



RADIO TEST REPORT

Test Report No. : 13828808H-A-R1

Applicant : DENSO TEN Limited
Type of EUT : Car Navigation
Model Number of EUT : TN0022A
FCC ID : BABTN0022A
Test regulation : FCC Part 15 Subpart C: 2021
*WLAN and Bluetooth Low Energy parts
Test Result : Complied (Refer to SECTION 3)

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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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. Ise 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 13828808H-A. 13828808H-A is replaced with this report.

Date of test: June 6 to October 19, 2021

Representative test engineer: 
Nachi Konegawa
Engineer

Approved by: 
Tsubasa Takayama
Leader



CERTIFICATE 5107.02

- ☐ 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.: 13828808H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13828808H-A	October 20, 2021	-	-
1	13828808H-A-R1	October 27, 2021	P.10	Addition of Tested Antenna to Simultaneous transmission table
1	13828808H-A-R1	October 27, 2021	P.10	Correction of sentence *1) in Simultaneous transmission table

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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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SECTION 1: Customer information

Company Name	:	DENSO TEN Limited
Address	:	2-28, Goshō-dori 1-Chome, Hyogo-ku, Kobe, 652-8510 JAPAN
Telephone Number	:	+81-78-682-2159
Facsimile Number	:	+81-78-682-2169
Contact Person	:	Kaoru Abe

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	:	Car Navigation
Model Number	:	TN0022A
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 12 V
Receipt Date	:	June 4, 2021
Country of Mass-production	:	Japan
Condition	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	:	No Modification by the test lab.

2.2 Product Description

Model: TN0022A (referred to as the EUT in this report) is a Car Navigation.

Radio Specification

Radio Type : Transceiver
Clock frequency(ies) : 7.3333333 GHz

	IEEE802.11b	IEEE802.11g/n (20 M band)	IEEE802.11a/n/ac (20 M band)	IEEE802.11n/ac (40 M band)	IEEE802.11ac (80 M band)
Frequency of operation	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz	5180 MHz - 5240 MHz 5745 MHz - 5825 MHz	5190 MHz - 5230 MHz 5755 MHz - 5795 MHz	5210 MHz 5775 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK, 256QAM (IEEE802.11ac only))		
Channel spacing	5MHz		20MHz	40MHz	80MHz
Antenna type	Inverted F Antenna				
Antenna Connector type	U.FL-R-SMT-1(80)				
Antenna Gain	-1.59 dBi (Peak): 2.4 GHz Band 2.92 dBi (Peak) (ANT 1) / 2.11 dBi (Peak) (ANT 2) : 5 GHz Band				

	Bluetooth Ver.5.0 with EDR function
Frequency of operation	2402 MHz - 2480 MHz
Type of modulation	BT: FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK) LE: GFSK
Channel spacing	BT: 1 MHz LE: 2 MHz
Antenna type	Inverted F Antenna
Antenna Connector type	U.FL-R-SMT-1(80)
Antenna Gain	-1.7 dBi (Peak)

	Broadcast Receiver
Radio Type	Receiver
Frequency of Operation	AM, HD_AM: 530 kHz - 1710 kHz FM, RBDS/HD_FM: 87.75 MHz - 107.9 MHz SDARS: 2320 MHz - 2345 MHz
Channel spacing	AM, HD_AM: 10 kHz FM, RBDS/HD_FM: 200 kHz
Antenna connector type	HFC IV

*1) This test report applies to WLAN (2.4 GHz Band) and BT LE only.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

Title : FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz,
and 5725-5850 MHz

* 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	FCC: ANSI C63.10-2013 6. Standard test methods ISED: RSS-Gen 8.8	FCC: Section 15.207 ISED: RSS-Gen 8.8	-	N/A	*1)
6dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(2) ISED: RSS-247 5.2(a)	See data.	Complied a)	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.12	FCC: Section 15.247(b)(3) ISED: RSS-247 5.4(d)		Complied b)	Conducted
Power Density	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(e) ISED: RSS-247 5.2(b)		Complied c)	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.13	FCC: Section 15.247(d) ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	9.3 dB 915.819 MHz, QP, Vert.	Complied d), e)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)

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 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 section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6.

a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)

b) Refer to APPENDIX 1 (data of Maximum Peak Output Power)

c) Refer to APPENDIX 1 (data of Power Density)

d) Refer to APPENDIX 1 (data of Conducted Spurious Emission)

e) Refer to APPENDIX 1 (data of Radiated Spurious Emission)

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)

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.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	ISED: RSS-Gen 6.7	ISED: -	N/A	- a)	Conducted
a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)					

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

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the 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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Antenna Terminal test

Test Item	Uncertainty (+/-)
20 dB Bandwidth / 99 % Occupied Bandwidth	0.96 %
Maximum Peak Output Power / Average Output Power	1.4 dB
Carrier Frequency Separation	0.42 %
Dwell time / Burst rate	0.10 %
Conducted Spurious Emission	2.6 dB

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal) (Vertical)	4.8 dB
		5.0 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.2 dB
		6.3 dB
10 m	30 MHz to 200 MHz (Horizontal) (Vertical)	4.8 dB
		4.8 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.0 dB
		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	5.5 dB
	26.5 GHz to 40 GHz	5.5 dB
10 m	1 GHz to 18 GHz	5.2 dB

3.5 Test Location

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*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919

ISED Lab Company Number: 2973C / CAB identifier: JP0002

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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	-	-

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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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 802.11b (11b)	11 Mbps, PN9
IEEE 802.11g (11g)	48 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 6 (Short GI), PN9
Bluetooth Low Energy (BT LE)	Maximum Packet Size, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: 11b : 14 dBm 11g/11n : 6 dBm BT LE : 0 dBm Software: for WLAN: QCA RCT Ver 3.0.144.0 (Date: October 9, 2017) TeraTerm ver.4.104 (Date: August 30, 2019) for BT LE: BSDT Ver 5.2.0 (Date: October 9, 2019) TeraTerm ver.4.104 (Date: August 30, 2019) (Storage location: Driven by connected PC)	
*This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Spurious Emission (Radiated)	11b Tx	2412 MHz
	11n-20 Tx *1)	2437 MHz
		2462 MHz
	BT LE Tx	2402 MHz
		2440 MHz
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	11b Tx	2412 MHz
	11g Tx	2437 MHz
	11n-20 Tx	2462 MHz
	BT LE Tx	2402 MHz
		2440 MHz
Spurious Emission (Conducted)	11n-20 Tx *1)	2437 MHz
	BT LE Tx	2402 MHz
		2440 MHz
		2480 MHz

*1) Since 11g and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power.

Simultaneous transmission

Test Item	Mode *1)	Tested Antenna
Radiated Spurious Emission	Tx BT LE 2402 MHz + Tx 11a 5180 MHz Tx BT LE 2440 MHz + Tx 11a 5180 MHz Tx BT LE 2480 MHz + Tx 11a 5180 MHz	Bluetooth LE (Antenna 2) + 11a (Antenna 2)
*1) The test was performed on the mode as a representative, because it had the highest power (11a mode /Antenna 2) of 5 GHz band at antenna terminal test.		

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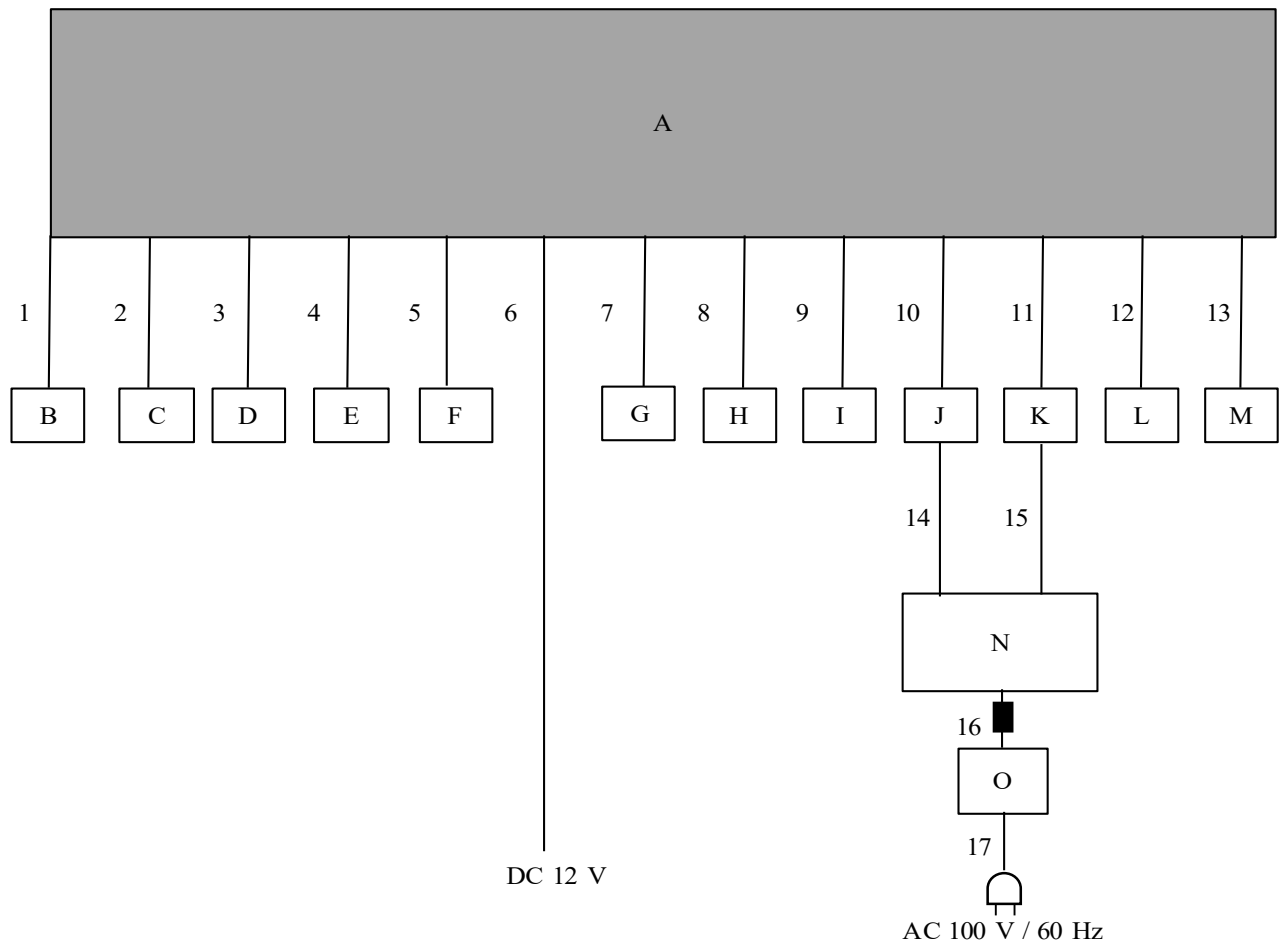
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4.2 Configuration and peripherals

For Antenna Terminal Conducted Tests



* 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 Navigation	TN0022A	AT200008	DENSO TEN Limited	EUT
B	Switch	-	-	-	-
C	DCM	19MC DCM	86741-48071	DENSO Corporation	-
D	Steering Switch	PA6-GF30	39	TOYOTA	-
E	Low noise Amp	ZX60-242	GLN-S+	Mini-Circuits	-
F	GPS Antenna	23D900113	48	yokowo co.,ltd.	-
G	FM/AM connector (Main)	86300-30C30	146000-63300101	DENSO TEN Limited	-
H	FM/AM connector (Sub)	86300-30C70	146000-63400101	DENSO TEN Limited	-
I	Back Camera	GP-KD7301RC	85C602752	Panasonic	-
J	USB LAN transfer	ETX3-US2	G000024	I-O DATA	-
K	Jig Board	135943-58990920	3700980A186	DENSO TEN Limited	-
L	Mic	SDA3510A	0AC067100	Panasonic	-
M	Mic	SDA3510A	0AC067082	Panasonic	-
N	Laptop PC	CF-LX4EDHCS	5GKSA17377	Panasonic	-
O	AC Adapter	CF-AA62J2C	64B2CM114703755B	Panasonic	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	2.4	Unshielded	Unshielded	-
2	Signal Cable	2.4	Unshielded	Unshielded	-
3	Signal Cable	2.4	Unshielded	Unshielded	-
4	Signal Cable	1.0	Unshielded	Unshielded	-
5	GNSS Antenna Cable	2.6	Shielded	Shielded	-
6	DC Cable	3.4	Unshielded	Unshielded	-
7	Signal Cable	2.6	Unshielded	Unshielded	-
8	Signal Cable	2.6	Unshielded	Unshielded	-
9	Signal Cable	2.4	Unshielded	Unshielded	-
10	USB Cable	3.2	Shielded	Shielded	-
11	Signal Cable	0.1	Unshielded	Unshielded	-
12	Signal Cable	2.7	Unshielded	Unshielded	-
13	Signal Cable	2.7	Unshielded	Unshielded	-
14	LAN Cable	1.0	Unshielded	Unshielded	-
15	USB Cable	0.2	Shielded	Shielded	-
16	DC Cable	0.9	Unshielded	Unshielded	-
17	AC Cable	0.8	Unshielded	Unshielded	-

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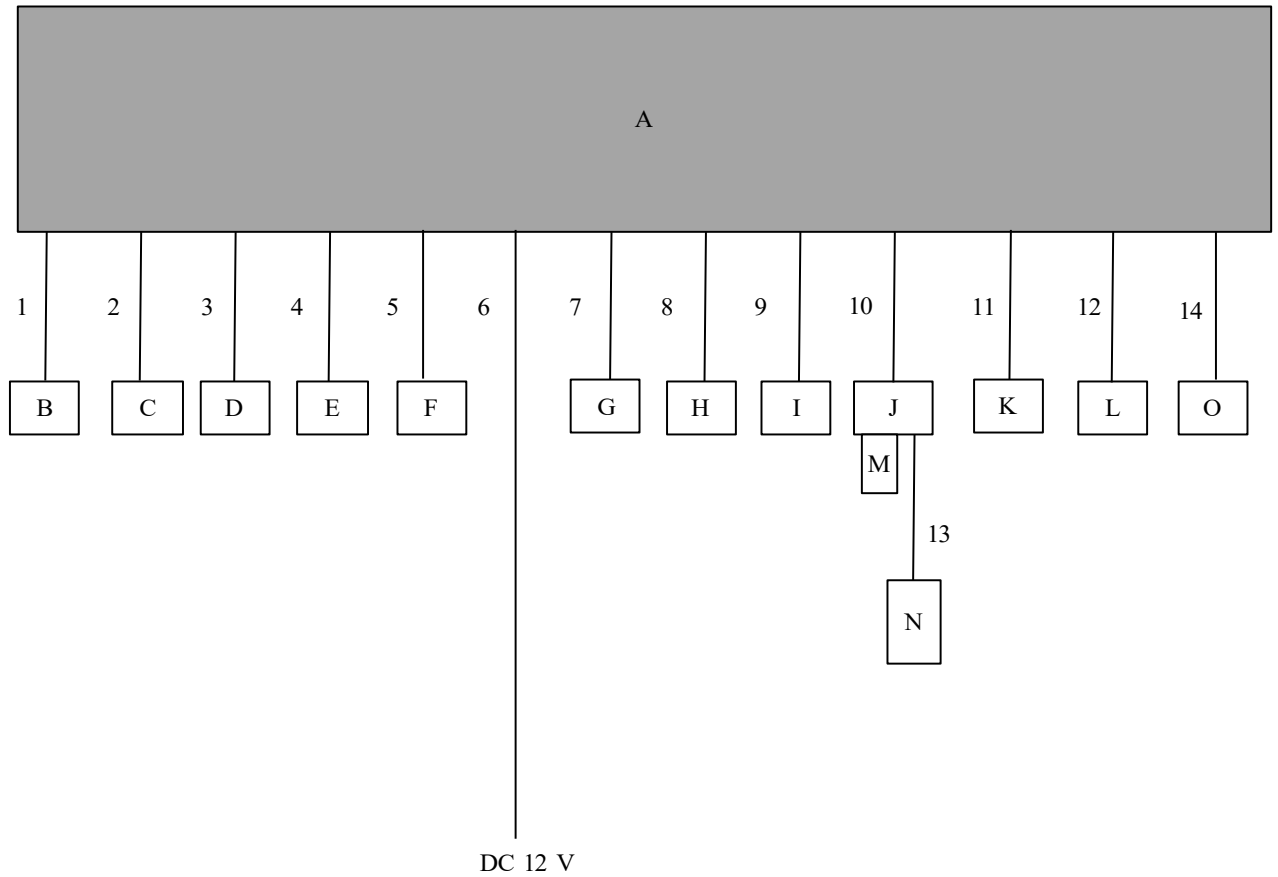
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For Radiated Spurious Emission test



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Navigation	TN0022A	AT200016	DENSO TEN Limited.	EUT
B	Switch	-	-	-	-
C	DCM	19MC DCM	E-033720026/006	DENSO Corporation	-
D	Steering Switch	PA6-GF30	48	TOYOTA	-
E	Low noise Amp	ZX60-242GLN-S+	S 2036302044	Mini-Circuits	-
F	GPS Antenna	23D90058	No.17	yokowo co.,ltd.	-
G	FM/AM connector (Main)	86300-30C30	PS600112	DENSO TEN Limited	-
H	FM/AM connector (Sub)	86300-30C70	PS6020494	DENSO TEN Limited	-
I	Back Camera	GP-KD7301RC	64F000037	Panasonic	-
J	USB/AUX socket	86190-12040	No.17	Kojima Industries Corporation	-
K	Mic	SDA3510A	0DC040830	Panasonic	-
L	Mic	SDA3510A	0DC040817	Panasonic	-
M	USB Memory	USM4GR B	17116 DGGNN	SONY	-
N	iPod touch	A1367	CCQ50WDDCPC	Apple	-
O	Speaker Dummy	-	-	-	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	2.4	Unshielded	Unshielded	-
2	Signal Cable	2.4	Unshielded	Unshielded	-
3	Signal Cable	2.4	Unshielded	Unshielded	-
4	Signal Cable	1.0	Unshielded	Unshielded	-
5	GNSS Antenna Cable	2.6	Shielded	Shielded	-
6	DC Cable	3.4	Unshielded	Unshielded	-
7	Signal Cable	2.6	Unshielded	Unshielded	-
8	Signal Cable	2.6	Unshielded	Unshielded	-
9	Signal Cable	2.4	Unshielded	Unshielded	-
10	USB Cable	3.2	Shielded	Shielded	-
11	Signal Cable	2.7	Unshielded	Unshielded	-
12	Signal Cable	2.7	Unshielded	Unshielded	-
13	Audio Cable	1.5	Shielded	Shielded	-
14	Speaker Cable	3.2	Unshielded	Unshielded	-

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SECTION 5: Radiated Spurious Emission

Test Procedure

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

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

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

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.

