RADIO TEST REPORT

Test Report No. 14299869H-B-R2

Customer	**DENSO TEN Limited**
Description of EUT	**Car Audio**
Model Number of EUT	**TN0036A**
FCC ID	**BABTN0036A**
Test Regulation	**FCC Part 15 Subpart E**
Test Result	**Complied (Refer to SECTION 3)**
Issue Date	**November 27, 2023**
Remarks	**-**

Representative Test Engineer

Nachi Konegawa
Engineer

Approved By

Ryota Yamanaka
Engineer

CERTIFICATE 5107.02

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

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

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REVISION HISTORY

Original Test Report No.: 14299869H-B

This report is a revised version of 14299869H-B-R1. 14299869H-B-R1 is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14299869H-B	May 20, 2022	-
1	14299869H-B-R1	November 7, 2023	P.1 Deletion of note for Remarks
1	14299869H-B-R1	November 7, 2023	P.5 Section 2.2 Correction of Antenna Gain: Bluetooth: from -0.86 dBi to -0.84 dBi WLAN: from 4.31 dBi to 2.90 dBi
1	14299869H-B-R1	November 7, 2023	P.20-21 Maximum Conducted Output Power P.27-28 Maximum Power Spectral Density Recalculation of e.i.r.p. by Antenna Gain changed
2	14299869H-B-R2	November 27, 2023	P.5 SECTION 2.1 Correction of Sample Receipt Date from November 20, 2021 to April 24, 2024
2	14299869H-B-R2	November 27, 2023	P.5 SECTION 2.2 Deletion of sentence about simultaneous transmission
2	14299869H-B-R2	November 27, 2023	P.11 Correction of No.10 Cable information: - Cable name: from Signal Cable to USB Cable - Shield (Cable and Connector) from Unshielded to Shielded
2	14299869H-B-R2	November 27, 2023	P.28 Correction of Duty factor from 1.72 to 1.36, and Recalculation of Result
2	14299869H-B-R2	November 27, 2023	P.32 and 34 Correction of test room for Below 1 GHz from No. 4 to No. 3
2	14299869H-B-R2	November 27, 2023	P.35 Correction of Antenna gain from 4.31 to 2.90, and Recalculation of Result

Reference: Abbreviations (Including words undescribed in this report)

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

CONTENTS **PAGE**

SECTION 1: Customer Information

Company Name	DENSO TEN Limited
Address	2-28, Gosho-dori 1-chome, Hyogo-ku, Kobe 652-8510 Japan
Telephone Number	+81-78-682-2159
Contact Person	Kaoru Abe

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

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

SECTION 2: Equipment Under Test (EUT)

2.1 Identification of EUT

Description	Car Audio
Model Number	TN0036A
Serial Number	Refer to SECTION 4.2
Condition	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	April 24, 2022
Test Date	April 25 to May 10, 2022

2.2 Product Description

General Specification

Rating	DC 12 V
Operating temperature	-20 deg. C to +65 deg. C (Performance assured temperature range)

Radio Specification

Bluetooth (BR / EDR)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	FHSS (GFSK, π/4 DQPSK, 8 DPSK)
Antenna Gain	-0.84 dBi (peak)

WLAN (IEEE802.11a/11n-20)

Equipment Type	Transceiver	
Frequency of Operation	20 MHz Band:	5765 MHz
Type of Modulation	OFDM	
Antenna Gain	2.90 dBi (peak)	

* This test report applies to Wireless LAN part.

SECTION 3: Test specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart E FCC Part 15 final revised on April 1, 2022 and effective May 2, 2022
Title	FCC 47 CFR Part 15 Radio Frequency Device Subpart E Unlicensed National Information Infrastructure Devices Section 15.407 General technical requirements

* The revision does not affect the test result conducted before its effective date.

3.2 Procedures and Results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	ANSI C63.10-2013	15.407 (b) (6) / 15.207	N/A	N/A	*1)
26 dB Emission Bandwidth	KDB Publication Number 789033	15.407 (a) (1) (2) (3)	See data	Complied a)	Conducted
Maximum Conducted Output Power	KDB Publication Number 789033	15.407 (a) (1) (2) (3)		Complied b)	Conducted
Maximum Power Spectral Density	KDB Publication Number 789033	15.407 (a) (1) (2) (3)		Complied c)	Conducted
Spurious Emission Restricted Band Edge	ANSI C63.10-2013 KDB Publication Number 789033	15.407 (b), 15.205 and 15.209	11.5 dB 927.0 MHz, QP, Hori.	Complied d) / e)	Conducted (< 30 MHz)/ Radiated (> 30 MHz) *2)
6 dB Emission Bandwidth	ANSI C63.10-2013	15.407 (e)	See data	Complied f)	Conducted

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

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.
*2) Radiated test was selected over 30 MHz based on RSS-247 6.2 and KDB 789033 D02 G.3.b).

a) Refer to APPENDIX 1 (data of 26 dB Emission Bandwidth and 99 % Occupied Bandwidth)
b) Refer to APPENDIX 1 (data of Maximum Conducted Output Power)
c) Refer to APPENDIX 1 (data of Maximum Power Spectral Density)
d) Refer to APPENDIX 1 (data of Radiated Spurious Emission)
e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
f) 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

FCC Part 15.31 (e)

This EUT provides stable voltage constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

3.3 Addition to Standard

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
99 % Occupied Band Width	**ISED:** RSS-Gen 6.7	**ISED:** -	N/A	- a)	Conducted
a) 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.

Radiated emission

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

Antenna Terminal test

Test Item	Uncertainty (+/-)
26 dB Emission Bandwidth / 6 dB Emission Bandwidth / 99 % Occupied Bandwidth	0.96 %
Maximum Conducted Output Power / Average Output Power	1.5 dB
Burst Rate	0.10 %
Maximum Power Spectral Density	2.7 dB
Conducted Spurious Emission	2.7 dB

3.5 Test Location

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

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

3.6 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals -" of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11a (11a)	48 Mbps, PN9
IEEE 802.11n SISO 20 MHz BW (11n-20)	MCS 4 (Long GI), PN9

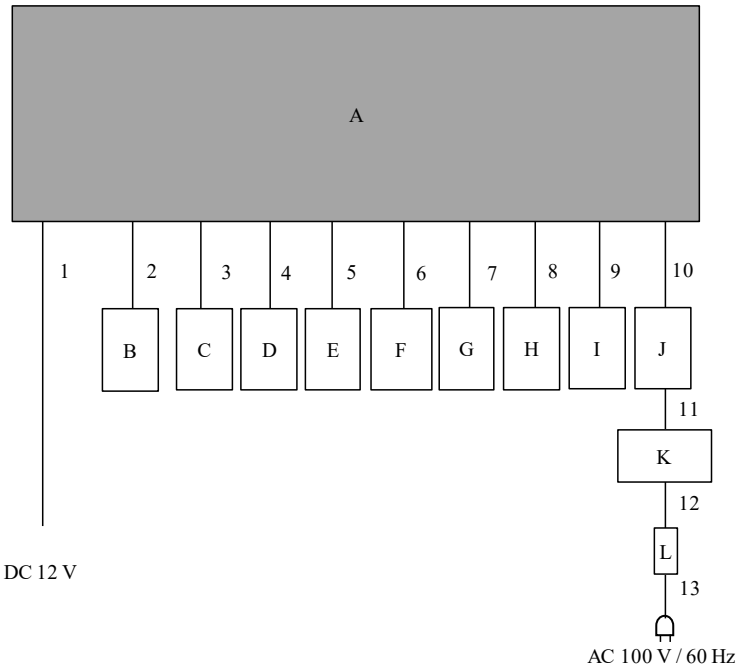
*Power of the EUT was set by the software as follows;
Power Setting: 6.5 dBm
Software: Wi-Fi Test FW_WF1 Version: WF1
(Date: November 25, 2021, Storage location: EUT memory)
*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.

