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

UL Japan, Inc.

Shonan EMC Lab.

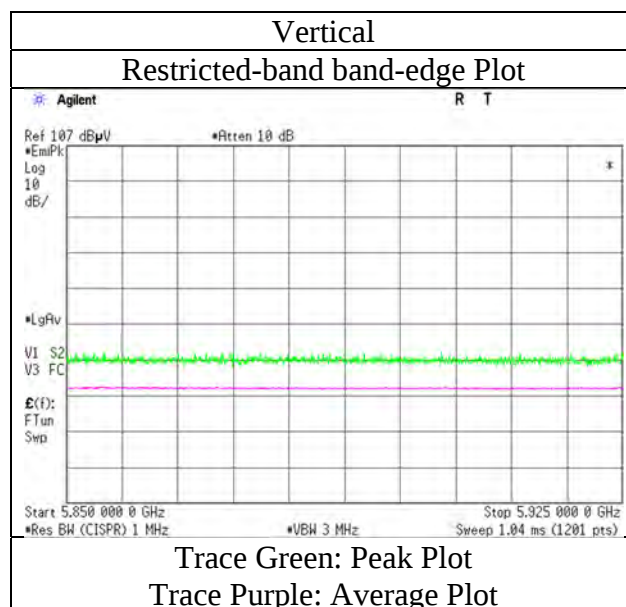
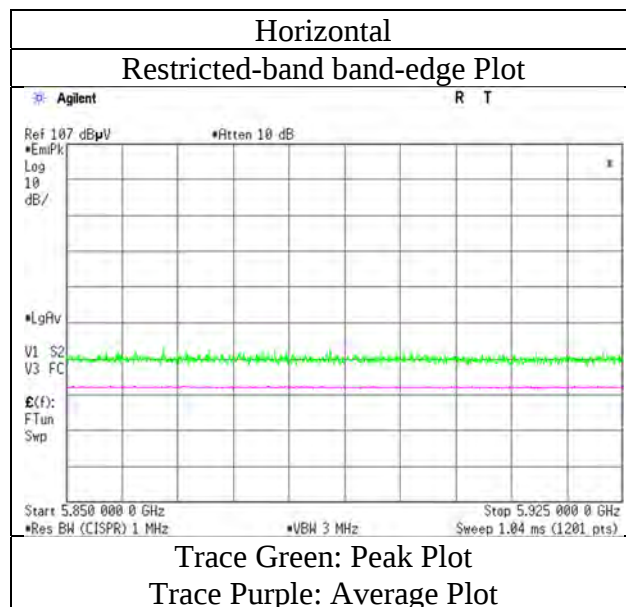
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Radiated Spurious Emission

Report No.	1372221S-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



* 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.

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Facsimile : +81 463 50 6401

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)

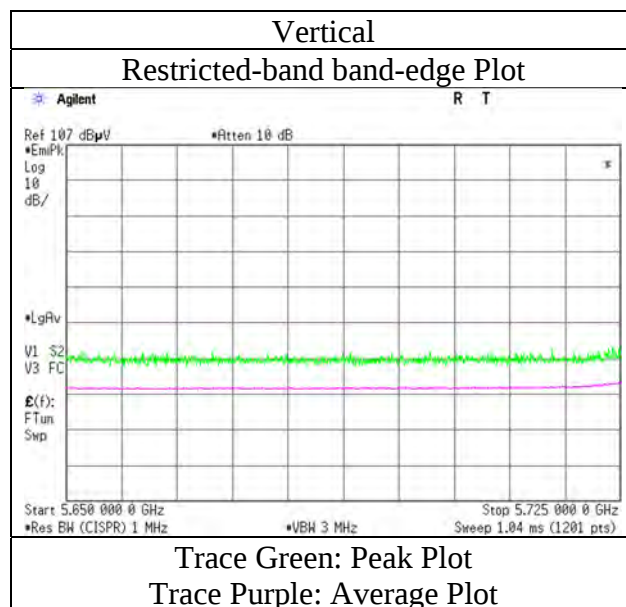
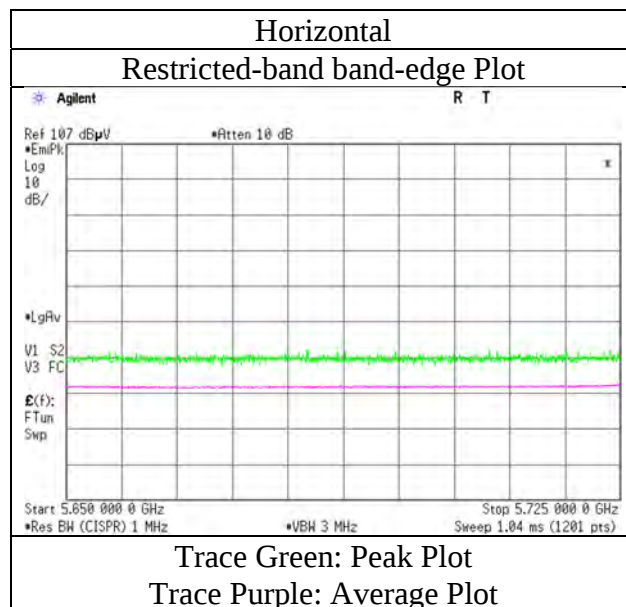
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).