Test Antennas are used as below;

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

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	11.12.2.5.1 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces 11.12.2.5.2 The duty cycle was less than 98% for detected noise, a duty factor was added to the 11.12.2.5.1 results.	RBW: 100 kHz VBW: 300 kHz

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

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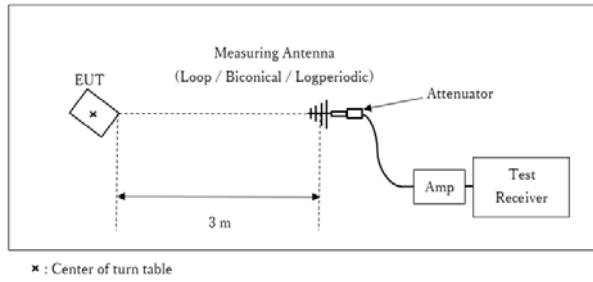
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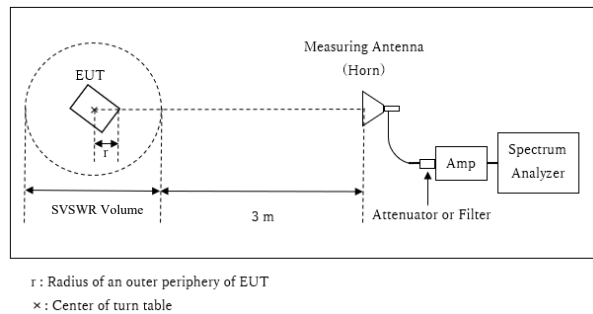
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

1 GHz - 10 GHz



Distance Factor: $20 \times \log (3.55 \text{ m} / 3.0 \text{ m}) = 1.46 \text{ dB}$

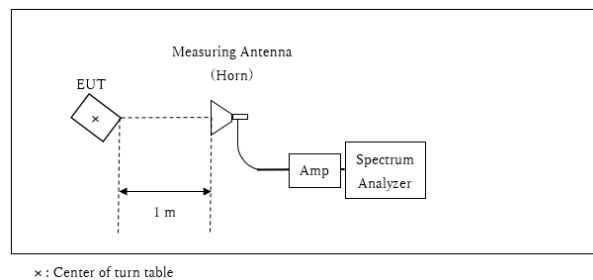
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.55 \text{ m}$

SVSWR Volume : 1.5 m

(SVSWR Volume has been calibrated based on CISPR 16-1-4.)

r = 0.2 m

10 GHz - 26.5 GHz



Distance Factor: $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

*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 - 26.5 GHz
Test data	: APPENDIX
Test result	: Pass

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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
6dB Bandwidth	20 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/Average *2)	-	Power Meter (Sensor: 50 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	10 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4) *5)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1 kHz	27 kHz				

*1) Peak hold was applied as Worst-case measurement.
 *2) Reference data
 *3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".
 *4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
 Then, wide-band noise near the limit was checked separately, however the noise was low enough as shown in the chart.
 (9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz).
 *5) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 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

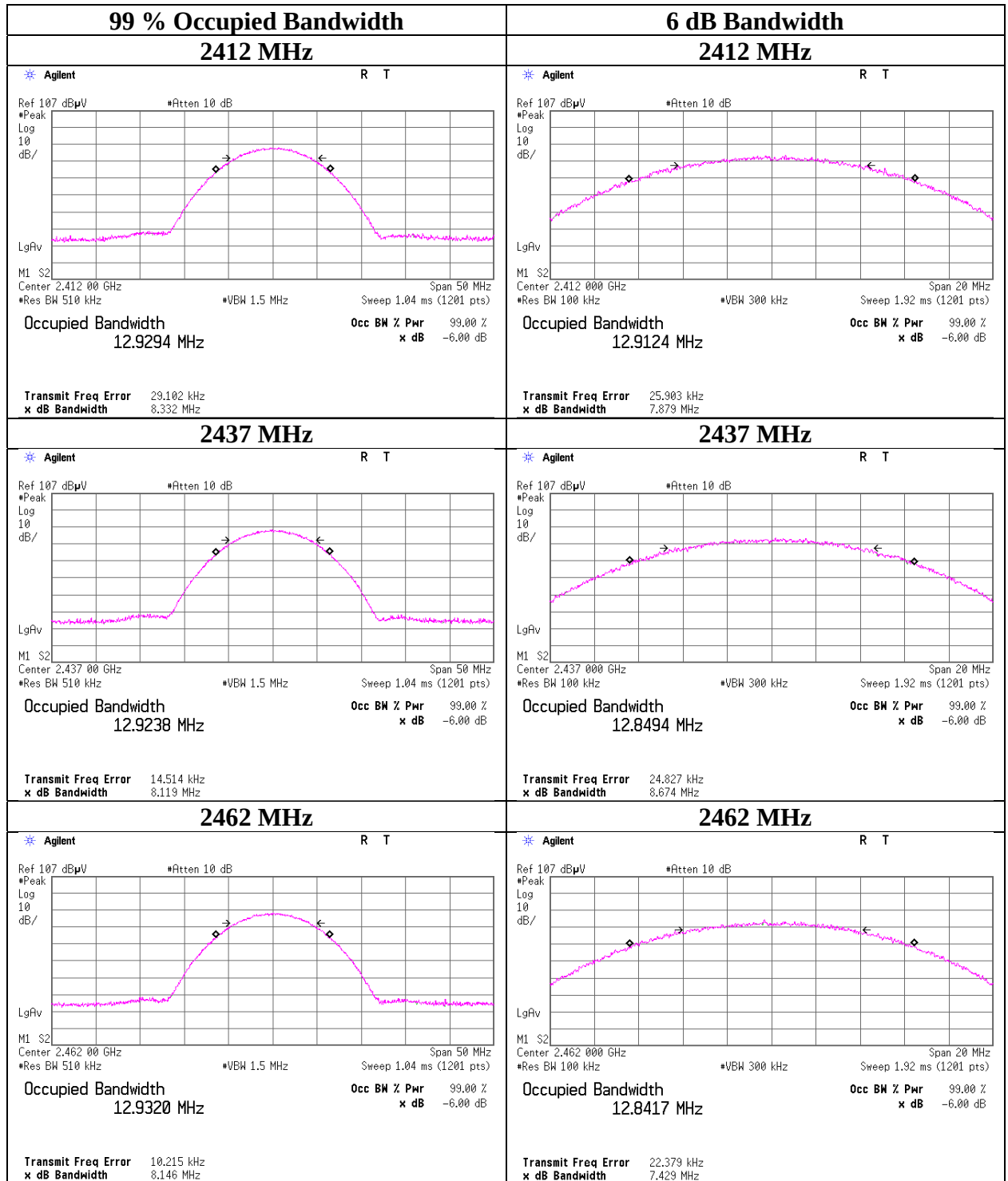
99 % Occupied Bandwidth and 6 dB Bandwidth

Report No.	13828808H	
Test place	Ise EMC Lab. No.6 Measurement Room	
Date	June 8, 2021	June 9, 2021
Temperature / Humidity	22 deg. C / 51 % RH	25 deg. C / 36 % RH
Engineer	Yuichiro Yamazaki	Yuichiro Yamazaki
Mode	Tx	

Mode	Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
11b	2412	12929.4	7.879	> 0.5000
	2437	12923.8	8.674	> 0.5000
	2462	12932.0	7.429	> 0.5000
11g	2412	17155.4	16.497	> 0.5000
	2437	17221.3	16.499	> 0.5000
	2462	17172.1	16.487	> 0.5000
11n-20	2412	18270.1	17.751	> 0.5000
	2437	18280.9	17.769	> 0.5000
	2462	18223.0	17.761	> 0.5000
BT LE	2402	1062.9	0.665	> 0.5000
	2440	1066.6	0.694	> 0.5000
	2480	1063.1	0.674	> 0.5000

99 % Occupied Bandwidth and 6 dB Bandwidth

11b



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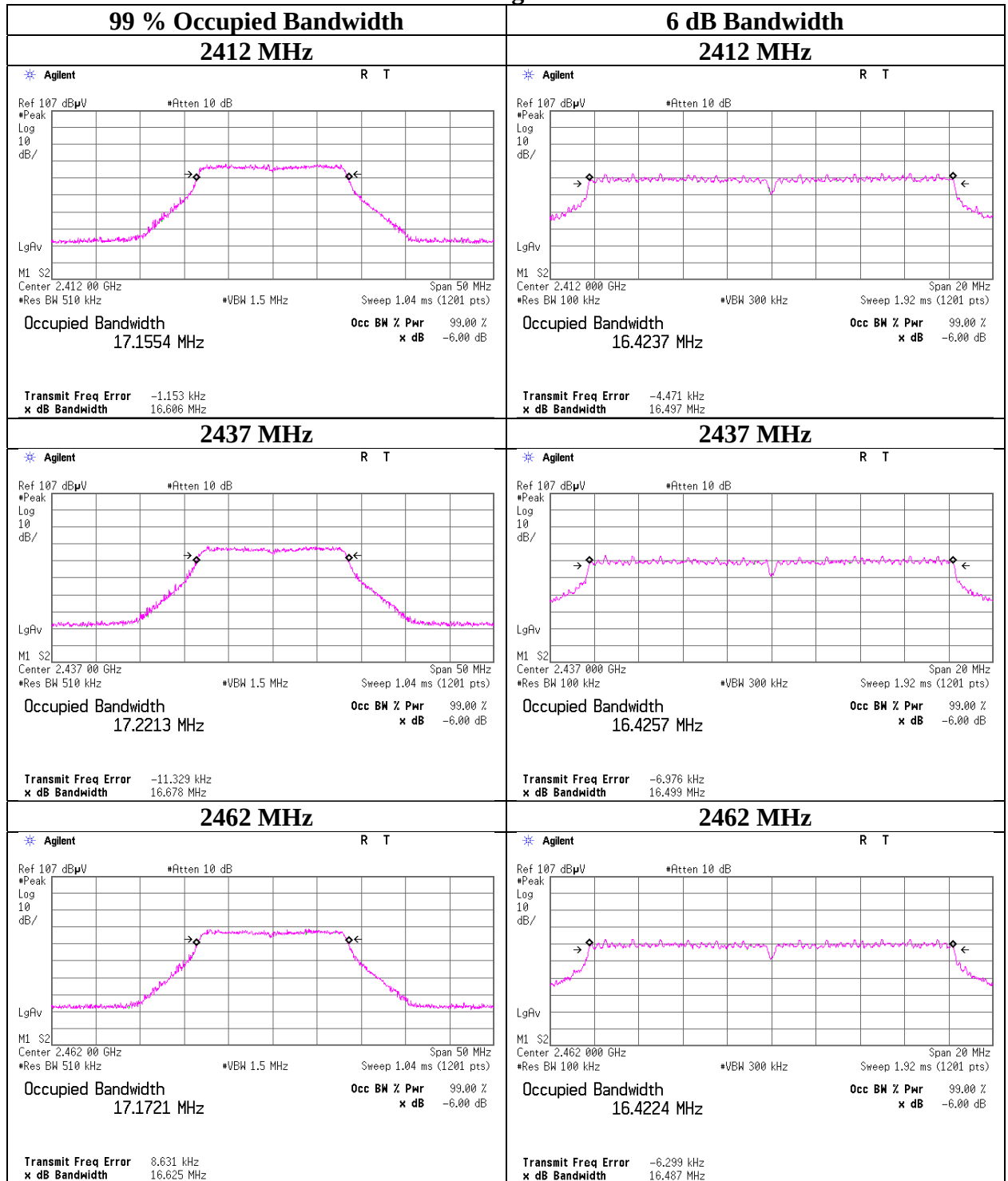
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99 % Occupied Bandwidth and 6 dB Bandwidth

11g



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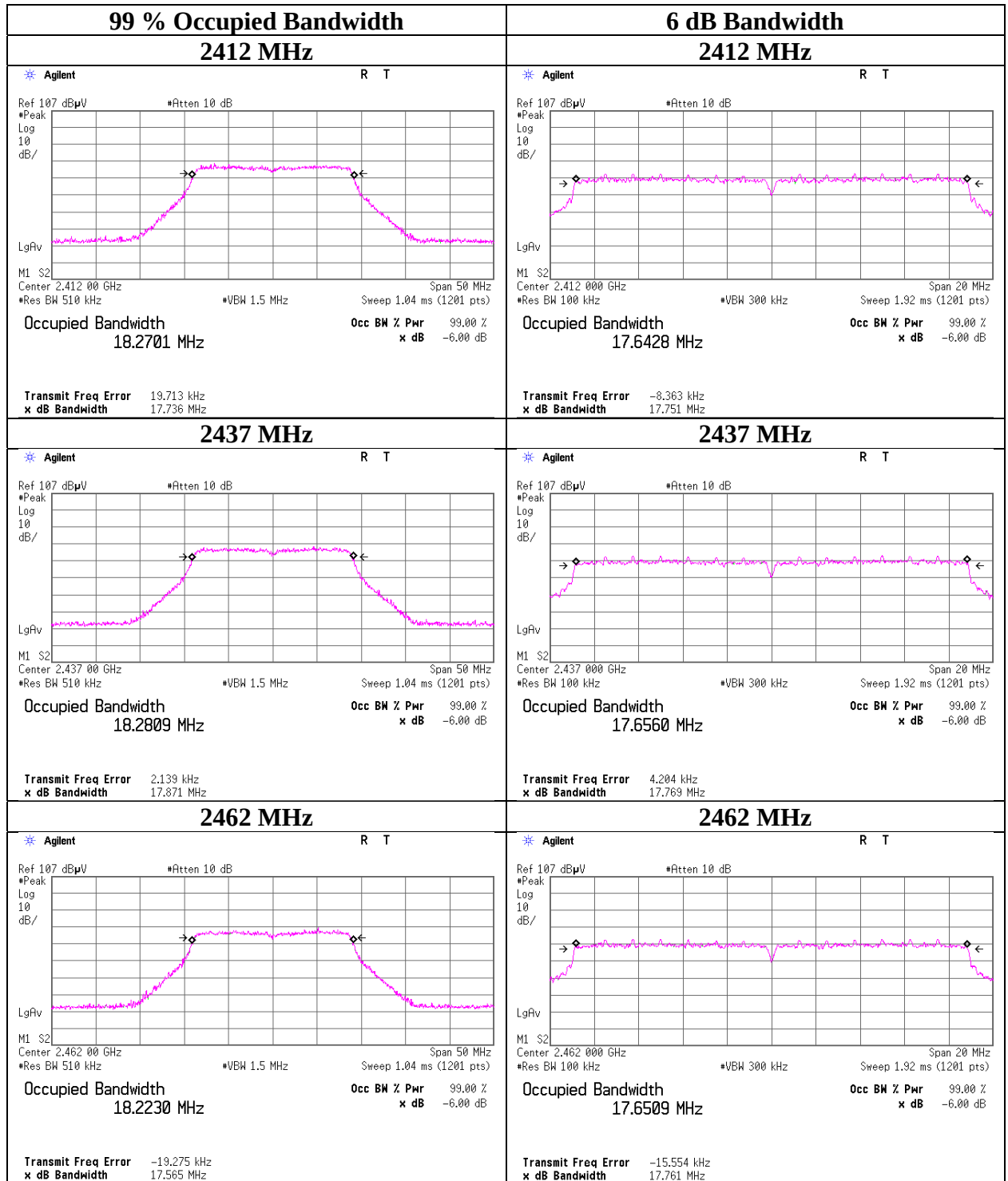
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99 % Occupied Bandwidth and 6 dB Bandwidth

11n-20



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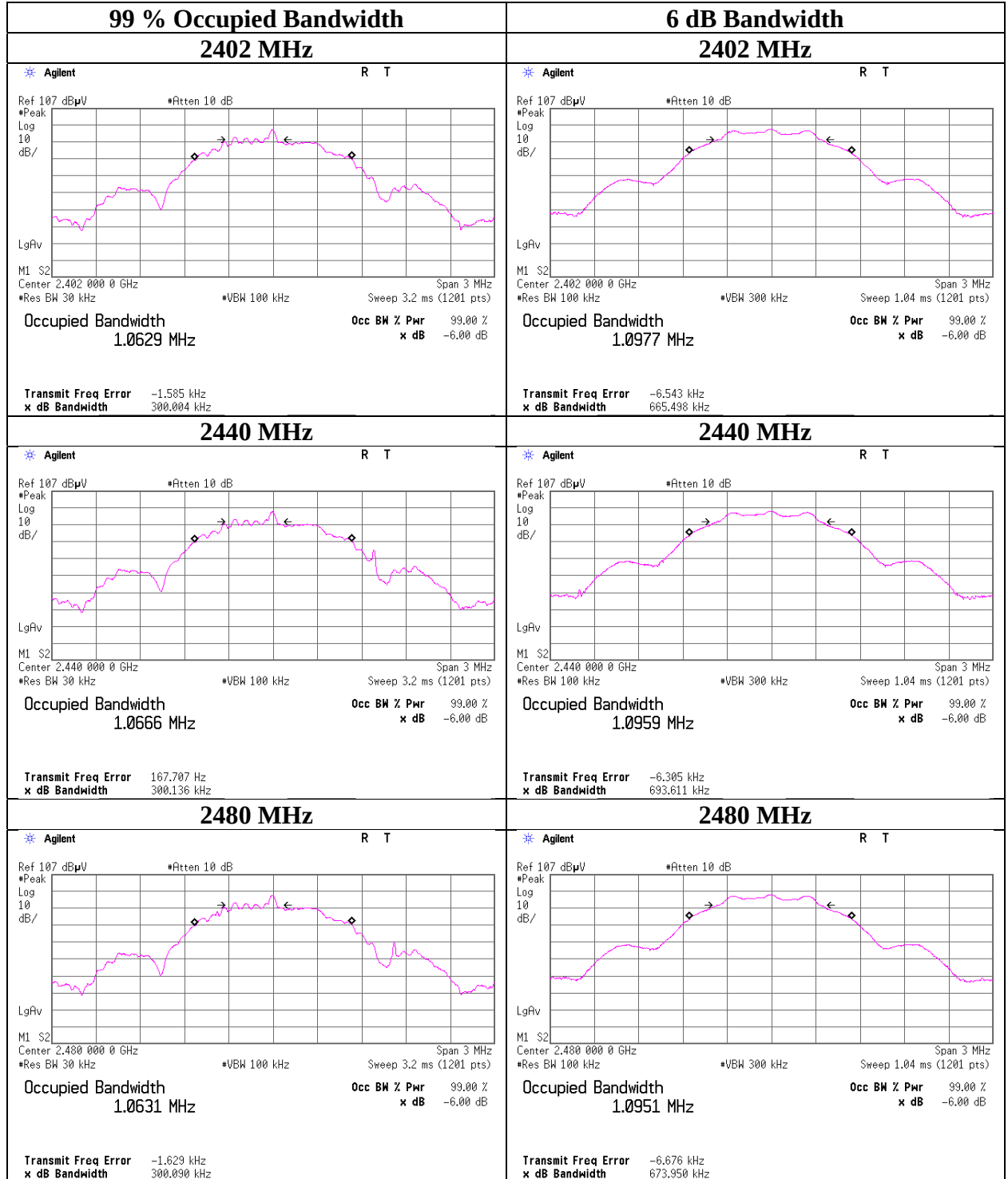
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99 % Occupied Bandwidth and 6 dB Bandwidth

BT LE



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Maximum Peak Output Power

Report No. 13828808H
Test place Ise EMC Lab. No.6 Measurement Room
Date June 8, 2021
Temperature / Humidity 22 deg. C / 51 % RH
Engineer Yuichiro Yamazaki
Mode Tx 11b