*The Details of Operation Mode(s)

Test Item	Operating Mode	Tested Frequency			
		Lower Band	Middle Band	Additional Band	Upper Band
26 dB Emission Bandwidth, 99 % Occupied Bandwidth, 6 dB Bandwidth, Maximum Conducted Output Power, Maximum Power Spectral Density, Radiated Spurious Emission (Above 1 GHz)	Tx 11a Tx 11n-20	-	-	-	5765 MHz
Radiated Spurious Emission (Below 1 GHz) Conducted Spurious Emission	Tx 11n-20 *1)	-	-	-	5765 MHz
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.					

Configuration and Peripherals

for Antenna Terminal test



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

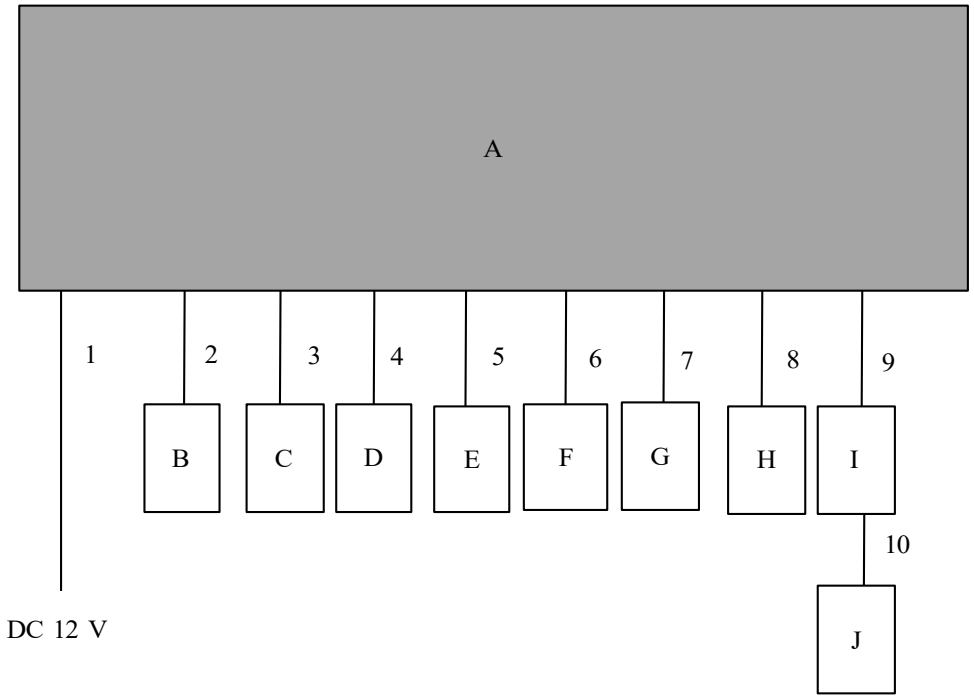
Description of EUT and Support Equipment

No.	Item	Model Number	Serial Number	Manufacturer	Remarks
A	Car Audio	TN0036A	114000-83790000	DENSO TEN Limited	EUT
B	Steering switch	84250-58150-B0	No.1	TOKAI RIKA	-
C	Microphone module	86730-78010	No.10	Panasonic	-
D	Back camera	867B0-78070	No.5	Panasonic	-
E	Speaker Dummy Load	SP Dummy	No.4	DENSO TEN Limited	-
F	AM/FM Sharkfin AMP	86760-K0010	No.4	YOKOWO	-
G	DAB Antenna AMP	863C0-60050	No.PQB02919	DENSO TEN Limited	-
H	GNSS Antenna	86880-78010	UI034347	HARADA	-
I	USB I/F Box	86190-78020	500881	Panasonic	-
J	Jig Board	-	-	-	-
K	Laptop PC	PR63PBAA337AD7X	6F053913H	TOSHIBA	-
L	AC Adapter	PA51770-1ACA	FX10800NSKACC	TOSHIBA	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	4.0	Unshielded	Unshielded	-
2	Signal Cable	3.0	Unshielded	Unshielded	-
3	Audio Cable	3.0	Shielded	Shielded	-
4	Signal Cable	5.0	Unshielded	Unshielded	-
5	Speaker Cable	3.0	Unshielded	Unshielded	-
6	Antenna Cable	2.0	Shielded	Shielded	-
7	Antenna Cable	2.0	Shielded	Shielded	-
8	Antenna Cable	2.0	Shielded	Shielded	-
9	Signal Cable	2.0	Unshielded	Unshielded	-
10	Signal Cable	2.3	Unshielded	Unshielded	-
11	USB Cable	1.0	Shielded	Shielded	-
12	DC Cable	1.7	Unshielded	Unshielded	-
13	AC Cable	0.8	Unshielded	Unshielded	-

for Radiated emission test



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

Description of EUT and Support Equipment

No.	Item	Model Number	Serial Number	Manufacturer	Remarks
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C	Microphone module	86730-78010	No.10	Panasonic	-
D	Back camera	867B0-78070	No.5	Panasonic	-
E	Speaker Dummy Load	SP Dummy	No.4	DENSO TEN Limited	-
F	AM/FM Sharkfin AMP	86760-K0010	No.4	YOKOWO	-
G	DAB Antenna AMP	863C0-60050	No.PQB02919	DENSO TEN Limited	-
H	GNSS Antenna	86880-78010	UI034347	HARADA	-
I	USB I/F Box	86190-78020	500881	Panasonic	-
J	iPhone	MD297B/A	C34JJ55EDTWD	Apple	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	4.0	Unshielded	Unshielded	-
2	Signal Cable	3.0	Unshielded	Unshielded	-
3	Audio Cable	3.0	Shielded	Shielded	-
4	Signal Cable	5.0	Unshielded	Unshielded	-
5	Speaker Cable	3.0	Unshielded	Unshielded	-
6	Antenna Cable	2.0	Shielded	Shielded	-
7	Antenna Cable	2.0	Shielded	Shielded	-
8	Antenna Cable	2.0	Shielded	Shielded	-
9	Signal Cable	2.0	Unshielded	Unshielded	-
10	USB Cable	1.0	Shielded	Shielded	-

SECTION 5: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

< Below 1GHz >
EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

< 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 W58 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:

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

Test Antennas are used as below;

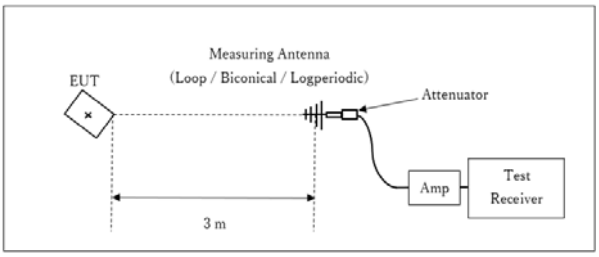
Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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 AD *1) RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: ≥ 100 traces If duty cycle was less than 98%, a duty factor was added to the results.