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.	1372221S-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



* 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.

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

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

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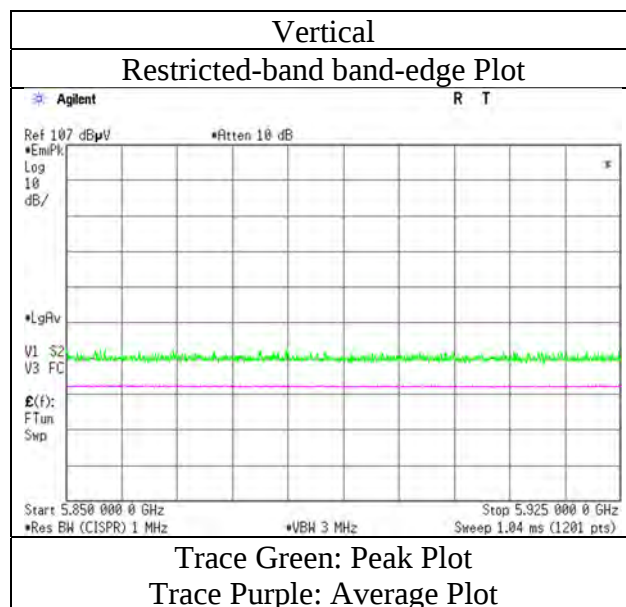
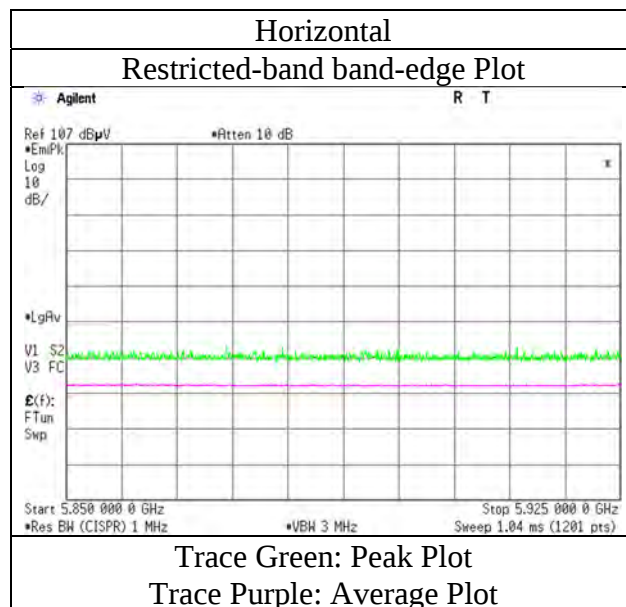
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission

Report No.	1372221S-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



* 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.

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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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)