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	4.01	1.44	10.04	15.49	35.40	30.00	1000	14.51	-1.59	13.90	24.55	36.02	4000	22.12
2437	4.24	1.44	10.04	15.72	37.33	30.00	1000	14.28	-1.59	14.13	25.88	36.02	4000	21.89
2462	4.27	1.45	10.04	15.76	37.67	30.00	1000	14.24	-1.59	14.17	26.12	36.02	4000	21.85

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

e.i.r.p. Result = Conducted Power Result + Antenna Gain

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

Antenna 1, 2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	4.22	
2	4.20	
5.5	4.21	
11	4.24	*

*: Worst Rate

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

Maximum Peak Output Power

Report No. 13828808H
Test place Ise EMC Lab. No.6 Measurement Room
Date June 8, 2021
Temperature / Humidity 22 deg. C / 51 % RH
Engineer Yuichiro Yamazaki
Mode Tx 11g

Freq.	Reading	Cable Loss	Atten. Loss	Conducted Power					Antenna Gain	e.i.r.p. for RSS-247				
				Result		Limit		Margin		Result		Limit		Margin
				[dBm]	[mW]	[dBm]	[mW]			[dB]	[dBm]	[mW]	[dBm]	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	5.02	1.44	10.04	16.50	44.67	30.00	1000	13.50	-1.59	14.91	30.97	36.02	4000	21.11
2437	5.38	1.44	10.04	16.86	48.53	30.00	1000	13.14	-1.59	15.27	33.65	36.02	4000	20.75
2462	5.43	1.45	10.04	16.92	49.20	30.00	1000	13.08	-1.59	15.33	34.12	36.02	4000	20.69

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

e.i.r.p. Result = Conducted Power Result + Antenna Gain

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

Antenna 1, 2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	4.64	
9	4.56	
12	5.30	
18	5.06	
24	4.90	
36	4.97	
48	5.38	*
54	4.88	

*: Worst Rate

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

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Maximum Peak Output Power

Report No. 13828808H
Test place Ise EMC Lab. No.6 Measurement Room
Date June 8, 2021
Temperature / Humidity 22 deg. C / 51 % RH
Engineer Yuichiro Yamazaki
Mode Tx 11n-20

Freq.	Reading	Cable Loss	Atten. Loss	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
				[dBm]	[mW]	[dBm]	[mW]	[dB]		[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	5.31	1.44	10.04	16.79	47.75	30.00	1000	13.21	-1.59	15.20	33.11	36.02	4000	20.82
2437	5.50	1.44	10.04	16.98	49.89	30.00	1000	13.02	-1.59	15.39	34.59	36.02	4000	20.63
2462	5.37	1.45	10.04	16.86	48.53	30.00	1000	13.14	-1.59	15.27	33.65	36.02	4000	20.75

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

e.i.r.p. Result = Conducted Power Result + Antenna Gain

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

Antenna 1, 2437 MHz, Short GI

MCS Number	Reading [dBm]	Remark
0	4.68	
1	4.89	
2	4.63	
3	4.55	
4	4.60	
5	4.99	
6	5.50	*
7	4.93	

* Worst MCS

MCS Number	Reading [dBm]	GI	Remark
6	5.05	Long	
6	5.50	Short	*

* Worst Condition

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

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Maximum Peak Output Power

Report No. 13828808H
Test place Ise EMC Lab. No.6 Measurement Room
Date June 9, 2021
Temperature / Humidity 24 deg. C / 45 % RH
Engineer Yuichiro Yamazaki
Mode Tx BT LE

Freq.	Reading	Cable Loss	Atten. Loss	Conducted Power					e.i.r.p. for RSS-247					
				Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
[MHz]	[dBm]	[dB]	[dB]					[dB]	[dBi]					[dB]
2402	-11.99	1.42	10.04	-0.53	0.89	30.00	1000	30.53	-1.70	-2.23	0.60	36.02	4000	38.25
2440	-11.65	1.43	10.04	-0.18	0.96	30.00	1000	30.18	-1.70	-1.88	0.65	36.02	4000	37.90
2480	-11.68	1.45	10.04	-0.19	0.96	30.00	1000	30.19	-1.70	-1.89	0.65	36.02	4000	37.91

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

e.i.r.p. Result = Conducted Power Result + Antenna Gain

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

Average Output Power (Reference data for RF Exposure)

Report No.	13828808H		
Test place	Ise EMC Lab. No.6 Measurement Room		
Date	June 8, 2021	June 9, 2021	
Temperature / Humidity	22 deg. C / 51 % RH	24 deg. C / 45 % RH	
Engineer	Yuichiro Yamazaki	Yuichiro Yamazaki	
Mode	Tx		

11b 1 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst power average)	
				[dBm]	[mW]
2412	1.86	1.44	10.04	13.34	21.58
2437	2.04	1.44	10.04	13.52	22.49
2462	2.06	1.45	10.04	13.55	22.65

11g 6 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst power average)	
				[dBm]	[mW]
2412	-5.85	1.44	10.04	5.63	3.66
2437	-5.78	1.44	10.04	5.70	3.72
2462	-5.48	1.45	10.04	6.01	3.99

11n-20 MCS 0 Short GI

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst power average)	
				[dBm]	[mW]
2412	-5.82	1.44	10.04	5.66	3.68
2437	-5.81	1.44	10.04	5.67	3.69
2462	-5.60	1.45	10.04	5.89	3.88

BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst power average)	
				[dBm]	[mW]
2402	-12.40	1.42	10.04	-0.94	0.81
2440	-12.27	1.43	10.04	-0.80	0.83
2480	-12.24	1.45	10.04	-0.75	0.84

Sample Calculation:

Result (Burst power average) = Reading + Cable Loss + Attenuator Loss

Reading (Burst Power) is used the gating functionality of the power meter.

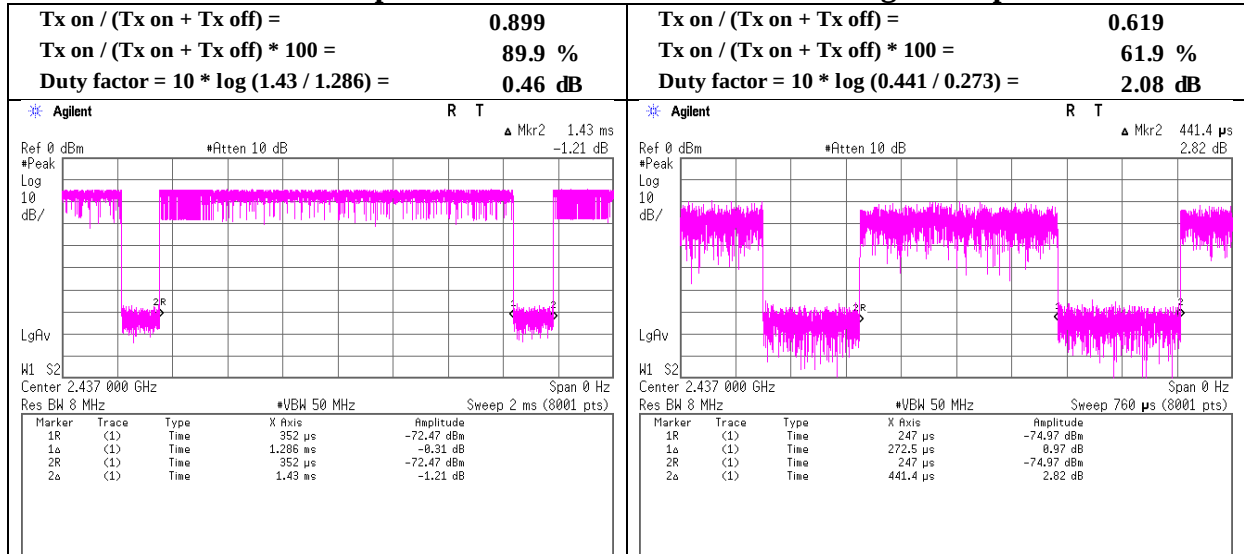
*The equipment and cables were not used for factor 0 dB of the data sheets.

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.

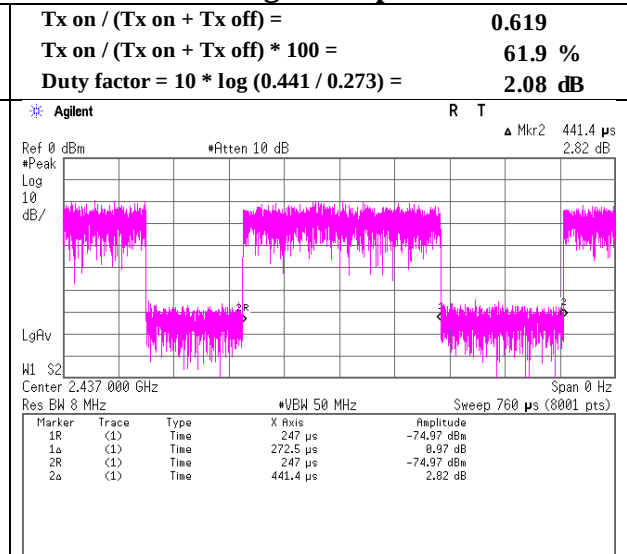
Burst rate confirmation

Report No. 13828808H
Test place Ise EMC Lab.
No.6 Measurement Room No.2 Semi Anechoic Chamber
Date June 8, 2021
Temperature / Humidity 22 deg. C / 51 % RH 21 deg. C / 59 % RH
Engineer Yuichiro Yamazaki Junya Okuno
WLAN (11b / 11g / 11n-20) (BT LE)
Mode Tx

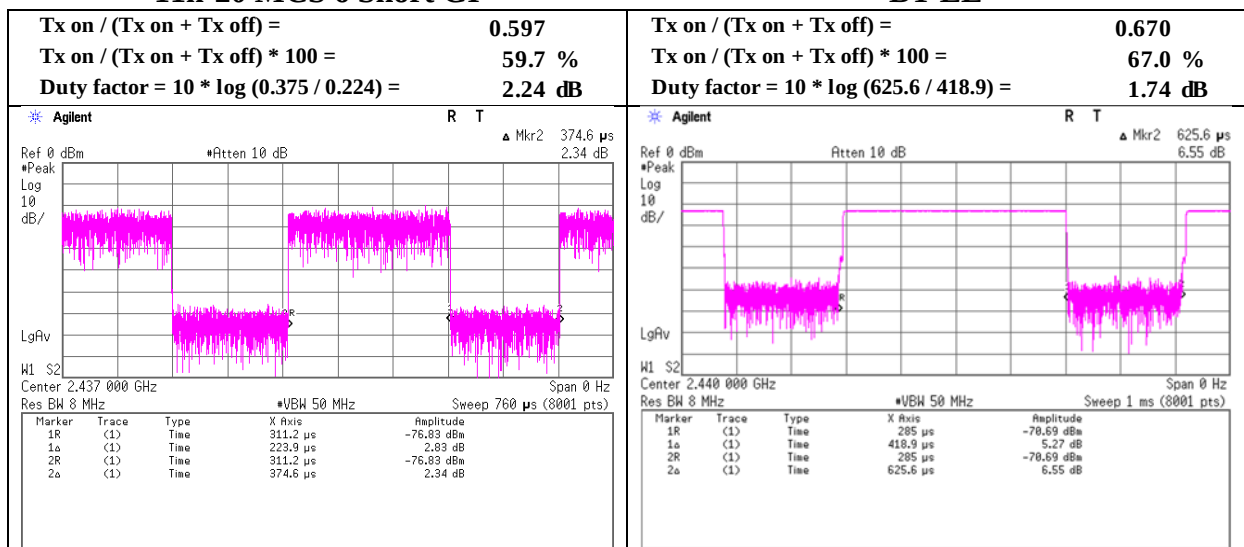
11b 11 Mbps



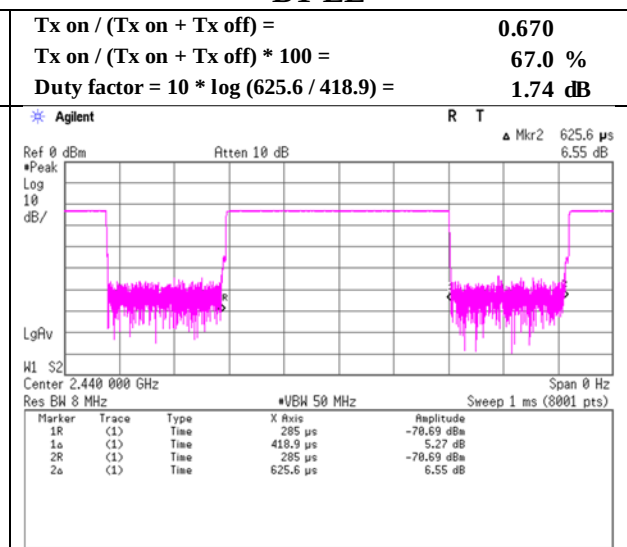
11g 48 Mbps



11n-20 MCS 6 Short GI



BT LE



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

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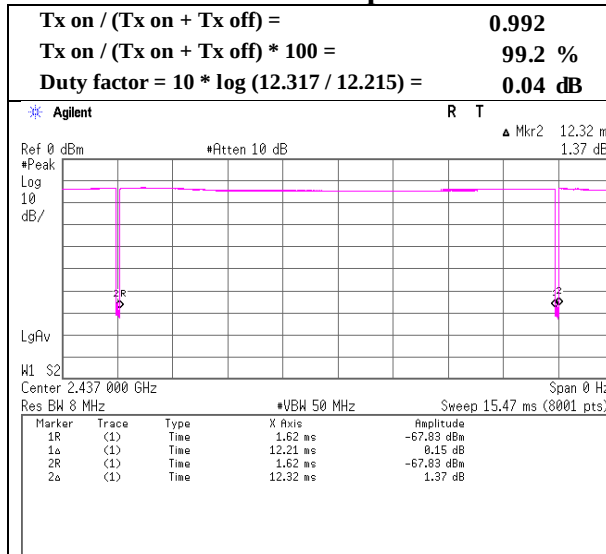
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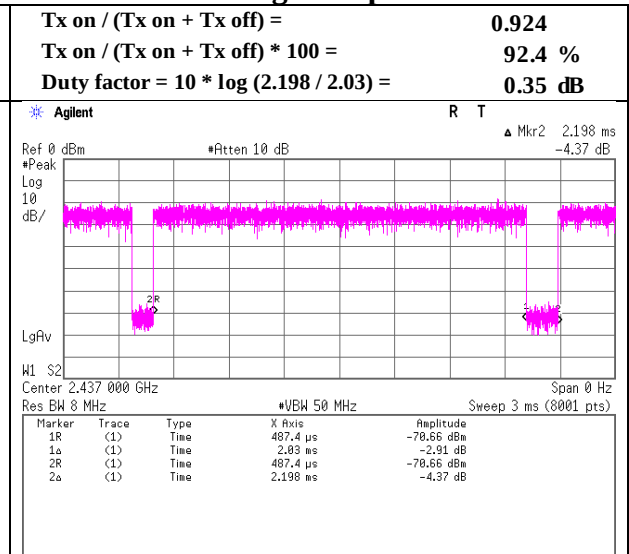
Burst rate confirmation

Report No. 13828808H
Test place Ise EMC Lab.
No.6 Measurement Room
Date June 8, 2021
Temperature / Humidity 22 deg. C / 51 % RH
Engineer Yuichiro Yamazaki
Mode Tx

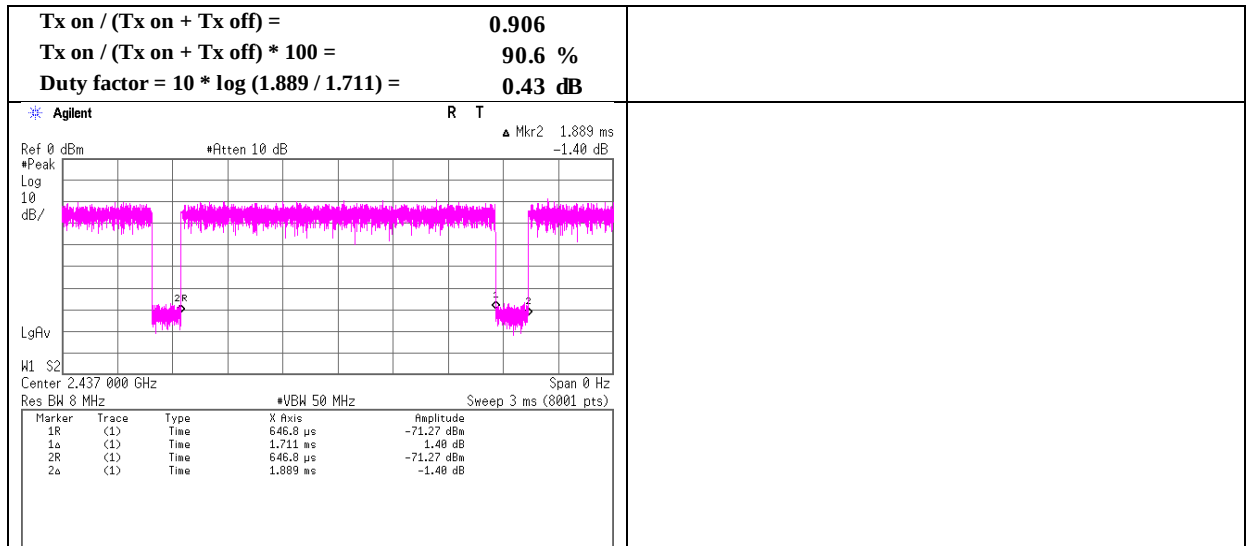
11b 1 Mbps



11g 6 Mbps



11n-20 MCS 0 Short GI



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

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Radiated Spurious Emission

Report No.	13828808H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	June 9, 2021	June 10, 2021	June 10, 2021
Temperature / Humidity	21 deg. C / 52 % RH	20 deg. C / 58 % RH	24 deg. C / 54 % RH
Engineer	Nachi Konegawa (1 GHz - 10 GHz)	Junya Okuno (10 GHz - 18 GHz)	Nachi Konegawa (18 GHz - 26.5 GHz)
Mode	Tx 11b 2412 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1579.986	PK	53.2	25.3	3.9	35.1	-	47.3	73.9	26.6	
Hori.	2390.000	PK	47.2	27.6	4.5	34.6	-	44.7	73.9	29.2	
Hori.	4824.000	PK	42.6	31.6	6.6	33.8	-	47.1	73.9	26.8	Floor noise
Hori.	7236.000	PK	43.0	36.0	8.0	33.6	-	53.3	73.9	20.6	Floor noise
Hori.	9648.000	PK	43.1	38.6	8.5	34.2	-	56.0	73.9	17.9	Floor noise
Hori.	1579.986	AV	47.0	25.3	3.9	35.1	-	41.1	53.9	12.8	
Hori.	2390.000	AV	37.1	27.6	4.5	34.6	0.5	35.1	53.9	18.8	*1)
Hori.	4824.000	AV	32.3	31.6	6.6	33.8	-	36.8	53.9	17.1	Floor noise
Hori.	7236.000	AV	32.7	36.0	8.0	33.6	-	43.1	53.9	10.8	Floor noise
Hori.	9648.000	AV	33.0	38.6	8.5	34.2	-	45.9	53.9	8.0	Floor noise
Vert.	1579.986	PK	55.1	25.3	3.9	35.1	-	49.2	73.9	24.7	
Vert.	2390.000	PK	49.3	27.6	4.5	34.6	-	46.8	73.9	27.1	
Vert.	4824.000	PK	42.3	31.6	6.6	33.8	-	46.8	73.9	27.1	Floor noise
Vert.	7236.000	PK	42.5	36.0	8.0	33.6	-	52.9	73.9	21.0	Floor noise
Vert.	9648.000	PK	42.7	38.6	8.5	34.2	-	55.5	73.9	18.4	Floor noise
Vert.	1579.986	AV	49.4	25.3	3.9	35.1	-	43.5	53.9	10.5	
Vert.	2390.000	AV	41.0	27.6	4.5	34.6	0.5	39.0	53.9	14.9	*1)
Vert.	4824.000	AV	32.2	31.6	6.6	33.8	-	36.7	53.9	17.2	Floor noise
Vert.	7236.000	AV	32.8	36.0	8.0	33.6	-	43.2	53.9	10.7	Floor noise
Vert.	9648.000	AV	33.0	38.6	8.5	34.2	-	45.8	53.9	8.1	Floor noise

Result = 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).