*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 1: Test Setup

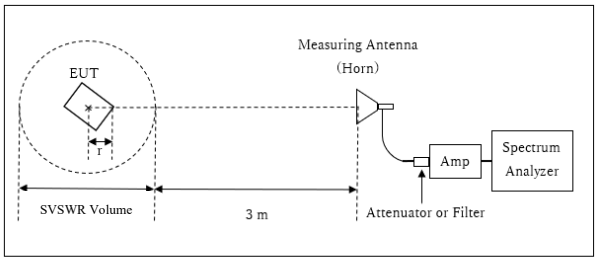
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

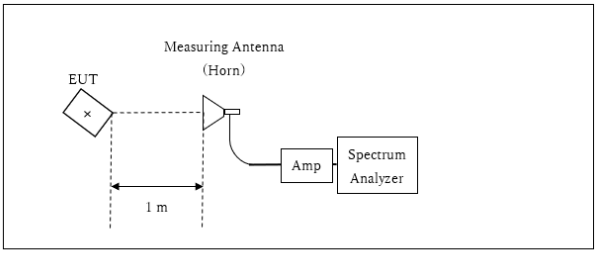


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.85 m / 3.0 m) = 2.17 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.85 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.15 m

10 GHz to 40 GHz



× : Center of turn table

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

The test was made on EUT at the normal use position.

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

Measurement Range : **30 MHz to 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
26 dB Bandwidth	Enough to capture the emission	Close to 1 % of EBW	> RBW	Auto	Peak	Max Hold	Spectrum Analyzer
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: 80 MHz BW) (Method PM)
Maximum Power Spectral Density	Encompass the entire EBW	1 MHz or 470 kHz *2)	≥ 3 RBW	Auto	RMS Power Averaging (200 times)	Clear Write	Spectrum Analyzer
Conducted Spurious Emission*3) *4)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 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 to 5.850 GHz, but it is not possible with spectrum analyzer, so RBW Correction Factor (10 log(500 kHz / 470 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 to 150 kHz: RBW = 200 Hz, 150 kHz to 30 MHz: RBW = 9.1 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

26 dB Emission Bandwidth and 99 % Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Date	May 9, 2022
Temperature / Humidity	26 deg. C / 33 % RH
Engineer	Nachi Konegawa
Mode	Tx

11a

Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
5765	-	17116.3

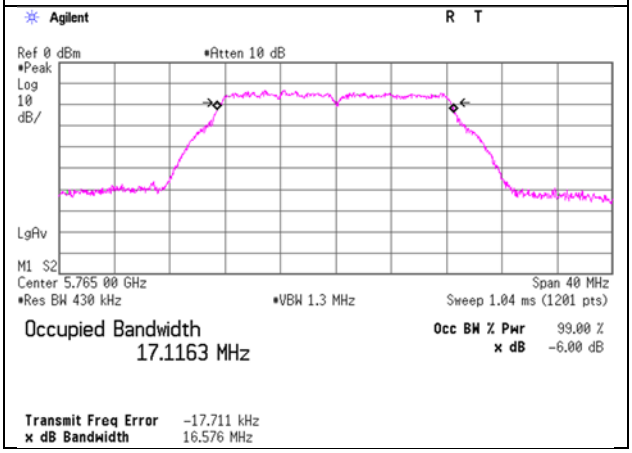
11n-20

Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
5765	-	18221.8

99 % Occupied Bandwidth

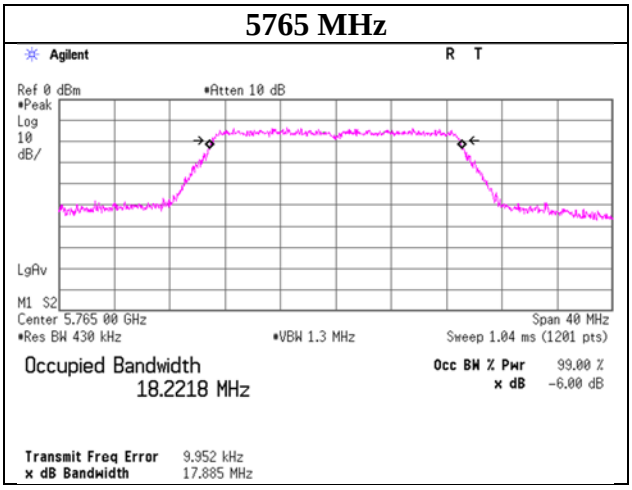
11a

5765 MHz



11n-20

5765 MHz



6 dB Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Date	May 9, 2022
Temperature / Humidity	26 deg. C / 33 % RH
Engineer	Nachi Konegawa
Mode	Tx

11a

Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
5765	16.460	> 0.500

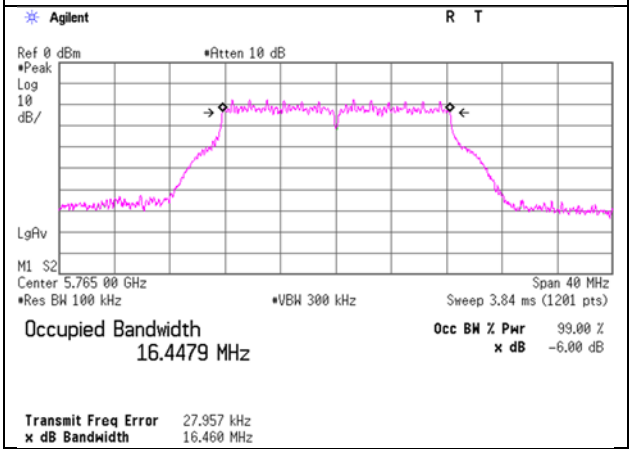
11n-20

Tested Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
5765	17.723	> 0.500

6 dB Bandwidth

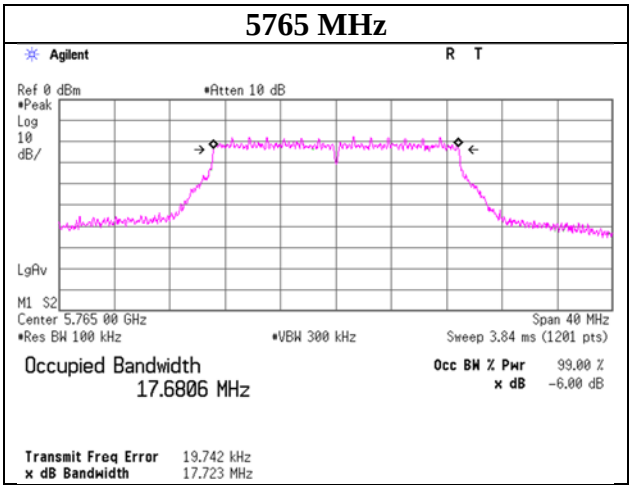
11a

5765 MHz



11n-20

5765 MHz



Maximum Conducted Output Power

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Date	April 25, 2022
Temperature / Humidity	23 deg. C / 46 % RH
Engineer	Hiroki Numata
Mode	Tx 11a