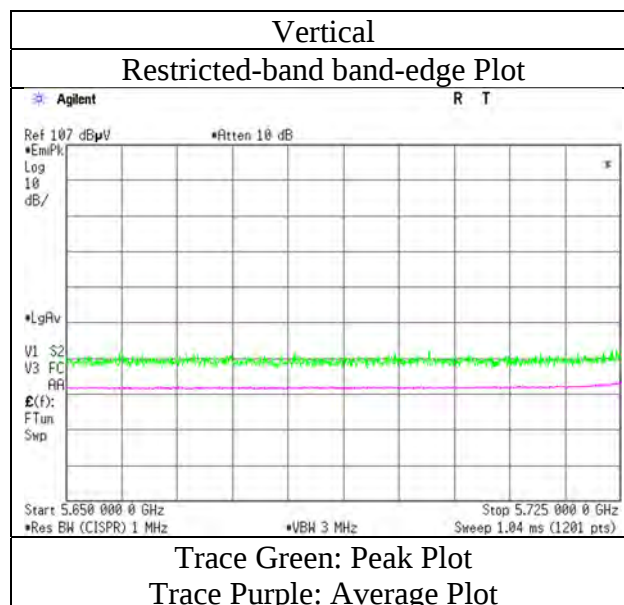
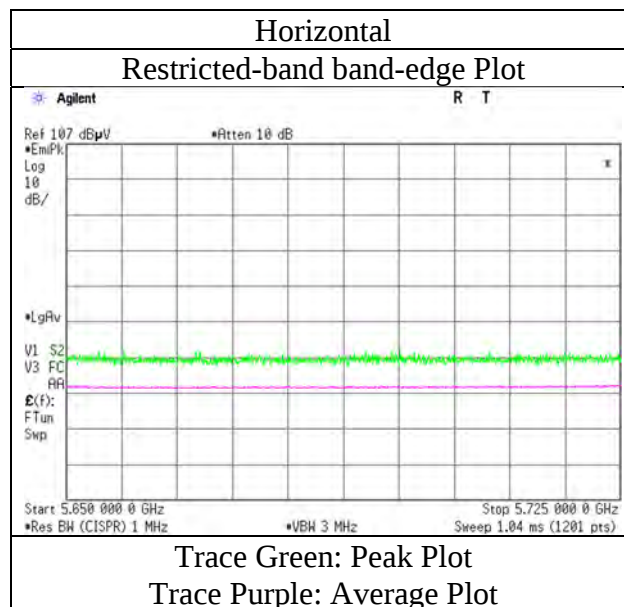
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).

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.	1372221S-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



* 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.

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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

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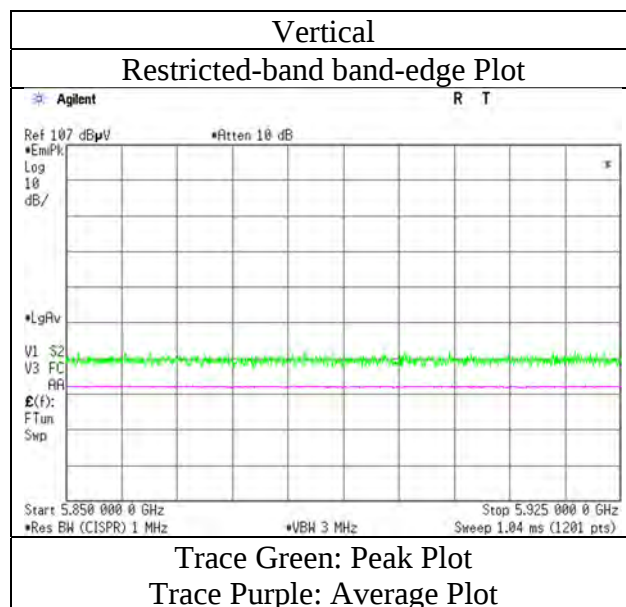
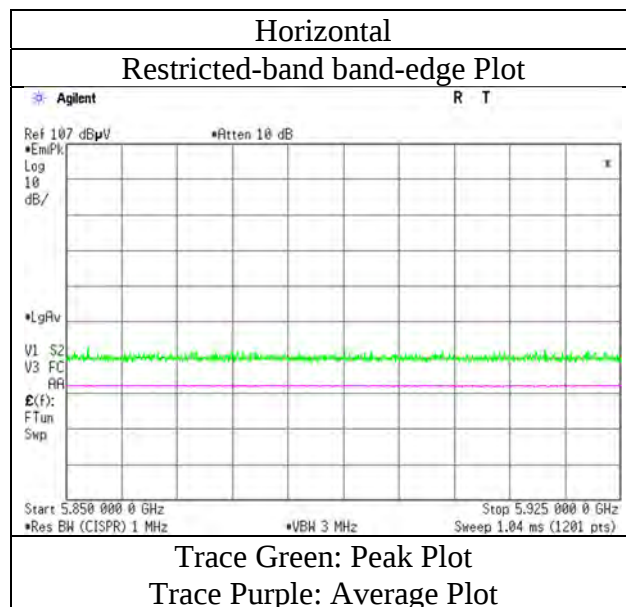
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission

Report No.	1372221S-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



* 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.

UL Japan, Inc.

Shonan EMC Lab.