Distance factor: 1 GHz - 10 GHz $20\log(3.55\text{ m} / 3.0\text{ m}) = 1.47\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

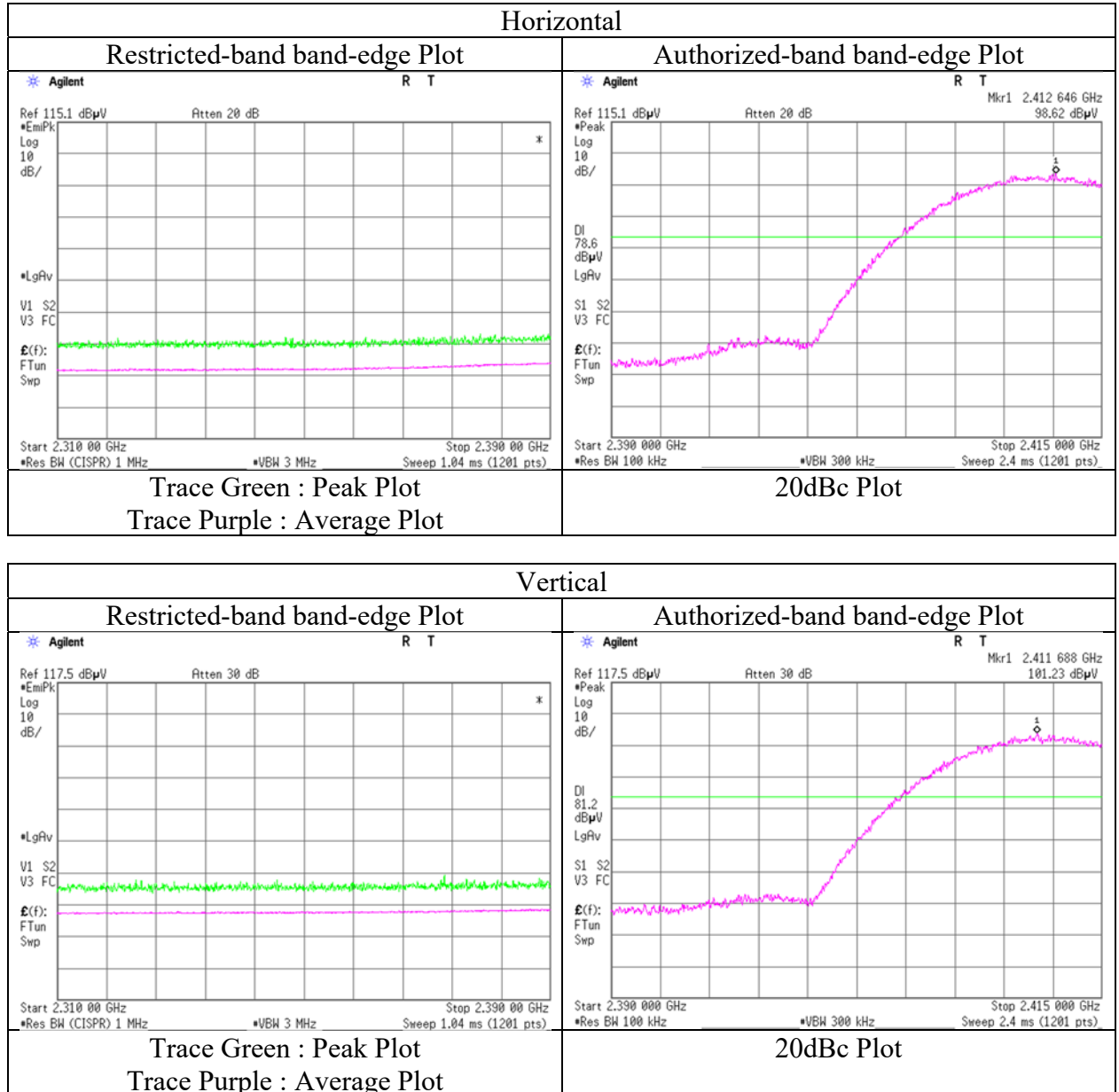
20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	98.6	27.5	4.6	34.6	96.1	-	-	Carrier
Hori.	2400.000	PK	45.3	27.6	4.6	34.6	42.8	76.1	33.3	
Vert.	2412.000	PK	101.2	27.5	4.6	34.6	98.7	-	-	Carrier
Vert.	2400.000	PK	46.9	27.6	4.6	34.6	44.4	78.7	34.3	

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13828808H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 9, 2021
Temperature / Humidity	21 deg. C / 52 % RH
Engineer	Nachi Konegawa (1 GHz - 10 GHz)
Mode	Tx 11b 2412 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.

Ise EMC Lab.

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Radiated Spurious Emission

Report No.	13828808H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	June 9, 2021	June 10, 2021	June 10, 2021
Temperature / Humidity	21 deg. C / 52 % RH	20 deg. C / 58 % RH	24 deg. C / 54 % RH
Engineer	Nachi Konegawa (1 GHz - 10 GHz)	Junya Okuno (10 GHz - 18 GHz)	Nachi Konegawa (18 GHz - 26.5 GHz)
Mode	Tx 11b 2437 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1579.988	PK	52.9	25.3	3.9	35.1	-	47.0	73.9	26.9	
Hori.	4874.000	PK	42.7	31.6	6.6	33.8	-	47.2	73.9	26.7	Floor noise
Hori.	7311.000	PK	42.9	36.2	8.0	33.6	-	53.5	73.9	20.4	Floor noise
Hori.	9748.000	PK	43.0	38.8	8.5	34.2	-	56.1	73.9	17.8	Floor noise
Hori.	1579.988	AV	46.9	25.3	3.9	35.1	-	41.0	53.9	12.9	
Hori.	4874.000	AV	34.6	31.6	6.6	33.8	-	39.0	53.9	14.9	Floor noise
Hori.	7311.000	AV	34.6	36.2	8.0	33.6	-	45.2	53.9	8.7	Floor noise
Hori.	9748.000	AV	34.7	38.8	8.5	34.2	-	47.7	53.9	6.2	Floor noise
Vert.	1579.988	PK	55.3	25.3	3.9	35.1	-	49.4	73.9	24.5	
Vert.	4874.000	PK	42.5	31.6	6.6	33.8	-	47.0	73.9	26.9	Floor noise
Vert.	7311.000	PK	42.6	36.2	8.0	33.6	-	53.1	73.9	20.8	Floor noise
Vert.	9748.000	PK	43.0	38.8	8.5	34.2	-	56.0	73.9	17.9	Floor noise
Vert.	1579.988	AV	49.4	25.3	3.9	35.1	-	43.5	53.9	10.4	
Vert.	4874.000	AV	34.5	31.6	6.6	33.8	-	38.9	53.9	15.0	Floor noise
Vert.	7311.000	AV	34.5	36.2	8.0	33.6	-	45.1	53.9	8.8	Floor noise
Vert.	9748.000	AV	34.5	38.8	8.5	34.2	-	47.6	53.9	6.3	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz $20\log(3.55\text{ m} / 3.0\text{ m}) = 1.47\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No.	13828808H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	June 9, 2021	June 10, 2021	June 10, 2021
Temperature / Humidity	21 deg. C / 52 % RH	20 deg. C / 58 % RH	24 deg. C / 54 % RH
Engineer	Nachi Konegawa (1 GHz - 10 GHz)	Junya Okuno (10 GHz - 18 GHz)	Nachi Konegawa (18 GHz - 26.5 GHz)
Mode	Tx 11b 2462 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1579.977	PK	51.1	25.3	3.9	35.1	-	45.2	73.9	28.7	
Hori.	2483.500	PK	48.9	27.4	4.6	34.6	-	46.3	73.9	27.6	
Hori.	2500.000	PK	45.5	27.4	4.6	34.6	-	43.0	73.9	30.9	
Hori.	4924.000	PK	42.3	31.5	6.6	33.8	-	46.7	73.9	27.2	Floor noise
Hori.	7386.000	PK	42.7	36.1	8.0	33.6	-	53.1	73.9	20.8	Floor noise
Hori.	9848.000	PK	43.2	39.0	8.5	34.3	-	56.4	73.9	17.5	Floor noise
Hori.	1579.977	AV	48.0	25.3	3.9	35.1	-	42.1	53.9	11.8	
Hori.	2483.500	AV	40.8	27.4	4.6	34.6	0.5	38.7	53.9	15.3	*1)
Hori.	2500.000	AV	39.8	27.4	4.6	34.6	-	37.3	53.9	16.6	
Hori.	4924.000	AV	33.4	31.5	6.6	33.8	-	37.8	53.9	16.1	Floor noise
Hori.	7386.000	AV	33.8	36.1	8.0	33.6	-	44.2	53.9	9.7	Floor noise
Hori.	9848.000	AV	34.4	39.0	8.5	34.3	-	47.6	53.9	6.3	Floor noise
Vert.	1579.977	PK	55.7	25.3	3.9	35.1	-	49.8	73.9	24.1	
Vert.	2483.500	PK	49.4	27.4	4.6	34.6	-	46.9	73.9	27.0	
Vert.	2500.000	PK	44.7	27.4	4.6	34.6	-	42.2	73.9	31.7	
Vert.	4924.000	PK	42.4	31.5	6.6	33.8	-	46.8	73.9	27.1	Floor noise
Vert.	7386.000	PK	42.4	36.1	8.0	33.6	-	52.8	73.9	21.1	Floor noise
Vert.	9848.000	PK	42.8	39.0	8.5	34.3	-	56.0	73.9	17.9	Floor noise
Vert.	1579.977	AV	49.5	25.3	3.9	35.1	-	43.6	53.9	10.3	
Vert.	2483.500	AV	42.4	27.4	4.6	34.6	0.5	40.3	53.9	13.6	*1)
Vert.	2500.000	AV	39.0	27.4	4.6	34.6	-	36.5	53.9	17.4	
Vert.	4924.000	AV	33.4	31.5	6.6	33.8	-	37.8	53.9	16.1	Floor noise
Vert.	7386.000	AV	33.9	36.1	8.0	33.6	-	44.2	53.9	9.7	Floor noise
Vert.	9848.000	AV	34.3	39.0	8.5	34.3	-	47.5	53.9	6.4	Floor noise

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

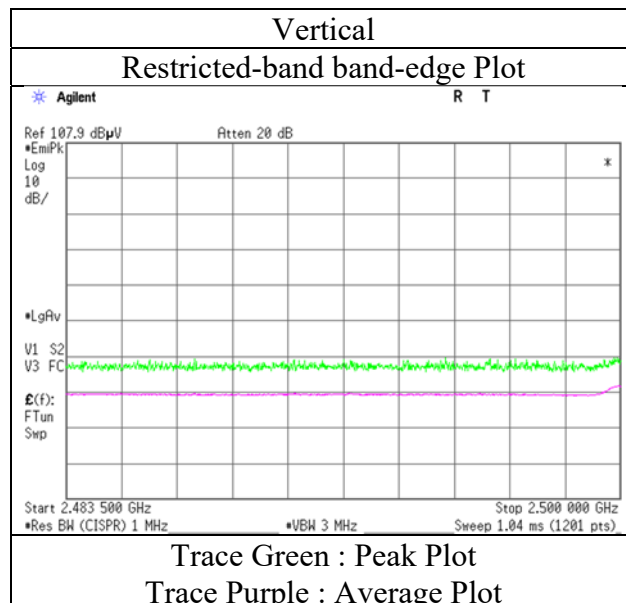
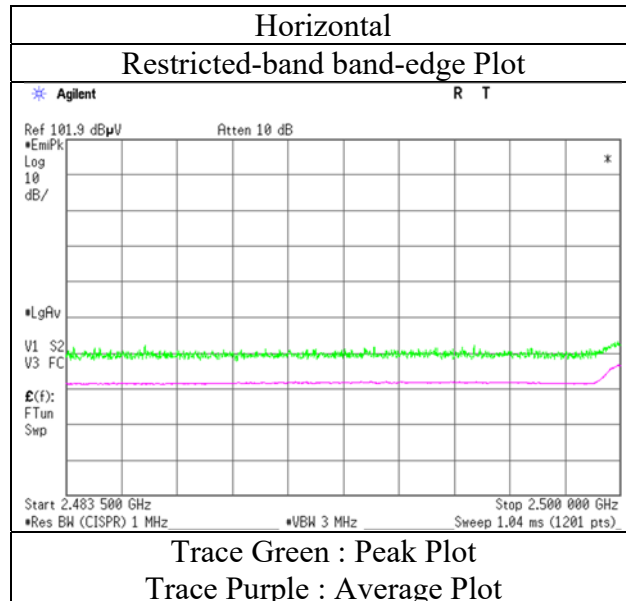
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log(3.55 m / 3.0 m) = 1.47 dB
10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission **(Reference Plot for band-edge)**

Report No. 13828808H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date June 9, 2021
Temperature / Humidity 21 deg. C / 52 % RH
Engineer Nachi Konegawa
(1 GHz - 10 GHz)
Mode Tx 11b 2462 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.	13828808H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	June 9, 2021	June 10, 2021
Temperature / Humidity	21 deg. C / 52 % RH	24 deg. C / 54 % RH
Engineer	Nachi Konegawa	Nachi Konegawa
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-20 2412 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1579.978	PK	53.0	25.3	3.9	35.1	-	47.1	73.9	26.8	
Hori.	2390.000	PK	46.2	27.6	4.5	34.6	-	43.7	73.9	30.2	
Hori.	4824.000	PK	42.3	31.6	6.6	33.8	-	46.8	73.9	27.1	Floor noise
Hori.	7236.000	PK	42.4	36.0	8.0	33.6	-	52.8	73.9	21.1	Floor noise
Hori.	9648.000	PK	43.1	38.6	8.5	34.2	-	55.9	73.9	18.0	Floor noise
Hori.	1579.978	AV	46.9	25.3	3.9	35.1	-	40.9	53.9	13.0	
Hori.	2390.000	AV	37.1	27.6	4.5	34.6	2.2	36.9	53.9	17.1	*1)
Hori.	4824.000	AV	33.5	31.6	6.6	33.8	-	38.0	53.9	15.9	Floor noise
Hori.	7236.000	AV	33.6	36.0	8.0	33.6	-	43.9	53.9	10.0	Floor noise
Hori.	9648.000	AV	34.1	38.6	8.5	34.2	-	46.9	53.9	7.0	Floor noise
Vert.	1579.978	PK	53.0	25.3	3.9	35.1	-	47.1	73.9	26.8	
Vert.	2390.000	PK	47.9	27.6	4.5	34.6	-	45.4	73.9	28.5	
Vert.	4824.000	PK	42.2	31.6	6.6	33.8	-	46.6	73.9	27.3	Floor noise
Vert.	7236.000	PK	42.7	36.0	8.0	33.6	-	53.1	73.9	20.8	Floor noise
Vert.	9648.000	PK	43.0	38.6	8.5	34.2	-	55.9	73.9	18.1	Floor noise
Vert.	1579.978	AV	46.9	25.3	3.9	35.1	-	40.9	53.9	13.0	
Vert.	2390.000	AV	38.4	27.6	4.5	34.6	2.2	38.2	53.9	15.7	*1)
Vert.	4824.000	AV	33.7	31.6	6.6	33.8	-	38.2	53.9	15.7	Floor noise
Vert.	7236.000	AV	33.9	36.0	8.0	33.6	-	44.3	53.9	9.6	Floor noise
Vert.	9648.000	AV	34.2	38.6	8.5	34.2	-	47.1	53.9	6.8	Floor noise

Result = 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).

Distance factor: 1 GHz - 10 GHz 20log(3.55 m / 3.0 m) = 1.47 dB
10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	87.8	27.5	4.6	34.6	85.2	-	-	Carrier
Hori.	2400.000	PK	53.4	27.6	4.6	34.6	50.9	65.2	14.3	
Vert.	2412.000	PK	90.0	27.5	4.6	34.6	87.5	-	-	Carrier
Vert.	2400.000	PK	56.3	27.6	4.6	34.6	53.8	67.5	13.7	

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

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Ise EMC Lab.

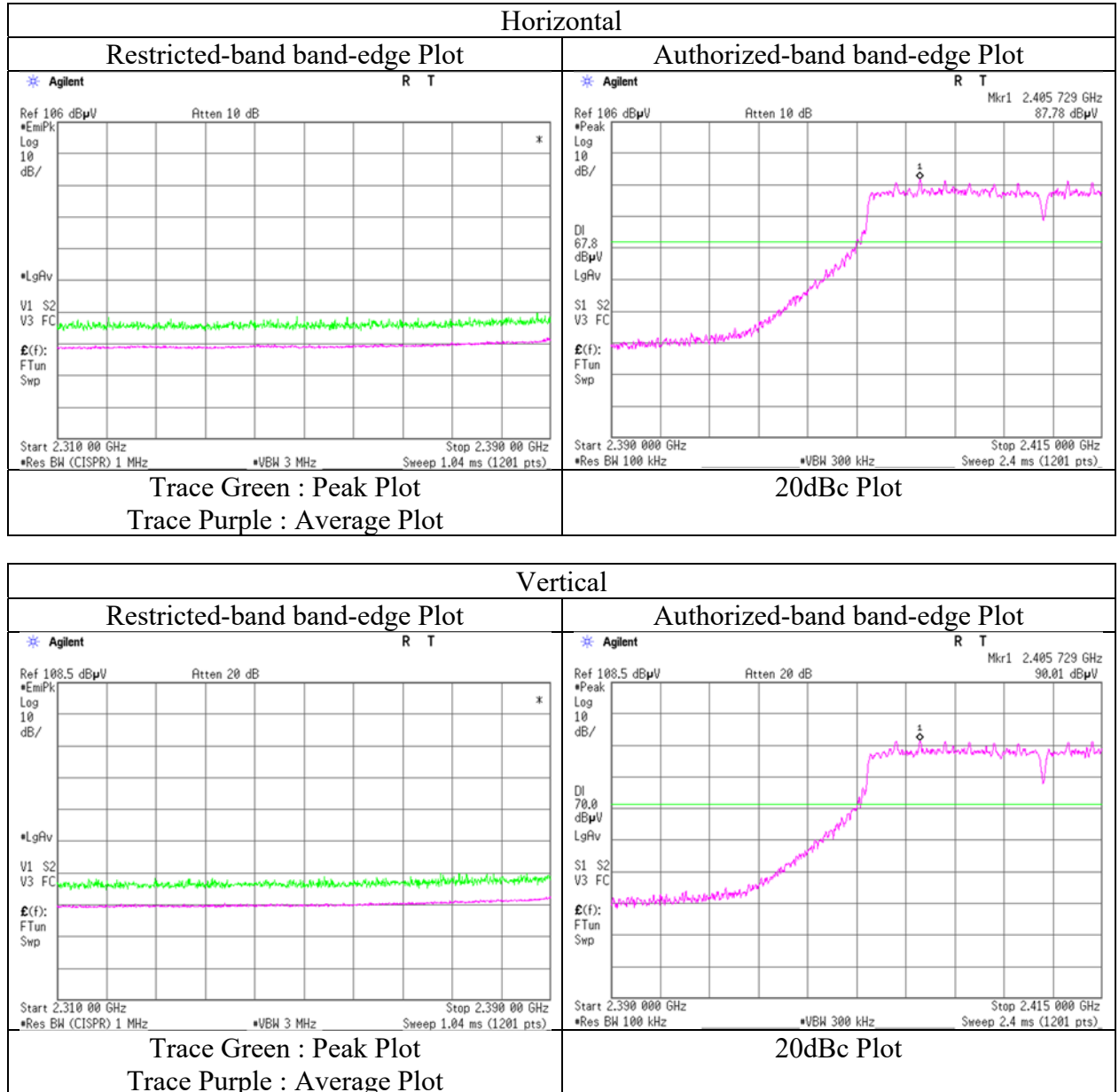
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13828808H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 9, 2021
Temperature / Humidity	21 deg. C / 52 % RH
Engineer	Nachi Konegawa (1 GHz - 10 GHz)
Mode	Tx 11n-20 2412 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.