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

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	26 dB EBW (B for FCC)	99% OBW (B for IC)	Conducted Power Result		Limit	Margin	e.i.r.p. Result		Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBi]	[MHz]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5765	-6.80	0.75	10.15	1.72	2.90	-	17.116	5.82	3.82	30.00	24.18	8.72	7.45	36.00	27.28

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 (5250 MHz-5350 MHz, 5470 MHz-5725 MHz) = 250 mW or (11 + 10logB) dBm, whichever is lower
Conducted Power Limit (5725 MHz-5850 MHz) = 1W

Maximum Conducted Output Power

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Date	April 25, 2022
Temperature / Humidity	23 deg. C / 46 % RH
Engineer	Hiroki Numata
Mode	Tx 11n-20

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

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Duty Factor	Antenna Gain	26 dB EBW (B for FCC)	99% OBW (B for IC)	Conducted Power Result		Limit	Margin	e.i.r.p. Result		Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBi]	[MHz]	[MHz]	[dBm]	[mW]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[dB]
5765	-6.38	0.75	10.15	1.36	2.90	-	18.222	5.88	3.88	30.00	24.12	8.78	7.56	36.00	27.22

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 (5250 MHz-5350 MHz, 5470 MHz-5725 MHz) = 250 mW or (11 + 10logB) dBm, whichever is lower
Conducted Power Limit (5725 MHz-5850 MHz) = 1W

Maximum Conducted Output Power

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Date	April 25, 2022
Temperature / Humidity	23 deg. C / 46 % RH
Engineer	Hiroki Numata
Mode	Tx 11a

5765 MHz

Mode	Rate Mbps	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11a	6	-5.94	0.25	-5.69	
	9	-6.10	0.41	-5.69	
	12	-6.06	0.53	-5.53	
	18	-6.27	0.76	-5.51	
	24	-6.27	0.97	-5.30	
	36	-6.69	1.37	-5.32	
	48	-6.80	1.72	-5.08	*
	54	-7.23	1.81	-5.42	

* 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

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Date	April 25, 2022
Temperature / Humidity	23 deg. C / 46 % RH
Engineer	Hiroki Numata
Mode	Tx 11n-20

5765 MHz

Mode	MCS Number	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11n-20	0	-6.23	0.29	-5.94	
	1	-6.17	0.57	-5.60	
	2	-6.49	0.80	-5.69	
	3	-6.29	1.01	-5.28	
	4	-6.38	1.36	-5.02	Long GI *
	4	-6.91	1.50	-5.41	Short GI
	5	-6.93	1.66	-5.27	
	6	-7.12	1.78	-5.34	
	7	-7.16	1.91	-5.25	

* Worst rate

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

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

SGI : Short Guard Interval

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Date	April 25, 2022
Temperature / Humidity	22 deg. C / 44 % RH
Engineer	Hiroki Numata
Mode	Tx 11a

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Result (Timed average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
5765	-6.80	0.75	10.15	4.10	2.57	1.72	5.82	3.82

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

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

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Date	April 25, 2022
Temperature / Humidity	22 deg. C / 44 % RH
Engineer	Hiroki Numata
Mode	Tx 11n-20

Tested Frequency	Power Meter Reading	Cable Loss	Atten. Loss	Result (Timed average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
5765	-6.38	0.75	10.15	4.52	2.83	1.36	5.88	3.88

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

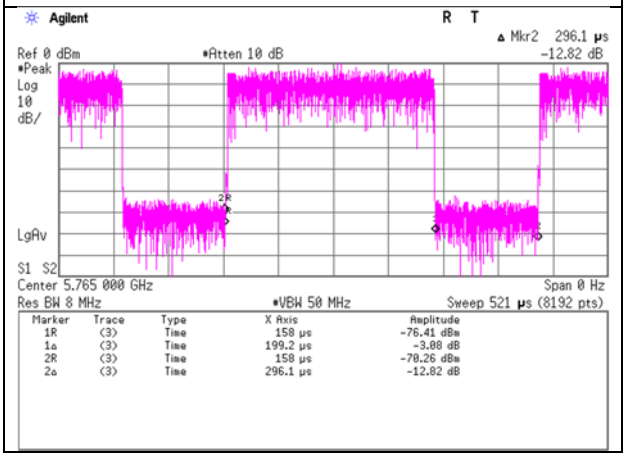
The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

Burst rate confirmation

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Date	April 25, 2022
Temperature / Humidity	22 deg. C / 44 % RH
Engineer	Hiroki Numata
Mode	Tx

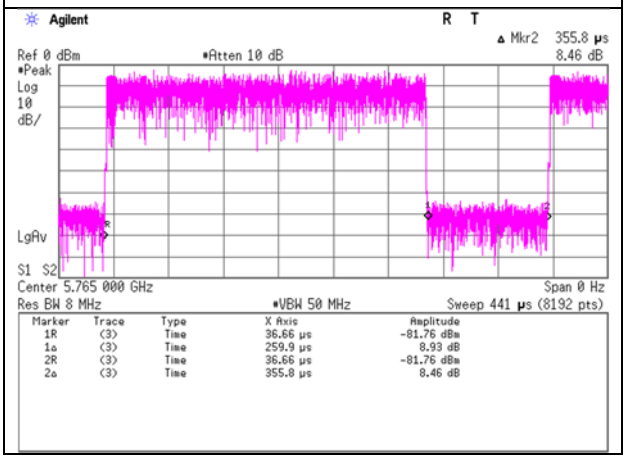
11a 48 Mbps

Tx on / (Tx on + Tx off) =	**0.673**
Tx on / (Tx on + Tx off) * 100 =	**67.3 %**
Duty factor = 10 * log (296.1 / 199.2) =	**1.72 dB**



11n-20 MCS 4

Tx on / (Tx on + Tx off) =	**0.730**
Tx on / (Tx on + Tx off) * 100 =	**73.0 %**
Duty factor = 10 * log (355.8 / 259.9) =	**1.36 dB**



Maximum Power Spectral Density

Test place	Ise EMC Lab. No.6 Measurement Room
Date	May 9, 2022
Temperature / Humidity	26 deg. C / 33 % RH
Engineer	Nachi Konegawa
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]
5765	-22.07	2.17	9.85	1.72	2.90	0.27	-8.06	30.00	38.06	-5.16	36.00	41.16

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 IC)

Maximum Power Spectral Density

Test place	Ise EMC Lab. No.6 Measurement Room
Date	May 9, 2022
Temperature / Humidity	26 deg. C / 33 % RH
Engineer	Nachi Konegawa
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]
5765	-22.21	2.17	9.85	1.36	2.90	0.27	-8.55	30.00	38.55	-5.65	36.00	41.65