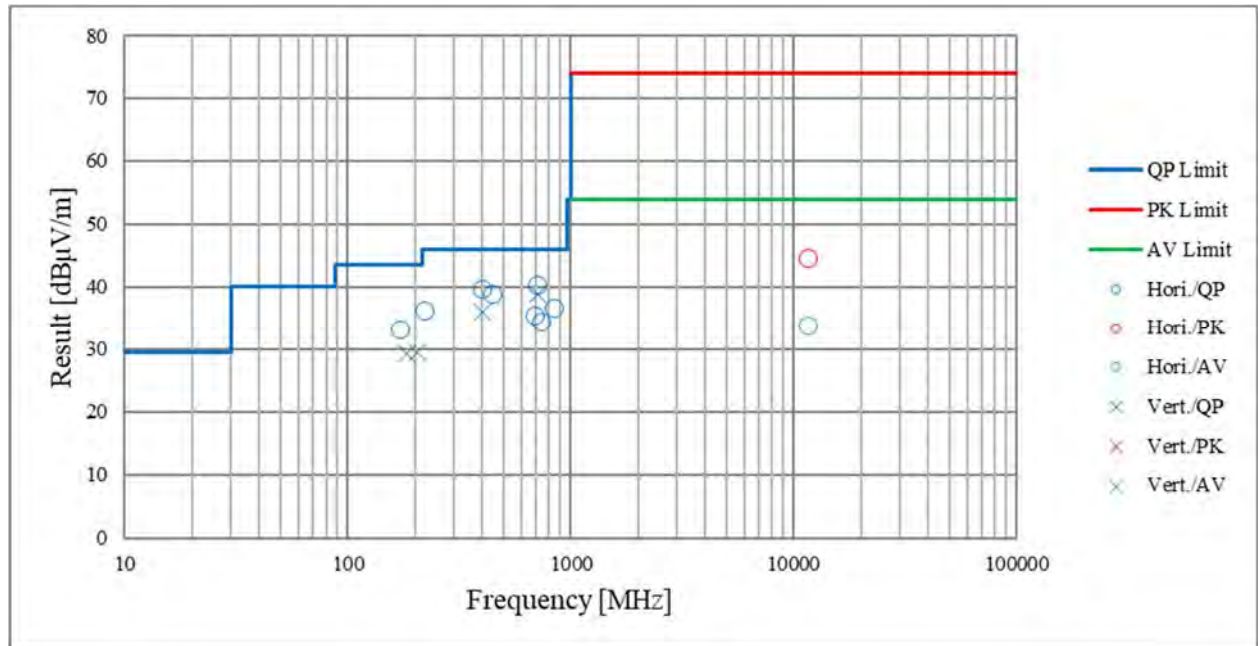
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission
(Plot data, Worst case)

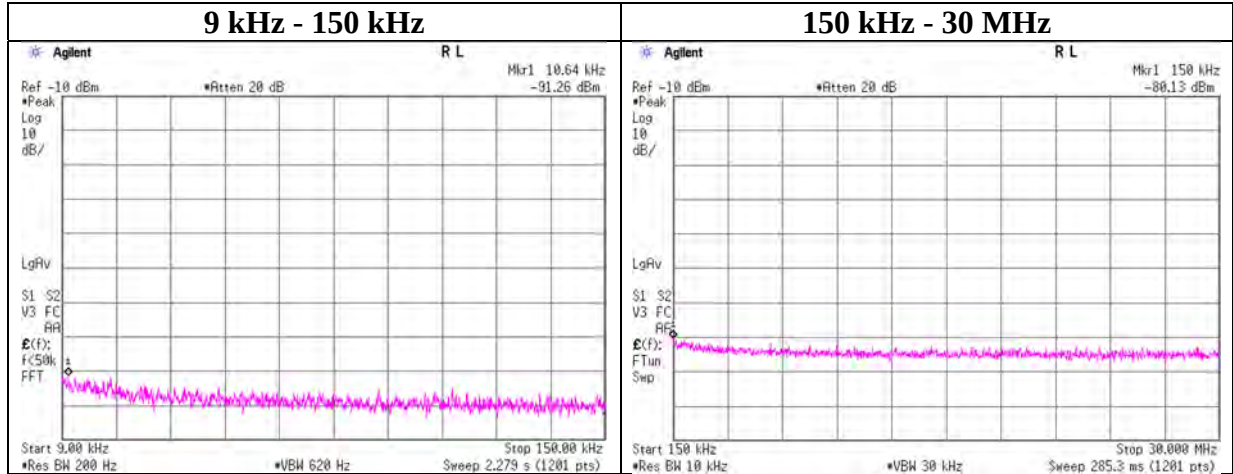
Report No.	13722221S-C-R1			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	2	3	3	1
Date	August 23, 2021	August 25, 2021	August 31, 2021	August 31, 2021
Temperature / Humidity	24 deg.C, 56 %RH	22 deg.C, 45 %RH	23 deg.C, 62 %RH	24 deg.C, 56 %RH
Engineer	Yosuke Murakami (30 MHz -1 GHz)	Akihiro Oda (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. 1372221S-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



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

UL Japan, Inc.

Shonan EMC Lab.

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