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Radiated Spurious Emission

Report No.	13828808H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	June 9, 2021	June 10, 2021	June 16, 2021
Temperature / Humidity	21 deg. C / 52 % RH	24 deg. C / 54 % RH	23 deg. C / 70 % RH
Engineer	Nachi Konegawa (1 GHz - 10 GHz)	Nachi Konegawa (10 GHz - 26.5 GHz)	Junki Nagatomi (Below 1 GHz)
Mode	Tx 11n-20 2437 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	30.000	QP	23.1	18.5	6.7	28.5	-	19.9	40.0	20.1	
Hori.	49.099	QP	23.4	11.5	7.0	28.4	-	13.5	40.0	26.6	
Hori.	81.000	QP	24.0	6.7	7.3	28.4	-	9.6	40.0	30.4	
Hori.	209.638	QP	29.5	11.2	8.3	27.9	-	21.1	43.5	22.4	
Hori.	423.640	QP	27.1	16.1	9.6	28.6	-	24.2	46.0	21.8	
Hori.	914.512	QP	30.2	22.1	11.4	28.7	-	34.9	46.0	11.1	
Hori.	1579.975	PK	52.8	25.3	3.9	35.1	-	46.9	73.9	27.0	
Hori.	4874.000	PK	42.2	31.6	6.6	33.8	-	46.7	73.9	27.3	Floor noise
Hori.	7311.000	PK	42.4	36.2	8.0	33.6	-	53.0	73.9	20.9	Floor noise
Hori.	9748.000	PK	43.2	38.8	8.5	34.2	-	56.2	73.9	17.7	Floor noise
Hori.	1579.975	AV	46.8	25.3	3.9	35.1	-	40.9	53.9	13.1	
Hori.	4874.000	AV	33.4	31.6	6.6	33.8	-	37.9	53.9	16.0	Floor noise
Hori.	7311.000	AV	33.5	36.2	8.0	33.6	-	44.1	53.9	9.8	Floor noise
Hori.	9748.000	AV	33.8	38.8	8.5	34.2	-	46.8	53.9	7.1	Floor noise
Vert.	30.000	QP	23.3	18.5	6.7	28.5	-	20.1	40.0	19.9	
Vert.	48.000	QP	27.6	11.8	7.0	28.4	-	17.9	40.0	22.1	
Vert.	82.044	QP	27.5	6.8	7.3	28.4	-	13.3	40.0	26.7	
Vert.	207.912	QP	27.8	11.2	8.3	27.9	-	19.4	43.5	24.1	
Vert.	431.712	QP	23.6	16.3	9.6	28.6	-	20.8	46.0	25.2	
Vert.	914.498	QP	30.8	22.1	11.4	28.7	-	35.5	46.0	10.5	
Vert.	1579.975	PK	55.0	25.3	3.9	35.1	-	49.1	73.9	24.8	
Vert.	4874.000	PK	42.2	31.6	6.6	33.8	-	46.7	73.9	27.2	Floor noise
Vert.	7311.000	PK	42.8	36.2	8.0	33.6	-	53.4	73.9	20.5	Floor noise
Vert.	9748.000	PK	43.4	38.8	8.5	34.2	-	56.4	73.9	17.5	Floor noise
Vert.	1579.975	AV	49.2	25.3	3.9	35.1	-	43.3	53.9	10.6	
Vert.	4874.000	AV	33.4	31.6	6.6	33.8	-	37.8	53.9	16.1	Floor noise
Vert.	7311.000	AV	33.4	36.2	8.0	33.6	-	44.0	53.9	9.9	Floor noise
Vert.	9748.000	AV	33.6	38.8	8.5	34.2	-	46.7	53.9	7.2	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz $20\log(3.55\text{ m} / 3.0\text{ m}) = 1.47\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No. 13828808H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date June 9, 2021 No.2
Temperature / Humidity 21 deg. C / 52 % RH June 10, 2021
Engineer Nachi Konegawa 24 deg. C / 54 % RH
(1 GHz - 10 GHz) Nachi Konegawa
(10 GHz - 26.5 GHz)
Mode Tx 11n-20 2462 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1579.999	PK	50.9	25.3	3.9	35.1	-	45.0	73.9	28.9	
Hori.	2483.500	PK	45.5	27.4	4.6	34.6	-	42.9	73.9	31.0	
Hori.	2500.000	PK	45.5	27.4	4.6	34.6	-	43.0	73.9	30.9	
Hori.	4924.000	PK	42.1	31.5	6.6	33.8	-	46.5	73.9	27.4	Floor noise
Hori.	7386.000	PK	42.5	36.1	8.0	33.6	-	52.9	73.9	21.0	Floor noise
Hori.	9848.000	PK	43.0	39.0	8.5	34.3	-	56.2	73.9	17.7	Floor noise
Hori.	1579.999	AV	47.9	25.3	3.9	35.1	-	42.0	53.9	11.9	
Hori.	2483.500	AV	36.7	27.4	4.6	34.6	2.2	36.4	53.9	17.5	*1)
Hori.	2500.000	AV	39.7	27.4	4.6	34.6	-	37.1	53.9	16.8	
Hori.	4924.000	AV	34.0	31.5	6.6	33.8	-	38.4	53.9	15.6	Floor noise
Hori.	7386.000	AV	33.5	36.1	8.0	33.6	-	43.9	53.9	10.1	Floor noise
Hori.	9848.000	AV	34.4	39.0	8.5	34.3	-	47.6	53.9	6.3	Floor noise
Vert.	1579.999	PK	55.6	25.3	3.9	35.1	-	49.6	73.9	24.3	
Vert.	2483.500	PK	45.6	27.4	4.6	34.6	-	43.1	73.9	30.8	
Vert.	2500.000	PK	44.6	27.4	4.6	34.6	-	42.1	73.9	31.9	
Vert.	4924.000	PK	42.1	31.5	6.6	33.8	-	46.5	73.9	27.4	Floor noise
Vert.	7386.000	PK	42.7	36.1	8.0	33.6	-	53.0	73.9	20.9	Floor noise
Vert.	9848.000	PK	43.1	39.0	8.5	34.3	-	56.3	73.9	17.6	Floor noise
Vert.	1579.999	AV	49.4	25.3	3.9	35.1	-	43.5	53.9	10.4	
Vert.	2483.500	AV	37.6	27.4	4.6	34.6	2.2	37.3	53.9	16.6	*1)
Vert.	2500.000	AV	38.9	27.4	4.6	34.6	-	36.3	53.9	17.6	
Vert.	4924.000	AV	33.2	31.5	6.6	33.8	-	37.6	53.9	16.3	Floor noise
Vert.	7386.000	AV	33.7	36.1	8.0	33.6	-	44.1	53.9	9.8	Floor noise
Vert.	9848.000	AV	34.4	39.0	8.5	34.3	-	47.6	53.9	6.3	Floor noise

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

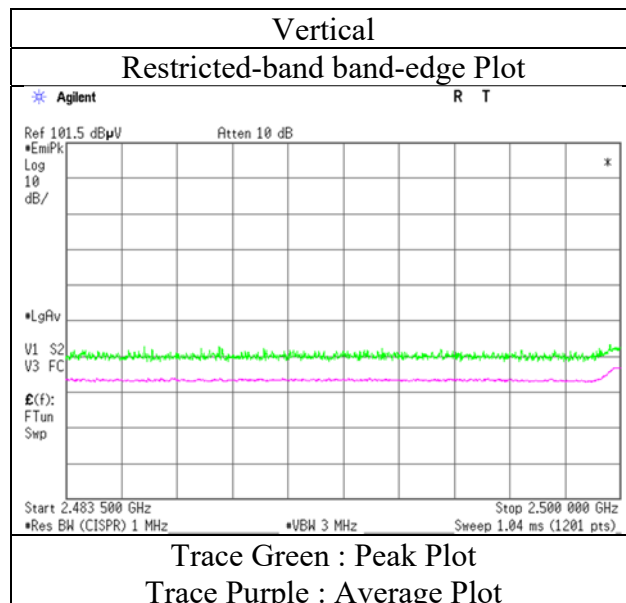
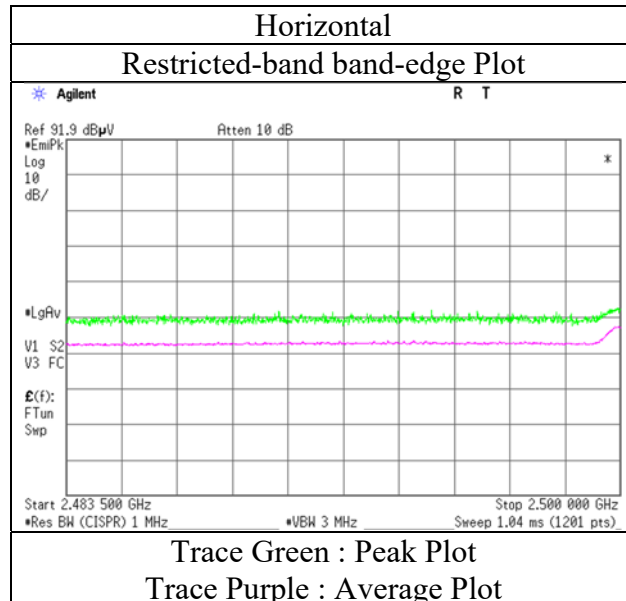
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(3.55 \text{ m} / 3.0 \text{ m}) = 1.47 \text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13828808H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 9, 2021
Temperature / Humidity	21 deg. C / 52 % RH
Engineer	Nachi Konegawa (1 GHz - 10 GHz)
Mode	Tx 11n-20 2462 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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Ise EMC Lab.

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Radiated Spurious Emission

Report No.	13828808H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	June 8, 2021	June 10, 2021	June 10, 2021
Temperature / Humidity	21 deg. C / 60 % RH	20 deg. C / 58 % RH	24 deg. C / 54 % RH
Engineer	Junya Okuno	Junya Okuno	Nachi Konegawa
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2402 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	30.002	QP	22.9	18.5	6.7	28.5	-	19.7	40.0	20.3	
Hori.	59.934	QP	24.3	7.9	7.1	28.4	-	10.8	40.0	29.2	
Hori.	101.751	QP	22.7	10.5	7.5	28.3	-	12.3	43.5	31.2	
Hori.	240.792	QP	26.8	11.6	8.5	27.7	-	19.1	46.0	26.9	
Hori.	439.215	QP	23.4	16.4	9.6	28.7	-	20.7	46.0	25.3	
Hori.	913.680	QP	22.7	22.1	11.4	28.7	-	27.4	46.0	18.6	
Hori.	1579.983	PK	50.4	25.3	3.9	35.1	-	44.5	73.9	29.4	
Hori.	2390.000	PK	43.6	27.6	4.5	34.6	-	41.1	73.9	32.8	
Hori.	3159.907	PK	48.4	28.7	5.0	34.2	-	47.9	73.9	26.0	
Hori.	4804.000	PK	42.8	31.6	6.6	33.7	-	47.2	73.9	26.7	Floor noise
Hori.	7206.000	PK	43.5	35.8	8.0	33.6	-	53.8	73.9	20.2	Floor noise
Hori.	9608.000	PK	43.4	38.6	8.4	34.2	-	56.3	73.9	17.6	Floor noise
Hori.	1579.983	AV	46.7	25.3	3.9	35.1	-	40.8	53.9	13.1	
Hori.	2390.000	AV	35.3	27.6	4.5	34.6	1.7	34.6	53.9	19.4	*1)
Hori.	4804.000	AV	34.4	31.6	6.6	33.7	-	38.9	53.9	15.0	Floor noise
Hori.	7206.000	AV	34.1	35.8	8.0	33.6	-	44.3	53.9	9.6	Floor noise
Hori.	9608.000	AV	34.0	38.6	8.4	34.2	-	46.8	53.9	7.1	Floor noise
Vert.	30.002	QP	23.2	18.5	6.7	28.5	-	20.0	40.0	20.0	
Vert.	59.934	QP	26.7	7.9	7.1	28.4	-	13.2	40.0	26.8	
Vert.	101.751	QP	22.6	10.5	7.5	28.3	-	12.2	43.5	31.3	
Vert.	236.830	QP	23.2	11.4	8.4	27.7	-	15.3	46.0	30.7	
Vert.	440.170	QP	23.2	16.4	9.6	28.7	-	20.5	46.0	25.5	
Vert.	914.530	QP	31.4	22.1	11.4	28.7	-	36.1	46.0	9.9	
Vert.	1579.983	PK	52.0	25.3	3.9	35.1	-	46.1	73.9	27.8	
Vert.	2390.000	PK	45.1	27.6	4.5	34.6	-	42.6	73.9	31.3	
Vert.	3159.907	PK	46.3	28.7	5.0	34.2	-	45.8	73.9	28.1	
Vert.	4804.000	PK	42.5	31.6	6.6	33.7	-	47.0	73.9	26.9	Floor noise
Vert.	7206.000	PK	43.5	35.8	8.0	33.6	-	53.7	73.9	20.2	Floor noise
Vert.	9608.000	PK	43.4	38.6	8.4	34.2	-	56.2	73.9	17.7	Floor noise
Vert.	1579.983	AV	49.1	25.3	3.9	35.1	-	43.1	53.9	10.8	
Vert.	2390.000	AV	35.5	27.6	4.5	34.6	1.7	34.7	53.9	19.2	*1)
Vert.	4804.000	AV	34.1	31.6	6.6	33.7	-	38.6	53.9	15.3	Floor noise
Vert.	7206.000	AV	33.6	35.8	8.0	33.6	-	43.8	53.9	10.1	Floor noise
Vert.	9608.000	AV	34.2	38.6	8.4	34.2	-	47.0	53.9	6.9	Floor noise

Result = 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).

Distance factor: 1 GHz - 10 GHz $20\log(3.55\text{ m} / 3.0\text{ m}) = 1.47\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

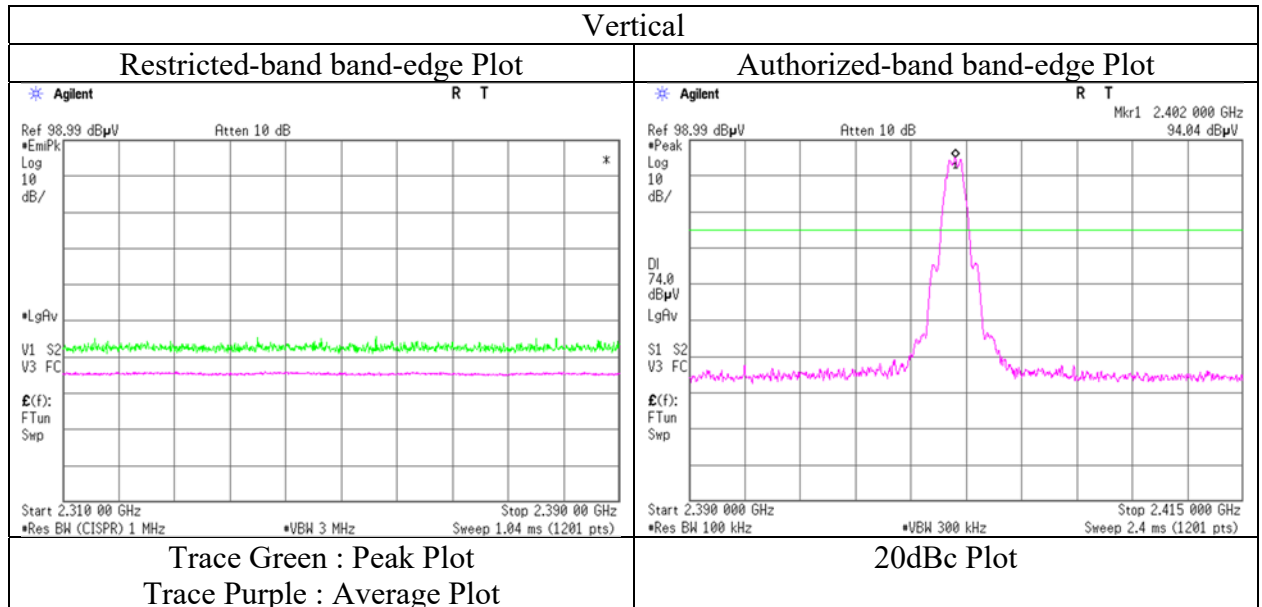
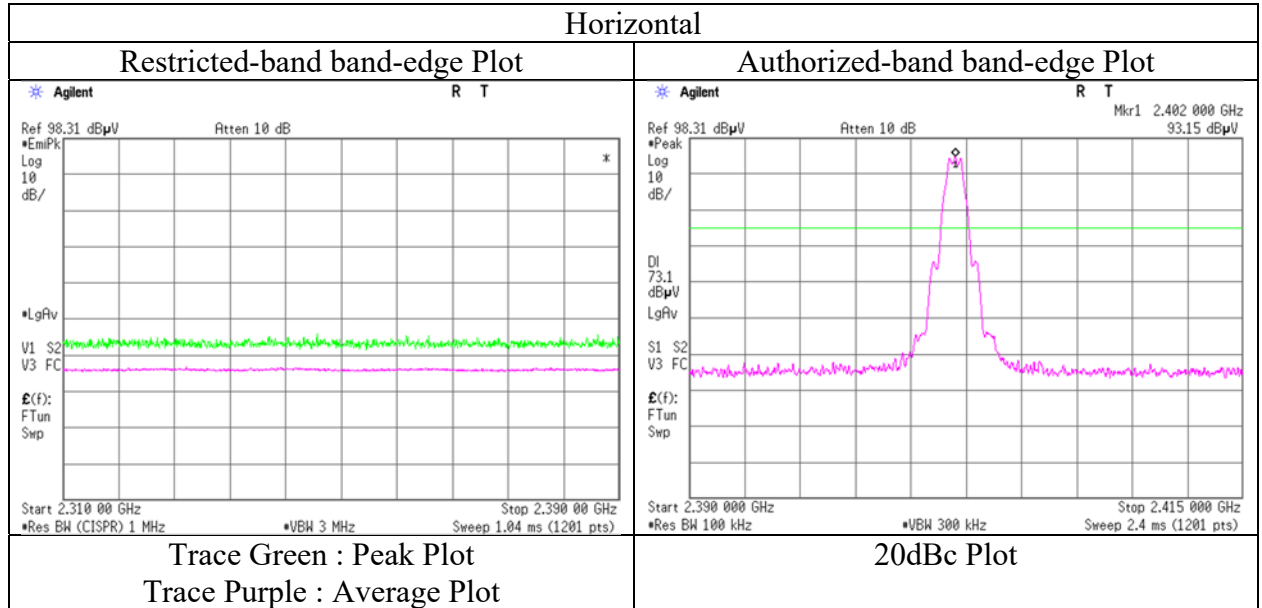
20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	93.2	27.5	4.6	34.6	90.6	-	-	Carrier
Hori.	2400.000	PK	39.9	27.6	4.6	34.6	37.4	70.6	33.2	
Vert.	2402.000	PK	94.0	27.5	4.6	34.6	91.5	-	-	Carrier
Vert.	2400.000	PK	40.4	27.6	4.6	34.6	37.9	71.5	33.6	