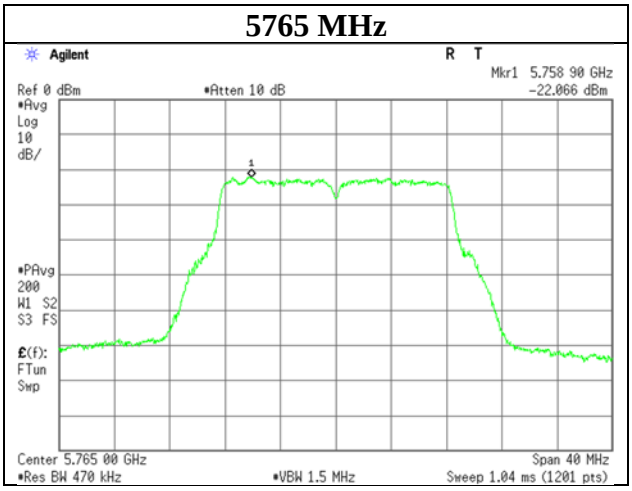
Sample Calculation:
PSD: Power Spectral Density
The PSD within 5725 MHz to 5825 MHz are based on any 500 kHz band.
RBW Correction Factor = 10 * log (Specified bandwidth / Measured bandwidth)
PSD Result (Conducted) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty 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 IC)

Maximum Power Spectral Density

Test place	Ise EMC Lab. No.6 Measurement Room
Date	May 9, 2022
Temperature / Humidity	26 deg. C / 33 % RH
Engineer	Nachi Konegawa
Mode	Tx

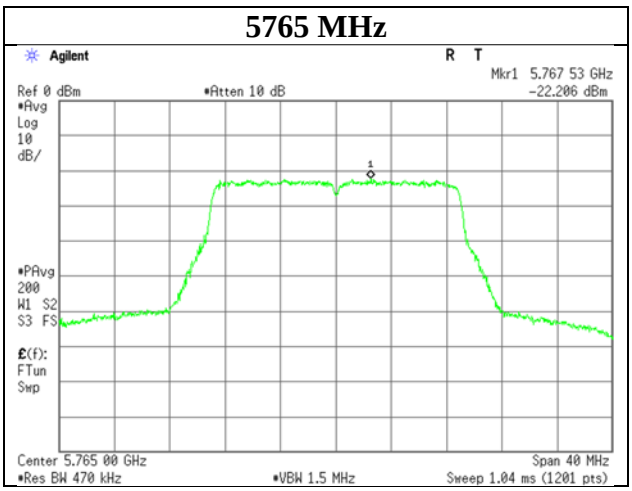
11a

5765 MHz



11n-20

5765 MHz



Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.1	No.1
Date	April 25, 2022	April 26, 2022
Temperature / Humidity	22 deg. C / 44 % RH	22 deg. C / 66 % RH
Engineer	Hiroki Numata	Yuichiro Yamazaki
	(1 GHz to 10 GHz)	(Above 10 GHz)
Mode	Tx 11a 5765 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	5650.0	43.9	-	31.5	6.1	35.7	-	45.8	-	68.2	-	22.4	-	
Hori.	5700.0	43.4	-	31.6	6.1	35.7	-	45.5	-	105.2	-	59.7	-	
Hori.	5720.0	46.1	-	31.7	6.1	35.7	-	48.2	-	110.8	-	62.6	-	
Hori.	5725.0	46.9	-	31.7	6.1	35.7	-	49.1	-	122.2	-	73.2	-	
Hori.	5850.0	44.1	-	32.1	6.1	35.7	-	46.6	-	122.2	-	75.6	-	
Hori.	5855.0	43.0	-	32.1	6.1	35.7	-	45.5	-	110.8	-	65.3	-	
Hori.	5875.0	43.6	-	32.1	6.1	35.7	-	46.1	-	105.2	-	59.1	-	
Hori.	5925.0	42.8	-	32.2	6.1	35.7	-	45.4	-	68.2	-	22.8	-	
Hori.	11530.0	42.7	33.4	39.7	-1.2	33.7	-	47.5	38.2	73.9	53.9	26.4	15.7	Floor noise
Hori.	17295.0	45.0	-	43.6	0.9	33.0	-	56.4	-	68.2	-	11.8	-	Floor noise
Hori.	23060.0	44.4	35.9	38.6	0.2	32.8	-	50.4	41.9	73.9	53.9	23.5	12.0	Floor noise
Vert.	5650.0	44.1	-	31.5	6.1	35.7	-	46.1	-	68.2	-	22.2	-	
Vert.	5700.0	44.0	-	31.6	6.1	35.7	-	46.0	-	105.2	-	59.2	-	
Vert.	5720.0	45.6	-	31.7	6.1	35.7	-	47.7	-	110.8	-	63.1	-	
Vert.	5725.0	44.4	-	31.7	6.1	35.7	-	46.5	-	122.2	-	75.7	-	
Vert.	5850.0	44.7	-	32.1	6.1	35.7	-	47.2	-	122.2	-	75.0	-	
Vert.	5855.0	45.1	-	32.1	6.1	35.7	-	47.6	-	110.8	-	63.2	-	
Vert.	5875.0	46.2	-	32.1	6.1	35.7	-	48.8	-	105.2	-	56.4	-	
Vert.	5925.0	43.1	-	32.2	6.1	35.7	-	45.8	-	68.2	-	22.4	-	
Vert.	11530.0	42.3	33.3	39.7	-1.2	33.7	-	47.2	38.2	73.9	53.9	26.7	15.8	Floor noise
Vert.	17295.0	45.2	-	43.6	0.9	33.0	-	56.7	-	68.2	-	11.5	-	Floor noise
Vert.	23060.0	44.7	35.9	38.6	0.2	32.8	-	50.7	41.9	73.9	53.9	23.2	12.0	Floor noise

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

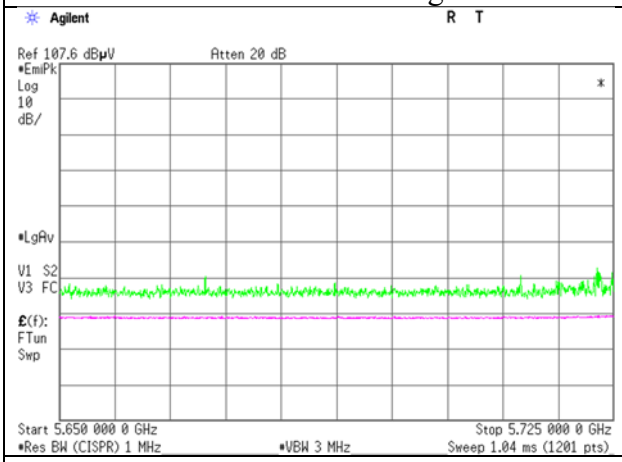
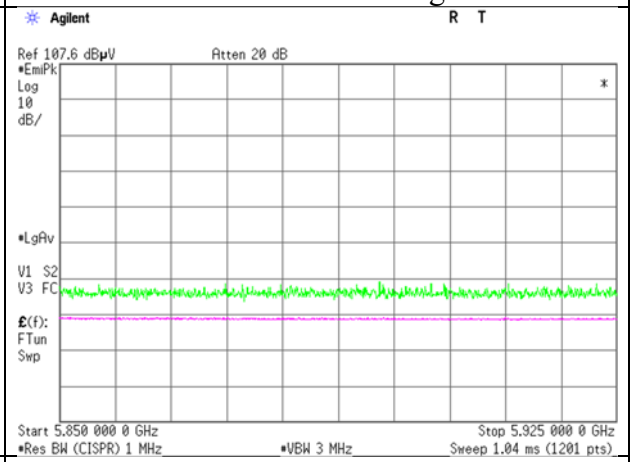
Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

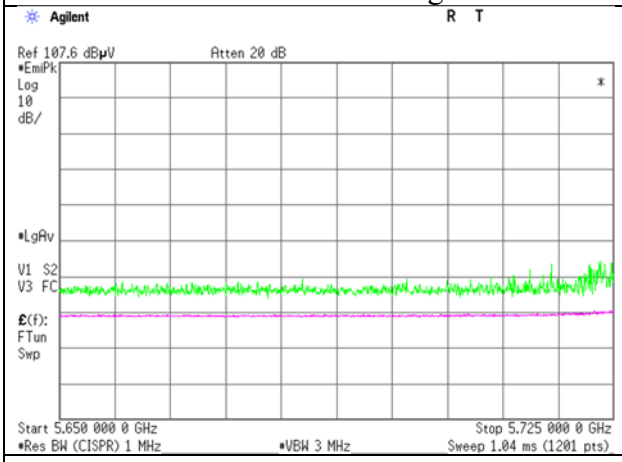
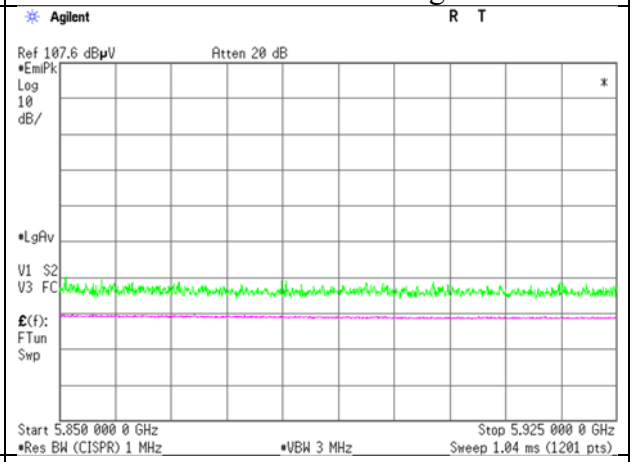
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*QP detector was used up to 1GHz.

Radiated Spurious Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	April 25, 2022
Temperature / Humidity	22 deg. C / 44 % RH
Engineer	Hiroki Numata
	(1 GHz to 10 GHz)
Mode	Tx 11a 5765 MHz

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

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

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

Radiated Spurious Emission

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.3
Date	April 25, 2022	April 26, 2022	May 9, 2022
Temperature / Humidity	22 deg. C / 44 % RH	22 deg. C / 66 % RH	22 deg. C / 54 % RH
Engineer	Hiroki Numata	Yuichiro Yamazaki	Takumi Nishida
	(1 GHz to 10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx 11n-20 5765 MHz		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	88.3	29.3	-	8.3	8.0	32.2	-	13.4	-	43.5	-	30.1	-	
Hori.	264.6	33.2	-	12.9	9.7	32.0	-	23.8	-	46.0	-	22.2	-	
Hori.	415.9	30.2	-	16.3	10.8	32.0	-	25.4	-	46.0	-	20.6	-	
Hori.	600.0	29.0	-	19.4	12.0	32.0	-	28.4	-	46.0	-	17.6	-	
Hori.	927.0	29.3	-	22.2	13.7	30.8	-	34.5	-	46.0	-	11.5	-	
Hori.	1000.0	28.1	-	22.5	14.1	30.4	-	34.3	-	53.9	-	19.6	-	
Hori.	5650.0	45.3	-	31.5	6.1	35.7	-	47.2	-	68.2	-	21.0	-	
Hori.	5700.0	44.3	-	31.6	6.1	35.7	-	46.3	-	105.2	-	58.9	-	
Hori.	5720.0	47.6	-	31.7	6.1	35.7	-	49.7	-	110.8	-	61.1	-	
Hori.	5725.0	47.7	-	31.7	6.1	35.7	-	49.9	-	122.2	-	72.3	-	
Hori.	5850.0	46.0	-	32.1	6.1	35.7	-	48.5	-	122.2	-	73.7	-	
Hori.	5855.0	44.7	-	32.1	6.1	35.7	-	47.2	-	110.8	-	63.6	-	
Hori.	5875.0	44.5	-	32.1	6.1	35.7	-	47.0	-	105.2	-	58.2	-	
Hori.	5925.0	45.4	-	32.2	6.1	35.7	-	48.0	-	68.2	-	20.2	-	
Hori.	11530.0	42.3	33.3	39.7	-1.2	33.7	-	47.1	38.2	73.9	53.9	26.8	15.7	Floor noise
Hori.	17295.0	44.8	-	43.6	0.9	33.0	-	56.3	-	68.2	-	11.9	-	Floor noise
Hori.	23060.0	44.3	35.8	38.6	0.2	32.8	-	50.3	41.8	73.9	53.9	23.7	12.1	Floor noise
Vert.	88.3	26.6	-	8.3	8.0	32.2	-	10.7	-	43.5	-	32.8	-	
Vert.	264.6	34.0	-	12.9	9.7	32.0	-	24.6	-	46.0	-	21.4	-	
Vert.	415.9	33.5	-	16.3	10.8	32.0	-	28.7	-	46.0	-	17.3	-	
Vert.	600.0	31.2	-	19.4	12.0	32.0	-	30.6	-	46.0	-	15.4	-	
Vert.	927.0	28.3	-	22.2	13.7	30.8	-	33.5	-	46.0	-	12.5	-	
Vert.	1000.0	31.8	-	22.5	14.1	30.4	-	38.0	-	53.9	-	15.9	-	
Vert.	5650.0	45.9	-	31.5	6.1	35.7	-	47.8	-	68.2	-	20.4	-	
Vert.	5700.0	45.1	-	31.6	6.1	35.7	-	47.2	-	105.2	-	58.0	-	
Vert.	5720.0	47.2	-	31.7	6.1	35.7	-	49.3	-	110.8	-	61.5	-	
Vert.	5725.0	45.2	-	31.7	6.1	35.7	-	47.3	-	122.2	-	74.9	-	
Vert.	5850.0	44.7	-	32.1	6.1	35.7	-	47.2	-	122.2	-	75.0	-	
Vert.	5855.0	45.1	-	32.1	6.1	35.7	-	47.6	-	110.8	-	63.2	-	
Vert.	5875.0	43.9	-	32.1	6.1	35.7	-	46.5	-	105.2	-	58.7	-	
Vert.	5925.0	44.5	-	32.2	6.1	35.7	-	47.2	-	68.2	-	21.0	-	
Vert.	11530.0	42.5	33.1	39.7	-1.2	33.7	-	47.4	38.0	73.9	53.9	26.6	16.0	Floor noise
Vert.	17295.0	44.7	-	43.6	0.9	33.0	-	56.2	-	68.2	-	12.0	-	Floor noise
Vert.	23060.0	44.6	35.8	38.6	0.2	32.8	-	50.6	41.8	73.9	53.9	23.3	12.2	Floor noise