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13828808H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	June 8, 2021
Temperature / Humidity	21 deg. C / 60 % RH
Engineer	Junya Okuno
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2402 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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Facsimile : +81 596 24 8124

Radiated Spurious Emission

Report No.	13828808H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	June 8, 2021	June 10, 2021	June 10, 2021
Temperature / Humidity	21 deg. C / 60 % RH	20 deg. C / 58 % RH	24 deg. C / 54 % RH
Engineer	Junya Okuno	Junya Okuno	Nachi Konegawa
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2440 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	30.233	QP	22.0	18.4	6.7	28.5	-	18.7	40.0	21.3	
Hori.	61.047	QP	22.8	7.7	7.1	28.4	-	9.2	40.0	30.8	
Hori.	240.472	QP	27.1	11.5	8.5	27.7	-	19.4	46.0	26.6	
Hori.	285.684	QP	21.9	13.5	8.8	27.7	-	16.5	46.0	29.5	
Hori.	424.632	QP	26.2	16.2	9.6	28.6	-	23.4	46.0	22.6	
Hori.	914.512	QP	28.2	22.1	11.4	28.7	-	32.9	46.0	13.1	
Hori.	1579.983	PK	53.3	25.3	3.9	35.1	-	47.3	73.9	26.6	
Hori.	4880.000	PK	42.5	31.6	6.6	33.8	-	46.9	73.9	27.0	Floor noise
Hori.	7320.000	PK	42.1	36.2	8.0	33.6	-	52.7	73.9	21.2	Floor noise
Hori.	9760.000	PK	43.4	38.8	8.5	34.2	-	56.4	73.9	17.5	Floor noise
Hori.	1579.983	AV	47.9	25.3	3.9	35.1	-	41.9	53.9	12.0	
Hori.	4880.000	AV	34.5	31.6	6.6	33.8	-	38.9	53.9	15.0	Floor noise
Hori.	7320.000	AV	34.6	36.2	8.0	33.6	-	45.1	53.9	8.8	Floor noise
Hori.	9760.000	AV	33.8	38.8	8.5	34.2	-	46.8	53.9	7.1	Floor noise
Vert.	30.423	QP	22.6	18.4	6.7	28.5	-	19.2	40.0	20.8	
Vert.	62.388	QP	28.4	7.3	7.1	28.4	-	14.4	40.0	25.6	
Vert.	205.690	QP	26.9	11.3	8.3	27.9	-	18.5	43.5	25.0	
Vert.	289.010	QP	22.1	13.5	8.8	27.6	-	16.8	46.0	29.2	
Vert.	422.210	QP	25.5	16.1	9.6	28.6	-	22.6	46.0	23.4	
Vert.	914.520	QP	30.8	22.1	11.4	28.7	-	35.5	46.0	10.5	
Vert.	1579.983	PK	51.1	25.3	3.9	35.1	-	45.2	73.9	28.8	
Vert.	4880.000	PK	43.4	31.6	6.6	33.8	-	47.8	73.9	26.1	Floor noise
Vert.	7320.000	PK	42.7	36.2	8.0	33.6	-	53.2	73.9	20.7	Floor noise
Vert.	9760.000	PK	43.1	38.8	8.5	34.2	-	56.2	73.9	17.8	Floor noise
Vert.	1579.983	AV	47.9	25.3	3.9	35.1	-	42.0	53.9	12.0	
Vert.	4880.000	AV	34.3	31.6	6.6	33.8	-	38.7	53.9	15.2	Floor noise
Vert.	7320.000	AV	34.9	36.2	8.0	33.6	-	45.4	53.9	8.5	Floor noise
Vert.	9760.000	AV	33.6	38.8	8.5	34.2	-	46.6	53.9	7.3	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz $20\log(3.55\text{ m} / 3.0\text{ m}) = 1.47\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No.	13828808H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	June 8, 2021	June 10, 2021	June 10, 2021
Temperature / Humidity	21 deg. C / 60 % RH	20 deg. C / 58 % RH	24 deg. C / 54 % RH
Engineer	Junya Okuno	Junya Okuno	Nachi Konegawa
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2480 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	34.080	QP	22.9	17.0	6.8	28.5	-	18.2	40.0	21.8	
Hori.	44.520	QP	22.9	13.1	6.9	28.4	-	14.5	40.0	25.5	
Hori.	81.000	QP	23.6	6.7	7.3	28.4	-	9.2	40.0	30.8	
Hori.	289.320	QP	24.7	13.5	8.8	27.6	-	19.4	46.0	26.6	
Hori.	426.400	QP	26.2	16.2	9.6	28.6	-	23.4	46.0	22.7	
Hori.	914.528	QP	30.3	22.1	11.4	28.7	-	35.0	46.0	11.0	
Hori.	1579.983	PK	52.5	25.3	3.9	35.1	-	46.6	73.9	27.3	
Hori.	2483.500	PK	46.9	27.4	4.6	34.6	-	44.3	73.9	29.6	
Hori.	2500.000	PK	45.7	27.4	4.6	34.6	-	43.2	73.9	30.7	
Hori.	4960.000	PK	43.0	31.6	6.6	33.8	-	47.4	73.9	26.5	Floor noise
Hori.	7440.000	PK	42.4	36.0	8.0	33.7	-	52.7	73.9	21.2	Floor noise
Hori.	9920.000	PK	43.0	38.9	8.5	34.3	-	56.2	73.9	17.7	Floor noise
Hori.	1579.983	AV	47.5	25.3	3.9	35.1	-	41.6	53.9	12.3	
Hori.	2483.500	AV	36.9	27.4	4.6	34.6	1.7	36.1	53.9	17.8	*1)
Hori.	2500.000	AV	39.9	27.4	4.6	34.6	-	37.3	53.9	16.6	
Hori.	4960.000	AV	34.5	31.6	6.6	33.8	-	38.9	53.9	15.0	Floor noise
Hori.	7440.000	AV	34.9	36.0	8.0	33.7	-	45.3	53.9	8.6	Floor noise
Hori.	9920.000	AV	34.1	38.9	8.5	34.3	-	47.3	53.9	6.6	Floor noise
Vert.	30.600	QP	23.7	18.3	6.7	28.5	-	20.2	40.0	19.8	
Vert.	49.160	QP	28.0	11.5	7.0	28.4	-	18.0	40.0	22.0	
Vert.	83.280	QP	27.3	7.0	7.3	28.4	-	13.3	40.0	26.8	
Vert.	299.470	QP	22.1	13.7	8.9	27.6	-	17.0	46.0	29.0	
Vert.	427.400	QP	24.8	16.2	9.6	28.6	-	22.0	46.0	24.0	
Vert.	915.819	QP	32.0	22.1	11.4	28.7	-	36.7	46.0	9.3	
Vert.	1579.983	PK	52.0	25.3	3.9	35.1	-	46.1	73.9	27.8	
Vert.	2483.500	PK	48.2	27.4	4.6	34.6	-	45.6	73.9	28.3	
Vert.	2500.000	PK	44.7	27.4	4.6	34.6	-	42.2	73.9	31.7	
Vert.	4960.000	PK	43.3	31.6	6.6	33.8	-	47.7	73.9	26.2	Floor noise
Vert.	7440.000	PK	43.2	36.0	8.0	33.7	-	53.5	73.9	20.4	Floor noise
Vert.	9920.000	PK	42.3	38.9	8.5	34.3	-	55.5	73.9	18.5	Floor noise
Vert.	1579.983	AV	48.0	25.3	3.9	35.1	-	42.0	53.9	11.9	
Vert.	2483.500	AV	36.5	27.4	4.6	34.6	1.7	35.7	53.9	18.2	*1)
Vert.	2500.000	AV	38.9	27.4	4.6	34.6	-	36.4	53.9	17.5	
Vert.	4960.000	AV	34.2	31.6	6.6	33.8	-	38.6	53.9	15.4	Floor noise
Vert.	7440.000	AV	35.3	36.0	8.0	33.7	-	45.6	53.9	8.3	Floor noise
Vert.	9920.000	AV	34.1	38.9	8.5	34.3	-	47.3	53.9	6.6	Floor noise

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

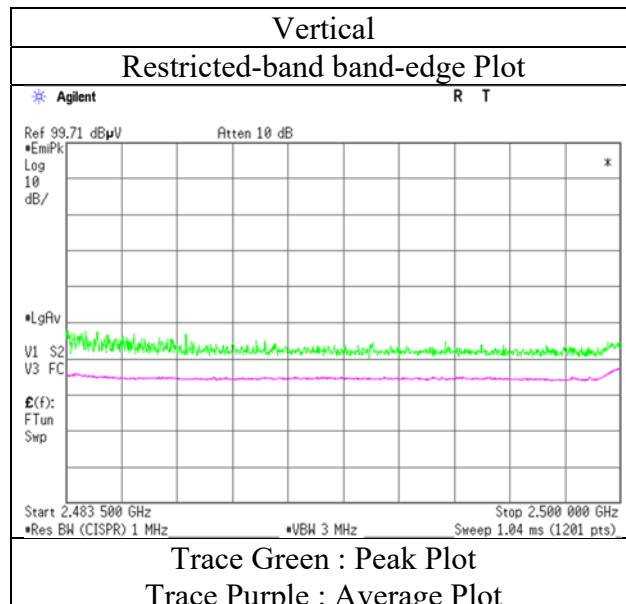
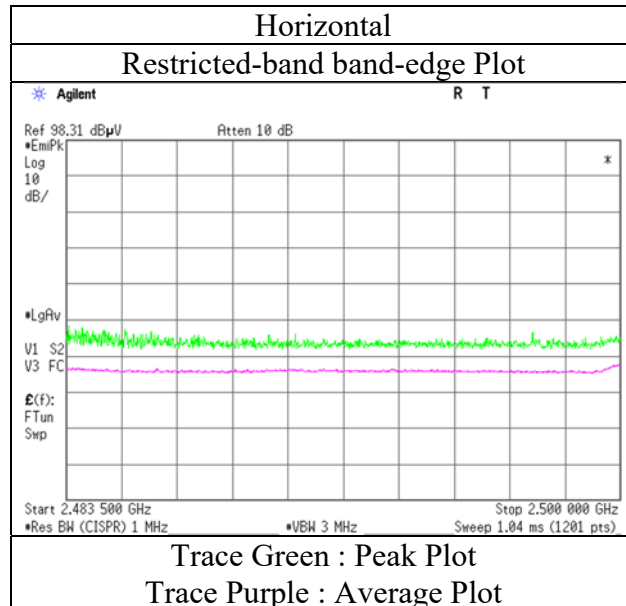
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(3.55\text{ m} / 3.0\text{ m}) = 1.47\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Radiated Spurious Emission **(Reference Plot for band-edge)**

Report No. 13828808H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date June 8, 2021
Temperature / Humidity 21 deg. C / 60 % RH
Engineer Junya Okuno
(1 GHz - 10 GHz)
Mode Tx BT LE 2480 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.

Radiated Spurious Emission

Report No. 13828808H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date October 18, 2021
Temperature / Humidity 22 deg. C / 53 % RH
Engineer Hiroki Numata
(1 GHz - 26.5 GHz)
Mode Tx BT LE 2402 MHz + 11a 5180 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1579.983	PK	58.2	25.1	4.0	35.1	-	52.1	73.9	21.8	
Hori.	2390.000	PK	44.8	27.5	4.6	34.6	-	42.3	73.9	31.6	
Hori.	1579.983	AV	47.6	25.1	4.0	35.1	-	41.5	53.9	12.4	
Hori.	2390.000	AV	35.6	27.5	4.6	34.6	1.7	34.8	53.9	19.1	*1)
Vert.	1579.983	PK	55.9	25.1	4.0	35.1	-	49.8	73.9	24.1	
Vert.	2390.000	PK	45.2	27.5	4.6	34.6	-	42.7	73.9	31.2	
Vert.	1579.983	AV	49.6	25.1	4.0	35.1	-	43.5	53.9	10.4	
Vert.	2390.000	AV	35.6	27.5	4.6	34.6	1.7	34.8	53.9	19.1	*1)

Result = 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).

Distance factor: 1 GHz - 10 GHz $20\log(3.55\text{ m} / 3.0\text{ m}) = 1.47\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

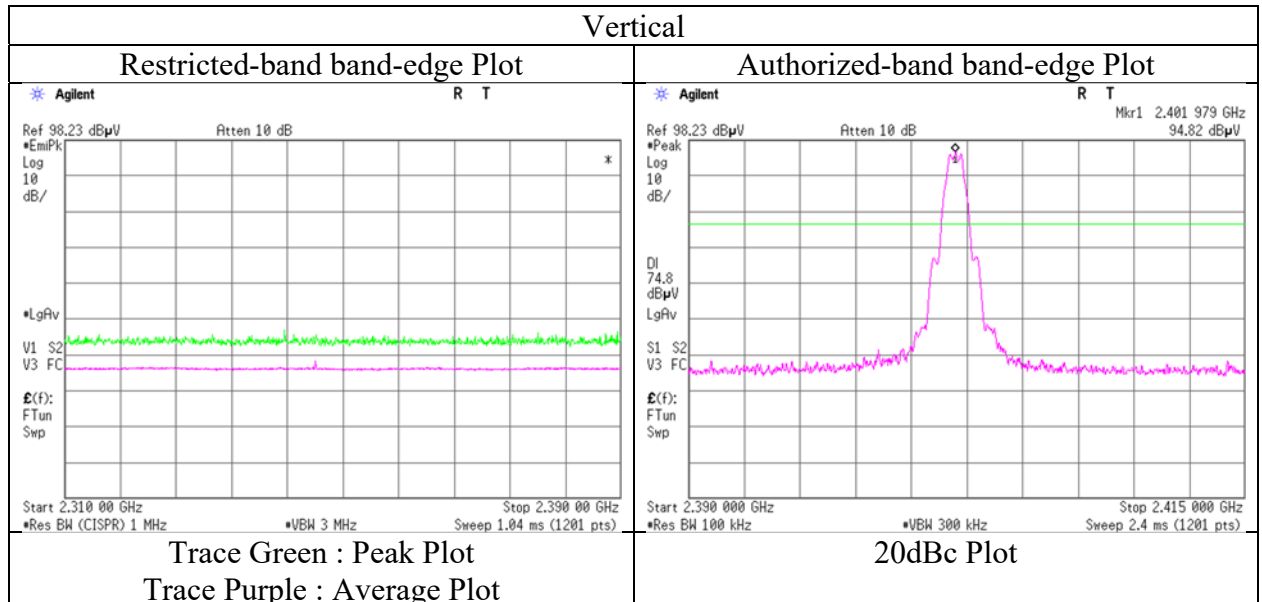
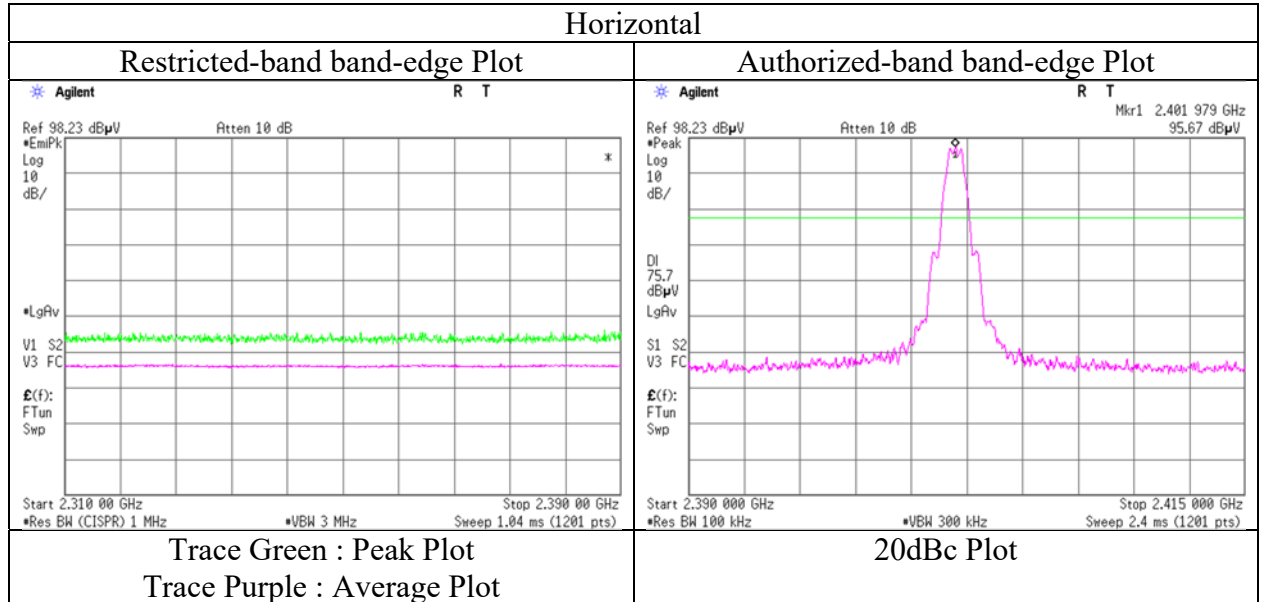
20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	95.7	27.5	4.6	34.6	93.2	-	-	Carrier
Hori.	2400.000	PK	42.2	27.5	4.6	34.6	39.7	73.2	33.5	
Vert.	2402.000	PK	94.8	27.5	4.6	34.6	92.3	-	-	Carrier
Vert.	2400.000	PK	40.8	27.5	4.6	34.6	38.3	72.3	34.1	