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

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

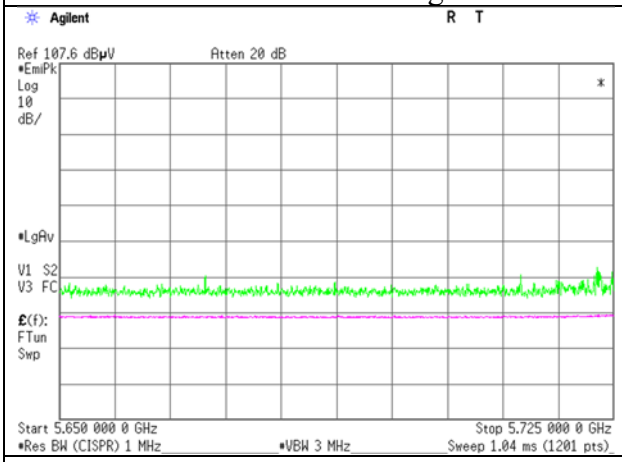
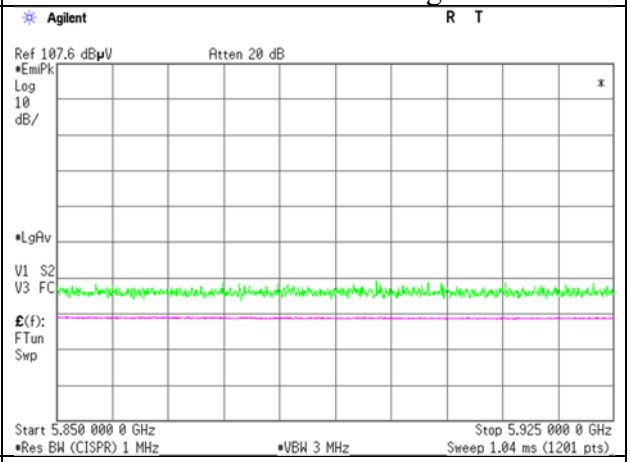
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

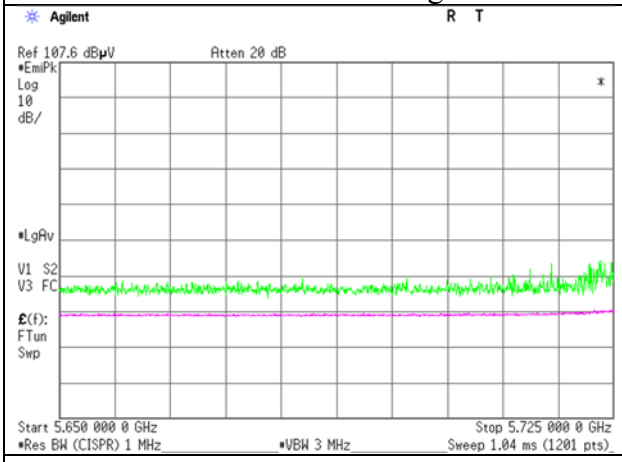
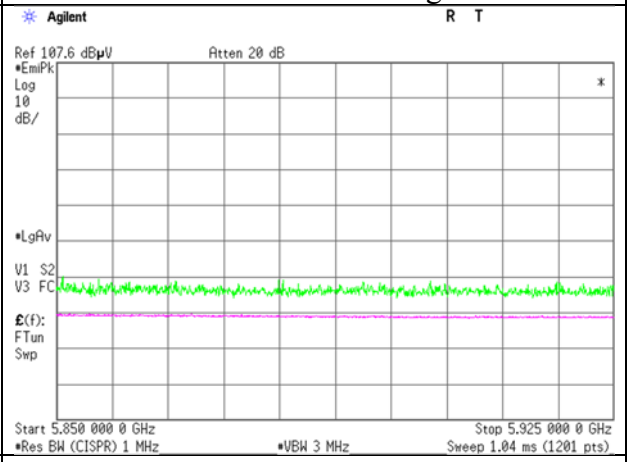
*QP detector was used up to 1GHz.

Distance factor: 1 GHz - 10 GHz 20log (3.85 m / 3.0 m) = 2.17 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	April 25, 2022
Temperature / Humidity	22 deg. C / 44 % RH
Engineer	Hiroki Numata
Mode	Tx 11n-20 5765 MHz

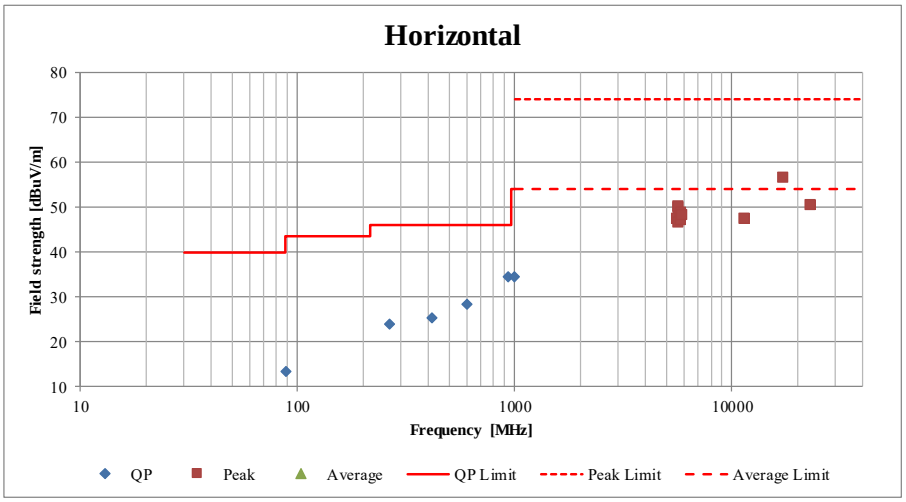
Horizontal	Horizontal
Restricted-band band-edge Plot	Restricted-band band-edge Plot
	
Trace Green: Peak Plot Trace Purple: Average Plot	Trace Green: Peak Plot Trace Purple: Average Plot

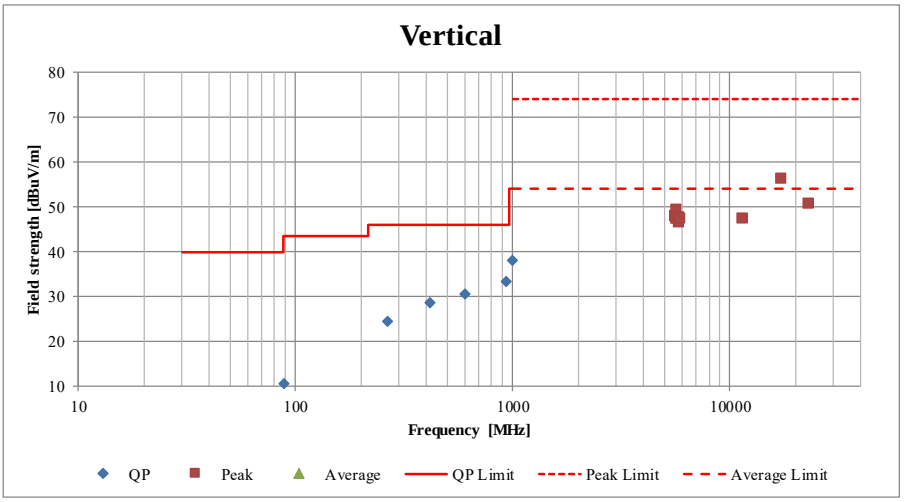
Vertical	Vertical
Restricted-band band-edge Plot	Restricted-band band-edge Plot
	
Trace Green: Peak Plot Trace Purple: Average Plot	Trace Green: Peak Plot Trace Purple: Average Plot

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

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

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.1	No.1	No.3
Date	April 25, 2022	April 26, 2022	May 9, 2022
Temperature / Humidity	22 deg. C / 44 % RH	22 deg. C / 66 % RH	22 deg. C / 54 % RH
Engineer	Hiroki Numata	Yuichiro Yamazaki	Takumi Nishida
	(1 GHz to 10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx 11n-20 5765 MHz		



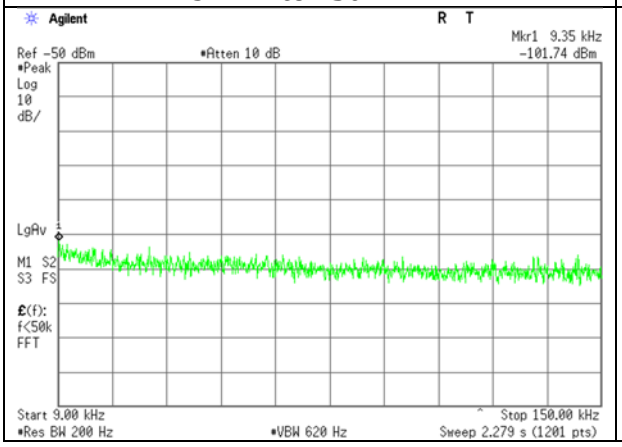


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

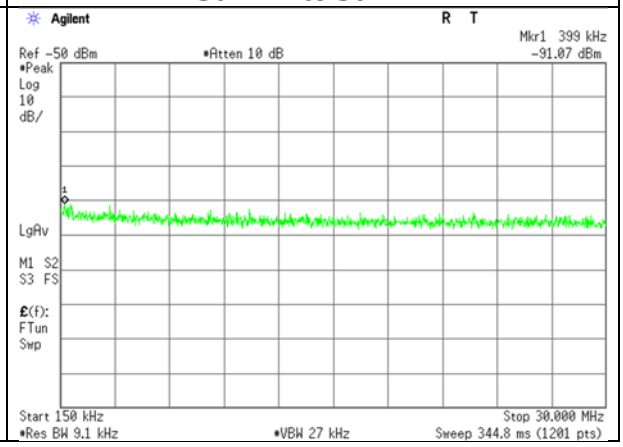
Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Date	May 9, 2022
Temperature / Humidity	26 deg. C / 33 % RH
Engineer	Nachi Konegawa
Mode	Tx 11n-20 5765 MHz

9 kHz to 150 kHz



150 kHz to 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
9.35	-101.7	0.77	9.84	2.90	1	-88.2	300	6.0	-27.0	48.1	75.1	
399.00	-91.1	0.93	9.89	2.90	1	-77.3	300	6.0	-16.1	15.5	31.6	

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

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

N: Number of output

APPENDIX 2: Test Instruments

Test Equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	MAT-10	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	11/09/2021	12
AT	MAT-20	141173	Attenuator(10dB) (above1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-110	-	12/08/2021	12
AT	MAT-89	141419	Attenuator	Weinschel Associates	WA56-10	56100305	05/14/2021	12
AT	MCC-244	197219	Microwave cable	Huber+Suhner	SF126E/11PC35/ 11PC35/2000MM	536999/126E	03/17/2022	12
AT	MCC-38	141395	Coaxial Cable	UL Japan	-	-	11/19/2021	12
AT	MMM-18	141558	Digital Tester(TRUE RMS MULTIMETER)	Fluke Corporation	115	17930030	05/24/2021	12
AT	MOS-14	141561	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1401	01/10/2022	12
AT	MPM-16	141812	Power Meter	Keysight Technologies Inc	8990B	MY51000271	08/11/2021	12
AT	MPSE-22	141842	Power sensor	Keysight Technologies Inc	N1923A	MY54070003	08/11/2021	12
AT	MSA-22	141978	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180899	03/24/2022	12
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-01	141998	AC1_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	06/08/2020	24
RE	MAEC-01-SVSWR	141994	AC1_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 10m	DA-06881	04/05/2021	24
RE	MAEC-03	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/22/2020	24
RE	MAEC-03-SVSWR	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/01/2021	24
RE	MAT-95	142314	Attenuator	Pasternack Enterprises	PE7390-6	D/C 1504	06/09/2021	12
RE	MBA-08	141427	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103B+BBA 9106	08031	07/10/2021	12
RE	MCC-177	141226	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S304	03/17/2022	12
RE	MCC-217	141393	Microwave Cable	Junkosha	MWX221	1604S254(1 m) / 1608S088(5 m)	08/04/2021	12
RE	MCC-231	177964	Microwave Cable	Junkosha INC.	MMX221	1901S329(1m)/ 1902S579(5m)	03/15/2022	12
RE	MCC-51	141323	Coaxial cable	UL Japan	-	-	07/19/2021	12
RE	MCC-54	141325	Microwave Cable	Suhner	SUCOFLEX101	2873(1m) / 2876(5m)	03/17/2022	12
RE	MHA-05	141511	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	253	09/24/2021	12
RE	MHA-16	141513	Horn Antenna 15-40GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9170	BBHA9170306	06/07/2021	12
RE	MHA-20	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	258	11/09/2021	12
RE	MHF-22	141293	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCB	602	02/24/2022	12
RE	MJM-16	142183	Measure	KOMELON	KMC-36	-	-	-
RE	MJM-25	142226	Measure	KOMELON	KMC-36	-	-	-
RE	MLA-22	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-191	08/21/2021	12
RE	MMM-03	141530	Digital Tester	Fluke Corporation	FLUKE 26-3	78030621	08/10/2021	12
RE	MMM-08	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201197	01/16/2022	12
RE	MOS-13	141554	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1301	01/10/2022	12
RE	MOS-27	141566	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	A08Q26	01/10/2022	12
RE	MPA-01	141576	Pre Amplifier	Keysight Technologies Inc	8449B	3008A01671	02/22/2022	12
RE	MPA-11	141580	MicroWave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	03/17/2022	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/25/2022	12
RE	MPA-22	141588	Pre Amplifier	MITEQ, Inc	AMF-6F-2600400-33-8P / AMF-4F-2600400-33-8P	1871355 / 1871328	09/30/2021	12
RE	MRENT-130	141855	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187750	11/28/2021	12
RE	MSA-22	141978	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180899	03/24/2022	12
RE	MTR-08	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	08/05/2021	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