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13828808H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	October 18, 2021
Temperature / Humidity	22 deg. C / 53 % RH
Engineer	Hiroki Numata
	(1 GHz - 26.5 GHz)
Mode	Tx BT LE 2402 MHz + 11a 5180 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.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Radiated Spurious Emission

Report No. 13828808H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2 No.3
Date October 18, 2021 October 19, 2021
Temperature / Humidity 22 deg. C / 53 % RH 21 deg. C / 55 % RH
Engineer Hiroki Numata Kiyoshiro Okazaki
(1 GHz - 26.5 GHz) (30MHz - 1GHz)
Mode Tx BT LE 2440 MHz + 11a 5180 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	31.700	QP	22.8	18.0	7.1	32.3	-	15.6	40.0	24.4	
Hori.	137.752	QP	24.1	14.4	8.6	32.2	-	14.8	43.5	28.7	
Hori.	196.770	QP	29.1	16.7	9.1	32.2	-	22.8	43.5	20.7	
Hori.	214.352	QP	32.4	11.7	9.3	32.2	-	21.2	43.5	22.3	
Hori.	231.995	QP	29.9	12.0	9.5	32.1	-	19.2	46.0	26.8	
Hori.	913.941	QP	21.8	22.3	13.6	30.9	-	26.8	46.0	19.2	
Hori.	1579.983	PK	58.0	25.1	4.0	35.1	-	52.0	73.9	21.9	
Hori.	4880.000	PK	47.7	31.5	6.9	33.8	-	52.2	73.9	21.7	
Hori.	7320.000	PK	42.4	36.2	8.3	33.6	-	53.3	73.9	20.6	Floor noise
Hori.	9760.000	PK	42.5	39.0	8.9	34.2	-	56.1	73.9	17.8	Floor noise
Hori.	1579.983	AV	47.2	25.1	4.0	35.1	-	41.1	53.9	12.8	
Hori.	4880.000	AV	40.1	31.5	6.9	33.8	1.7	46.4	53.9	7.5	
Hori.	7320.000	AV	34.1	36.2	8.3	33.6	-	45.0	53.9	8.9	Floor noise
Hori.	9760.000	AV	34.6	39.0	8.9	34.2	-	48.3	53.9	5.6	Floor noise
Vert.	31.700	QP	26.2	18.0	7.1	32.3	-	19.0	40.0	21.0	
Vert.	137.752	QP	22.2	14.4	8.6	32.2	-	12.9	43.5	30.6	
Vert.	196.770	QP	23.2	16.7	9.1	32.2	-	16.9	43.5	26.6	
Vert.	214.352	QP	31.8	11.7	9.3	32.2	-	20.6	43.5	22.9	
Vert.	231.995	QP	28.3	12.0	9.5	32.1	-	17.6	46.0	28.4	
Vert.	913.941	QP	21.3	22.3	13.6	30.9	-	26.3	46.0	19.7	
Vert.	1579.983	PK	54.1	25.1	4.0	35.1	-	48.0	73.9	25.9	
Vert.	4880.000	PK	45.5	31.5	6.9	33.8	-	50.1	73.9	23.8	
Vert.	7320.000	PK	42.3	36.2	8.3	33.6	-	53.2	73.9	20.7	Floor noise
Vert.	9760.000	PK	42.9	39.0	8.9	34.2	-	56.5	73.9	17.4	Floor noise
Vert.	1579.983	AV	49.7	25.1	4.0	35.1	-	43.7	53.9	10.2	
Vert.	4880.000	AV	38.6	31.5	6.9	33.8	1.7	44.9	53.9	9.0	
Vert.	7320.000	AV	34.1	36.2	8.3	33.6	-	45.0	53.9	8.9	Floor noise
Vert.	9760.000	AV	34.9	39.0	8.9	34.2	-	48.5	53.9	5.4	Floor noise

Result = 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).

Distance factor: 1 GHz - 10 GHz 20log (3.55 m / 3.0 m) = 1.47 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No. 13828808H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date October 18, 2021
Temperature / Humidity 22 deg. C / 53 % RH
Engineer Hiroki Numata
(1 GHz - 26.5 GHz)
Mode Tx BT LE 2480 MHz + 11a 5180 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	1579.983	PK	52.4	25.1	4.0	35.1	-	46.4	73.9	27.6	
Hori.	2483.500	PK	50.0	27.3	4.7	34.6	-	47.4	73.9	26.5	
Hori.	1579.983	AV	49.6	25.1	4.0	35.1	-	43.6	53.9	10.4	
Hori.	2483.500	AV	34.4	27.3	4.7	34.6	1.7	33.5	53.9	20.4	*1)
Vert.	1579.983	PK	52.9	25.1	4.0	35.1	-	46.8	73.9	27.1	
Vert.	2483.500	PK	48.6	27.3	4.7	34.6	-	46.0	73.9	27.9	
Vert.	1579.983	AV	47.7	25.1	4.0	35.1	-	41.6	53.9	12.3	
Vert.	2483.500	AV	36.5	27.3	4.7	34.6	1.7	35.6	53.9	18.3	*1)

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

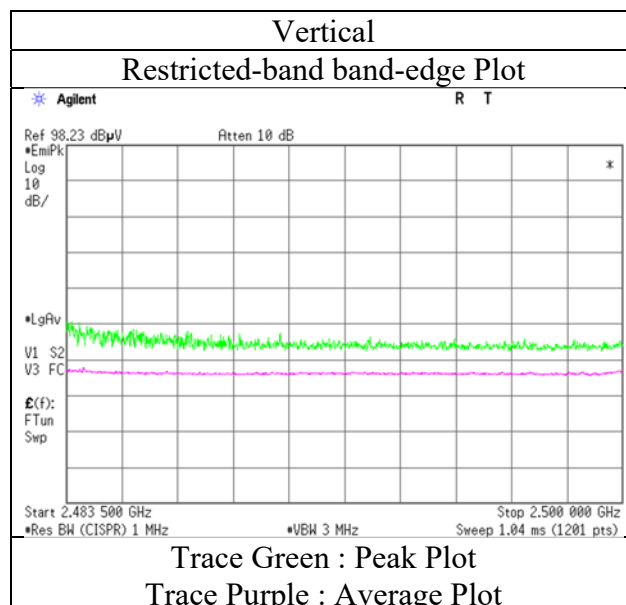
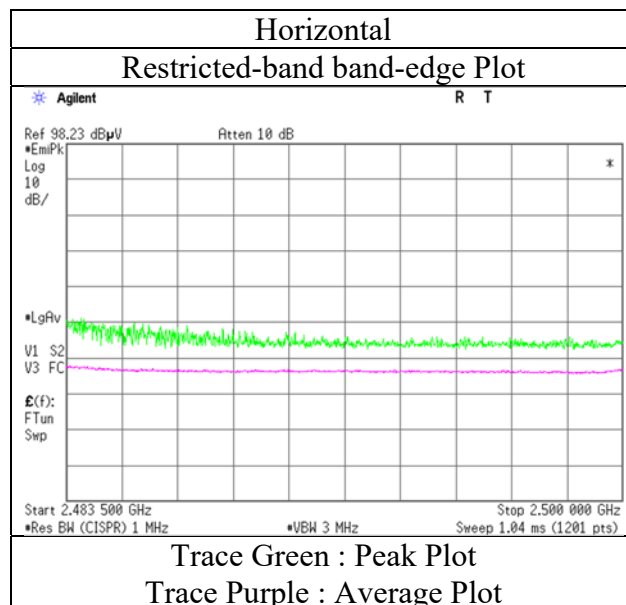
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(3.55\text{ m} / 3.0\text{ m}) = 1.47\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13828808H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	October 18, 2021
Temperature / Humidity	22 deg. C / 53 % RH
Engineer	Hiroki Numata
	(1 GHz - 26.5 GHz)
Mode	Tx BT LE 2480 MHz + 11a 5180 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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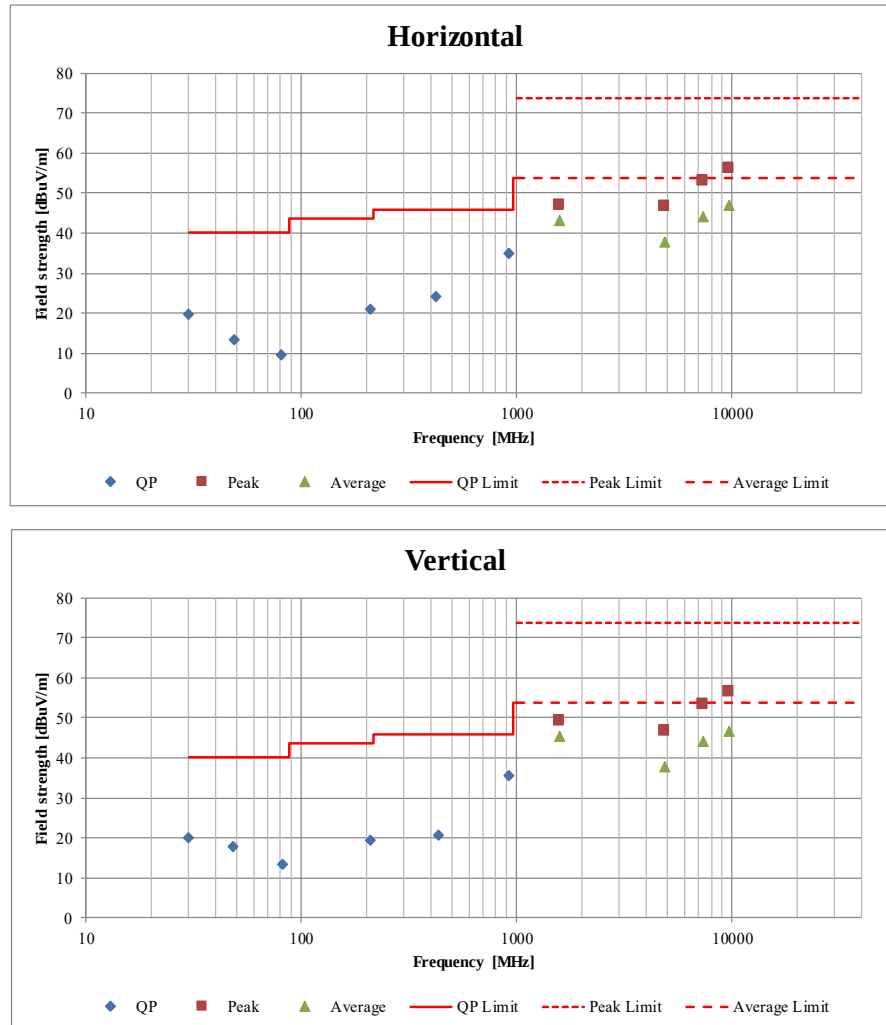
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Radiated Spurious Emission (Plot data, Worst case)

Report No.	13828808H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	June 9, 2021	June 10, 2021	June 16, 2021
Temperature / Humidity	21 deg. C / 52 % RH	24 deg. C / 54 % RH	23 deg. C / 70 % RH
Engineer	Nachi Konegawa (1 GHz - 10 GHz)	Nachi Konegawa (10 GHz - 26.5 GHz)	Junki Nagatomi (Below 1 GHz)
Mode	Tx 11n-20 2437 MHz		



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

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Ise EMC Lab.

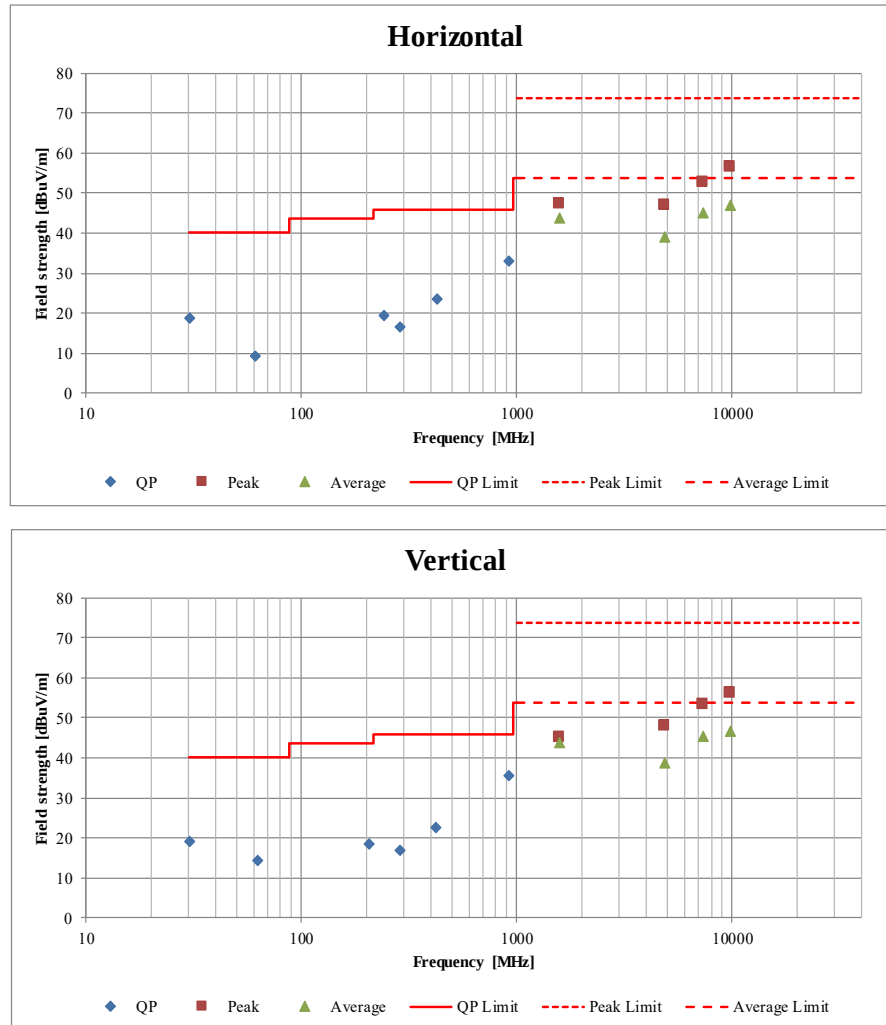
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Radiated Spurious Emission (Plot data, Worst case)

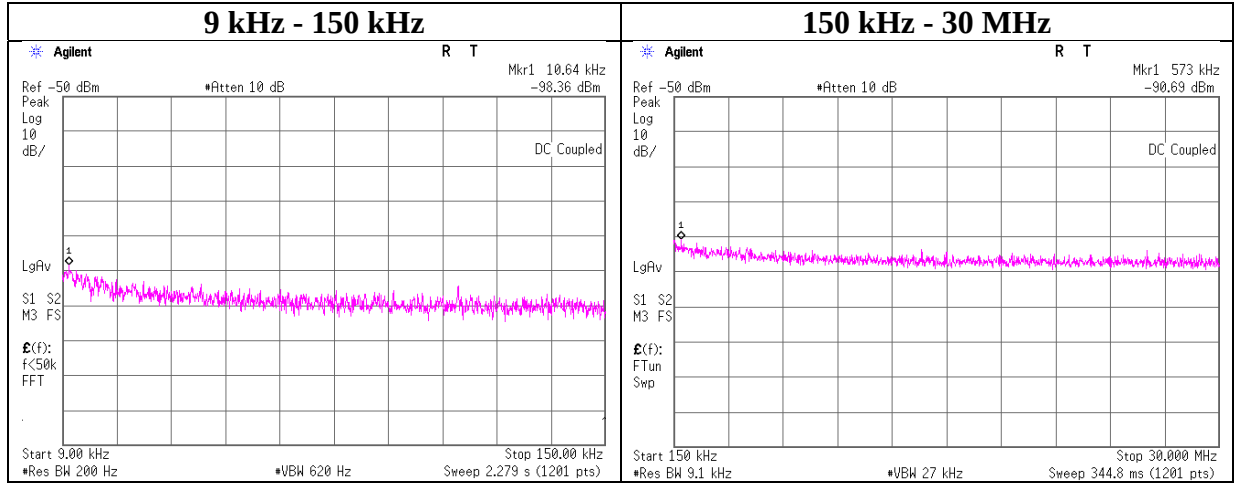
Report No.	13828808H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	June 8, 2021	June 10, 2021	June 10, 2021
Temperature / Humidity	21 deg. C / 60 % RH	20 deg. C / 58 % RH	24 deg. C / 54 % RH
Engineer	Junya Okuno	Junya Okuno	Nachi Konegawa
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2440 MHz		



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

Conducted Spurious Emission

Report No.	13828808H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	June 9, 2021
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Yuichiro Yamazaki
Mode	Tx 11n-20 2437 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
10.64	-98.4	0.61	9.7	2.0	1	-86.1	300	6.0	-24.8	47.0	71.8	
573.00	-90.7	0.62	9.7	2.0	1	-78.4	30	6.0	2.9	32.4	29.5	

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

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

N: Number of output

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

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Ise EMC Lab.

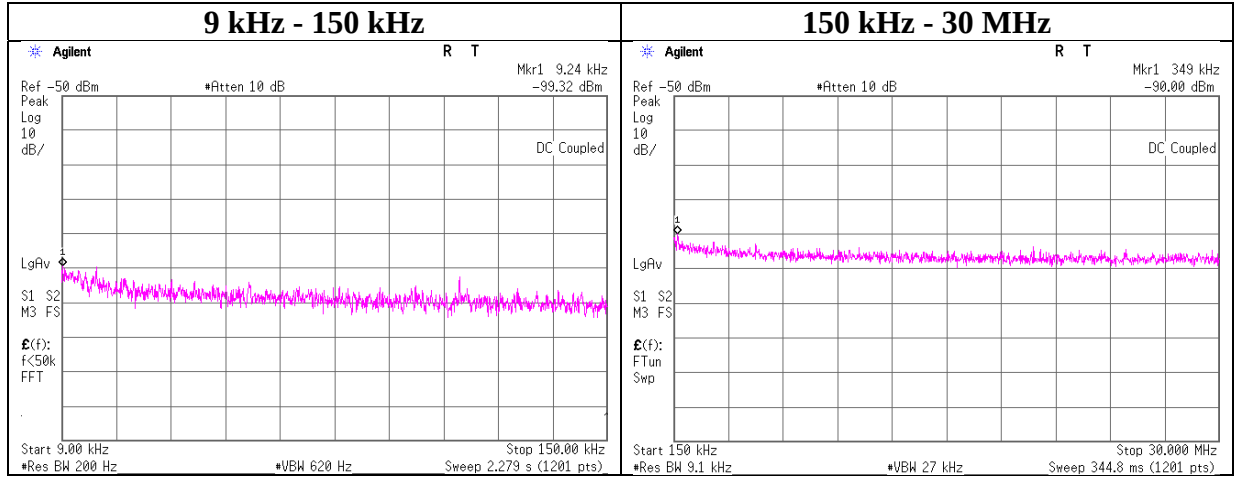
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Conducted Spurious Emission

Report No.	13828808H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	June 9, 2021
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Yuichiro Yamazaki
Mode	Tx BT LE 2402 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
9.24	-99.3	0.61	9.7	2.0	1	-87.0	300	6.0	-25.8	48.2	74.0	
349.00	-90.0	0.62	9.7	2.0	1	-77.7	300	6.0	-16.4	16.7	33.1	

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

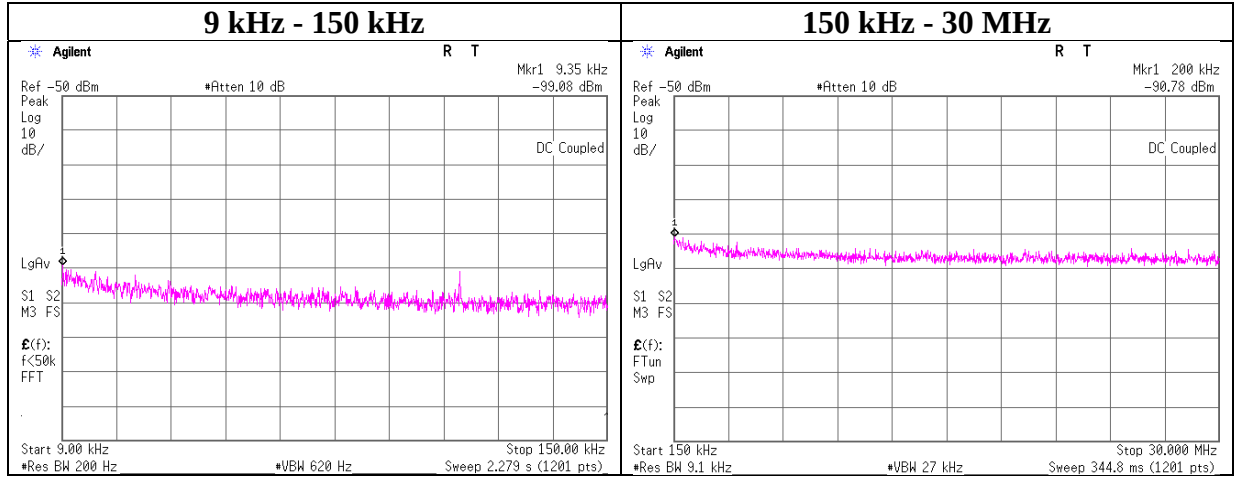
$EIRP [dBm] = Reading [dBm] + Cable\ loss [dB] + Attenuator\ Loss [dB] + Antenna\ gain [dBi] + 10 * \log (N)$

N: Number of output

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

Conducted Spurious Emission

Report No.	13828808H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	June 9, 2021
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Yuichiro Yamazaki
Mode	Tx BT LE 2440 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
9.35	-99.1	0.64	9.7	2.0	1	-86.8	300	6.0	-25.5	48.1	73.6	
200.00	-90.8	0.73	9.7	2.0	1	-78.3	300	6.0	-17.1	21.5	38.6	

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

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

N: Number of output

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

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9 kHz - 150 kHz

Agilent R T

Ref -50 dBm *Atten 10 dB Mkr1 9.82 kHz -98.14 dBm

Peak Log 10 dB/ DC Coupled

LgAv

S1 S2 M3 FS

$E(f)$: f<50k FFT

Start 9.00 kHz Stop 150.00 kHz

*Res BW 200 Hz *VBW 620 Hz Sweep 2.279 s (1201 pts)

150 kHz - 30 MHz

Agilent R T

Ref -50 dBm *Atten 10 dB Mkr1 150 kHz -90.55 dBm

Peak Log 10 dB/ DC Coupled

LgAv

S1 S2 M3 FS

$E(f)$: FTun Swp

Start 150 kHz Stop 30.000 MHz

*Res BW 9.1 kHz *VBW 27 kHz Sweep 344.8 ms (1201 pts)

Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain*	N (Number of Output)	EIRP	Distance	Ground bounce	E (field strength)	Limit	Margin	Remarks
[kHz]	[dBm]	[dB]	[dB]	[dBi]		[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
9.82	-98.1	0.64	9.7	2.0	1	-85.8	300	6.0	-24.6	47.7	72.3	
150.00	-90.6	0.72	9.7	2.0	1	-78.1	300	6.0	-16.9	24.0	40.9	

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

Power Density

Report No.	13828808H	
Test place	Ise EMC Lab. No.6 Measurement Room	
Date	June 8, 2021	June 9, 2021
Temperature / Humidity	22 deg. C / 51 % RH	25 deg. C / 36 % RH
Engineer	Yuichiro Yamazaki	Yuichiro Yamazaki
Mode	Tx	

11b

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	dBm / 3 kHz	[dB]	[dB]	[dBm / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-37.97	1.44	30.04	-6.49	8.00	14.49
2437	-36.16	1.44	30.04	-4.68	8.00	12.68
2462	-40.97	1.45	30.04	-9.48	8.00	17.48

11g

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	dBm / 3 kHz	[dB]	[dB]	[dBm / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-52.58	1.44	30.04	-21.10	8.00	29.10
2437	-50.53	1.44	30.04	-19.05	8.00	27.05
2462	-52.51	1.45	30.04	-21.02	8.00	29.02

11n-20

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	dBm / 3 kHz	[dB]	[dB]	[dBm / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-53.62	1.44	30.04	-22.14	8.00	30.14
2437	-51.74	1.44	30.04	-20.26	8.00	28.26
2462	-52.41	1.45	30.04	-20.92	8.00	28.92

BT LE

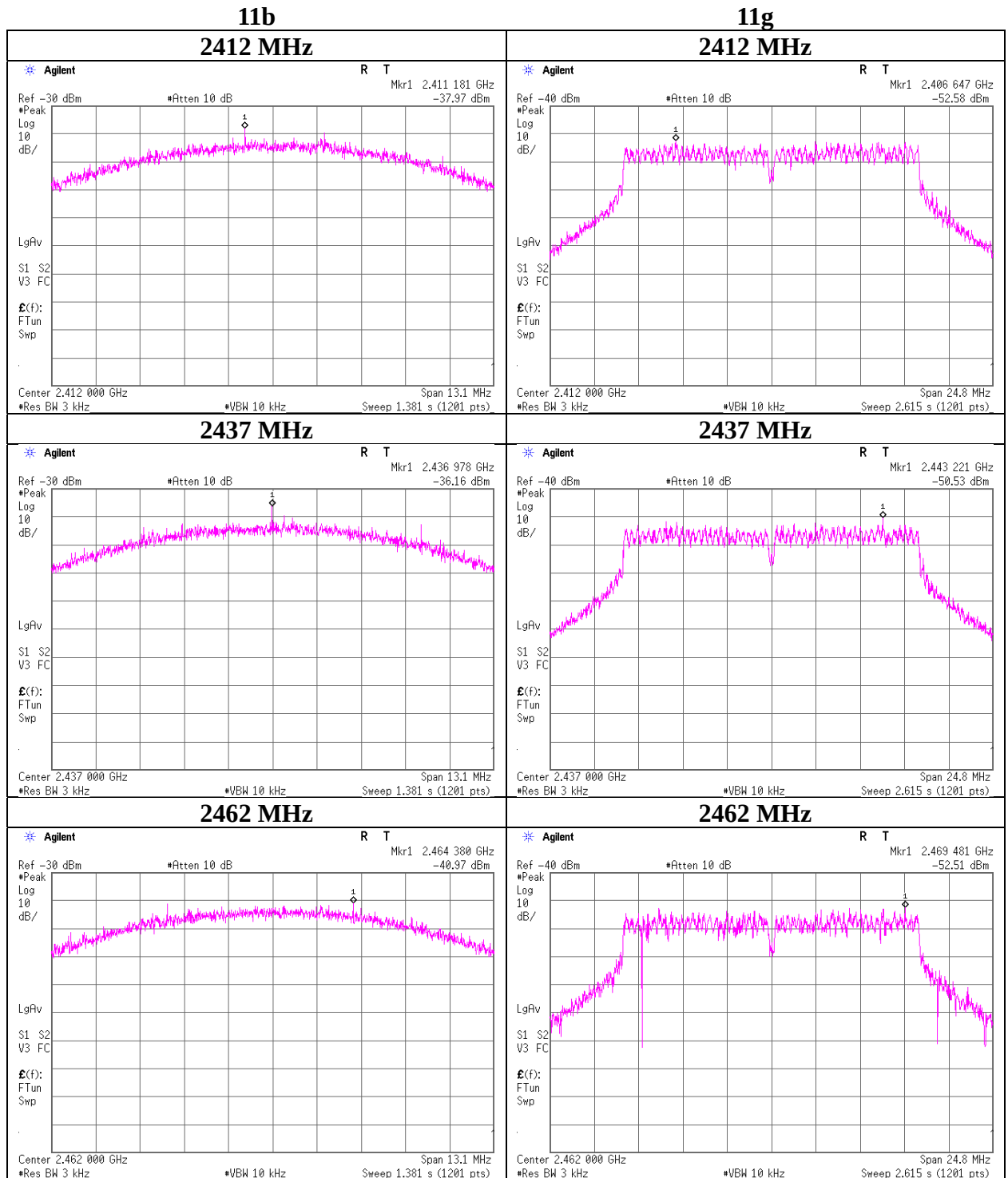
Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	dBm / 3 kHz	[dB]	[dB]	[dBm / 3 kHz]	[dBm / 3 kHz]	[dB]
2402	-27.10	1.42	10.04	-15.64	8.00	23.64
2440	-26.62	1.43	10.04	-15.15	8.00	23.15
2480	-26.67	1.45	10.04	-15.18	8.00	23.18

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

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

Power Density



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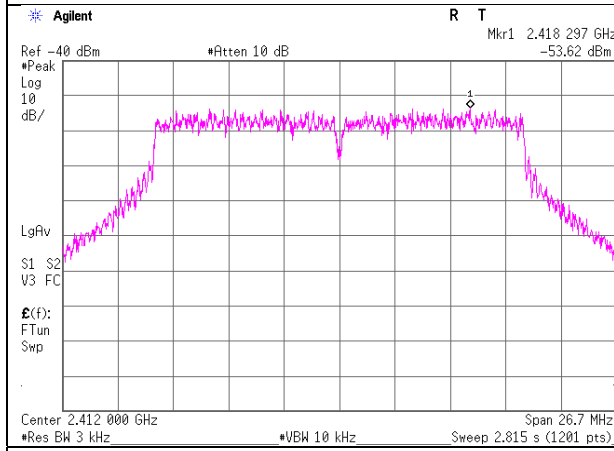
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Power Density

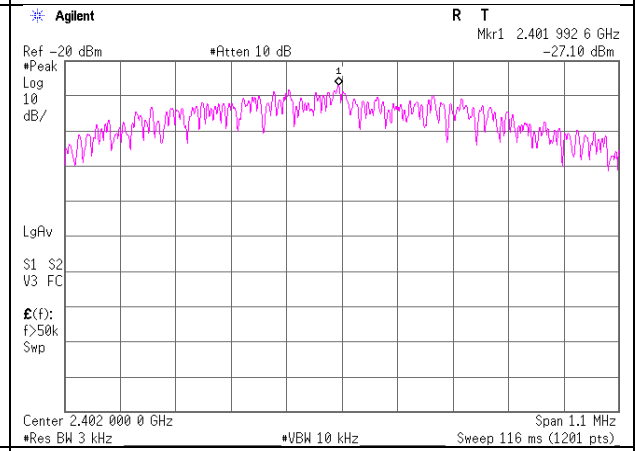
11n-20 Short GI

2412 MHz

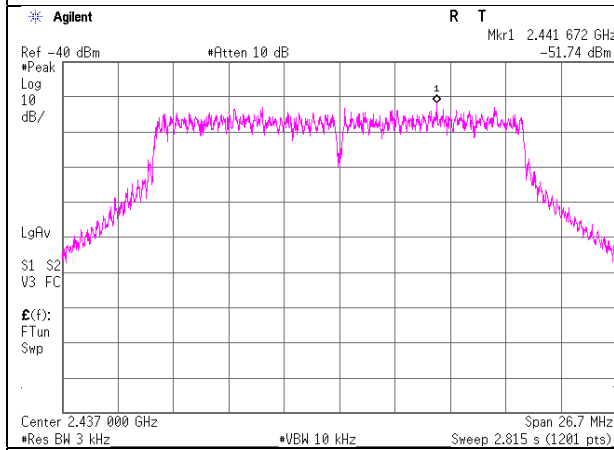


BT LE

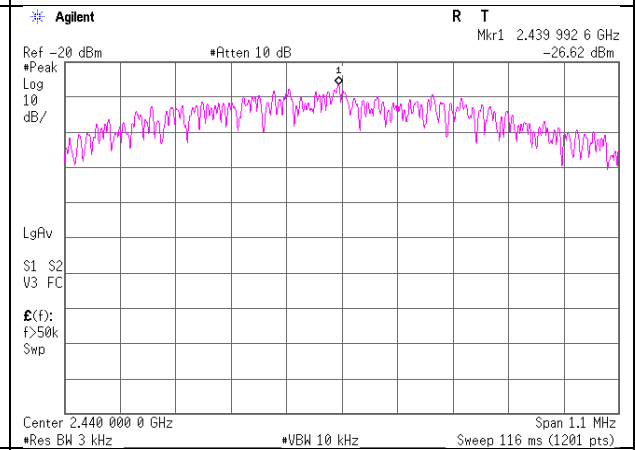
2402 MHz



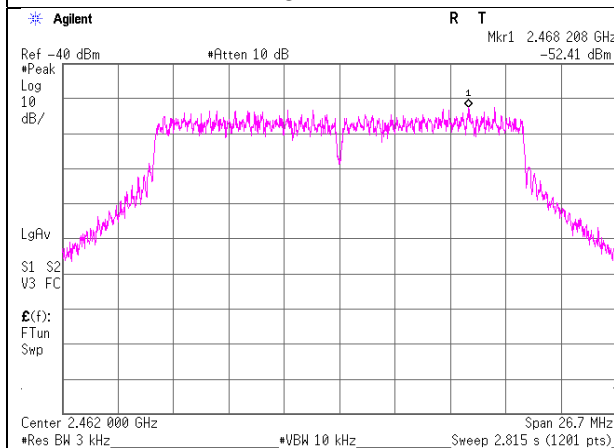
2437 MHz



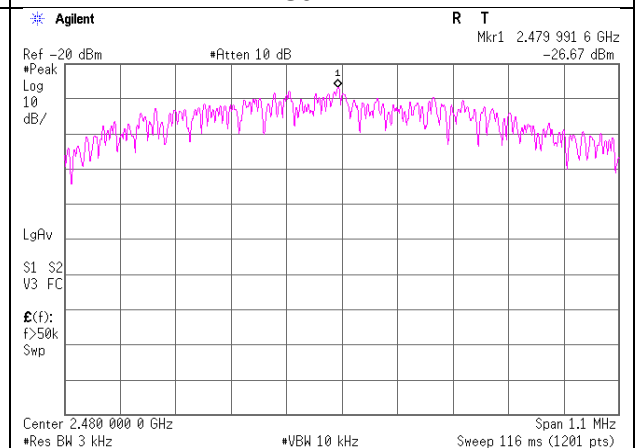
2440 MHz



2462 MHz



2480 MHz



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APPENDIX 2: Test instruments

Test equipment (Test on June 6 to 10, 2021)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MOS-41	192300	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0013	12/06/2020	12
RE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/18/2020	12
RE	MJM-27	142228	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-02-SVSWR	142006	AC2_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/09/2021	24
RE	MHA-06	141512	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	254	09/14/2020	12
RE	MCC-218	141394	Microwave Cable	Junkosha	MWX221	1607S141(1 m) / 1608S264(5 m)	09/23/2020	12
RE	MPA-10	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	02/18/2021	12
RE	MHF-25	141232	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	09/23/2020	12
RE	MSA-10	141899	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180655	08/04/2020	12
AT	MOS-14	141561	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1401	01/15/2021	12
AT	MMM-12	141547	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	60500120	02/01/2021	12
AT	MSA-16	141903	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186390	12/18/2020	12
AT	MCC-244	197219	Microwave cable	Huber+Suhner	SF126E/11PC35/11PC35/2000MM	536999/126E	03/04/2021	12
AT	MAT-58	141334	Attenuator(10dB)	Suhner	6810.19.A	-	12/07/2020	12
AT	MAT-21	141174	Attenuator(20dB) (above1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-120	901247	01/13/2021	12
AT	MCC-210	141289	Microwave Cable	RS Pro	R-132G7210200CD	-	04/02/2021	12
AT	MPM-16	141812	Power Meter	Keysight Technologies Inc	8990B	MY51000271	08/20/2020	12
AT	MPSE-22	141842	Power sensor	Keysight Technologies Inc	N1923A	MY54070003	08/20/2020	12
AT	MCC-38	141395	Coaxial Cable	UL Japan	-	-	11/17/2020	12
AT	MAT-26	141244	Attenuator(10dB)	Weinschel - API Technologies Corp	WA8-10-34	A198	02/24/2021	12
AT	MCC-211	141322	Microwave Cable	RS Pro	R-132G7210200CD	-	04/02/2021	12
RE	MHA-17	141506	Horn Antenna 15-40GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9170	BBHA9170307	07/16/2020	12
AT	MPM-17	141813	Power Meter	Raditec (Formerly DARE!! Instruments)	RPR3006W	14100048SNO081	11/06/2020	12
RE	MAT-07	141203	Attenuator(6dB)	Weinschel Corp	2	BK7970	11/13/2020	12
RE	MBA-08	141427	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103B+BBA9106	8031	07/29/2020	12
RE	MCC-12	141317	Coaxial Cable	UL Japan Inc.	-	-	09/25/2020	12
RE	MLA-21	141265	Logperiodic Antenna(200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-190	07/29/2020	12
RE	MPA-24	141594	Pre Amplifier	Keysight Technologies Inc	8447D	2944A10150	02/18/2021	12
RE	MTR-09	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	06/03/2020	12
RE	MAEC-02	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	05/26/2020	24

UL Japan, Inc.

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Test equipment (Test on October 18 and 19, 2021)

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MOS-41	192300	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0013	12/06/2020	12
RE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/10/2021	12
RE	MJM-27	142228	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-02-SVSWR	142006	AC2_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/09/2021	24
RE	MCC-218	141394	Microwave Cable	Junkosha	MWX221	1607S141(1 m) / 1608S264(5 m)	09/30/2021	12
RE	MPA-10	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	02/18/2021	12
RE	MHA-20	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	258	10/01/2020	12
RE	MHA-02	141503	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	06/28/2021	12
RE	MCC-176	141279	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S303	03/01/2021	12
RE	MHF-16	141406	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCA	7001	09/30/2021	12
RE	MRENT-130	141855	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187750	11/18/2020	12
RE	MAEC-03	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/22/2020	24
RE	MOS-13	141554	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1301	01/15/2021	12
RE	MMM-08	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201197	01/07/2021	12
RE	MJM-16	142183	Measure	KOMELON	KMC-36	-	-	-
RE	MAT-95	142314	Attenuator	Pasternack Enterprises	PE7390-6	D/C 1504	06/09/2021	12
RE	MBA-03	141424	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103+BBA9106	1915	08/21/2021	12
RE	MCC-51	141323	Coaxial cable	UL Japan	-	-	07/19/2021	12
RE	MLA-22	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-191	08/21/2021	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/18/2021	12
RE	MTR-03	141942	Test Receiver	Rohde & Schwarz	ESCI	100300	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 test
AT: Antenna Terminal Conducted test**

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