




RADIO TEST REPORT

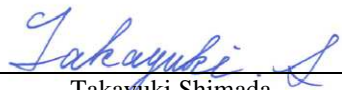
Test Report No. : 13694267H-A-R1

Applicant : Murata Manufacturing Co., Ltd.
Type of EUT : communication module
Model Number of EUT : Type2AH
FCC ID : VPYLBCA2HN2AH
Test regulation : FCC Part 15 Subpart C: 2021
Test Result : Complied (Refer to SECTION 3)

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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 13694267H-A. 13694267H-A is replaced with this report.

Date of test: February 2 to March 9, 2021

Representative test engineer: 
Yuichiro Yamazaki
Engineer
Consumer Technology Division

Approved by: 
Takayuki Shimada
Leader
Consumer Technology Division



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.: 13694267H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13694267H-A	March 22, 2021	-	-
1	13694267H-A-R1	April 6, 2021	P 12	Addition of configuration and peripherals for conducted emission test in Section 4.2 configuration and peripherals
1	13694267H-A-R1	April 6, 2021	P 28	Correction of reading of 2480 MHz of power setting 0 in APPENDIX 1: test data (maximum peak output power) -12.51 dBm → -12.19 dBm
1	13694267H-A-R1	April 6, 2021	P 72	Correction of last calibration date for below test instruments in APPENDIX 2: test instruments Local ID : MPA-24; 02/10/2020→02/18/2021 Local ID : MCC-216; 02/18/2020→02/03/2021

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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	:	Murata Manufacturing Co., Ltd.
Address	:	1-10-1 Higashikotari, Nagaokakyo-shi, Kyoto 617-8555 Japan
Telephone Number	:	+81-75-955-6736
Facsimile Number	:	+81-75-955-6634
Contact Person	:	Motoo Hayashi

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	:	communication module
Model Number	:	Type2AH
Serial Number	:	Refer to SECTION 4.2
Rating	:	Typ. DC 3.3 V / Min. DC 1.7 V / Max. DC 3.6 V
Receipt Date	:	February 2, 2021
Country of Mass-production	:	China, Japan
Condition	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	:	No Modification by the test lab.

2.2 Product Description

Model: Type2AH (referred to as the EUT in this report) is a communication module.

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480MHz
Modulation	:	GFSK
Antenna type	:	Internal Antenna: Monopole Antenna External Antenna (S171AH-2450S): Dipole Antenna External Antenna (AIR-ANT2460P-R): Patch Antenna
Antenna Gain	:	Internal Antenna: -1.0dBi External Antenna (S171AH-2450S): 6.5 dBi External Antenna (AIR-ANT2460P-R): 5.5 dBi
Clock frequency (Maximum)	:	32 MHz

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on January 12, 2021 and effective February 11, 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.

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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	35.30 dB, 0.15000 MHz, N	Complied a)	-
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 b)	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 c)	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 d)	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		3.0 dB 7206.000 MHz, AV, Hori.	Complied# e), f)
<p>Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W04221 *1) 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.</p> <p>a) Refer to APPENDIX 1 (data of Conducted Emission) b) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth) c) Refer to APPENDIX 1 (data of Maximum Peak Output Power) d) Refer to APPENDIX 1 (data of Power Density) e) Refer to APPENDIX 1 (data of Conducted Spurious Emission) f) Refer to APPENDIX 1 (data of Radiated Spurious Emission)</p> <p>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.</p>					

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

FCC Part 15.31 (e)

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

FCC Part 15.203 Antenna requirement

[Internal Antenna]

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.

[External Antenna]

The EUT has a unique coupling/antenna connector (UFL).
Therefore the equipment complies with the requirement of 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

Conducted emission

using Item	Frequency range	Uncertainty (+/-)
AMN (LISN)	0.009 MHz to 0.15 MHz	3.4 dB
	0.15 MHz to 30 MHz	2.9 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

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3.5 Test Location

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*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 199967

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.11 measurement room	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

* 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)

Mode	Remarks*
Bluetooth Low Energy (BT LE) Uncoded 1M-PHY	Maximum Packet Size, PRBS9
Bluetooth Low Energy (BT LE) Uncoded 2M-PHY	Maximum Packet Size, PRBS9
<p>*Power of the EUT was set by the software as follows (Setting value might be different from product specification value); Power settings: Max: 0, Min: -40 Software: Teraterm version 4.92 (Date: 2019.5.19, Storage location: Driven by connected PC)</p> <p>*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.</p>	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Conducted Emission, Radiated Spurious Emission, Maximum Peak Output Power, Power Density, 6dB Bandwidth, 99% Occupied Bandwidth, Conducted Spurious Emission	BT LE, Uncoded 1M-PHY BT LE, Uncoded 2M-PHY	2402 MHz 2440 MHz 2480 MHz

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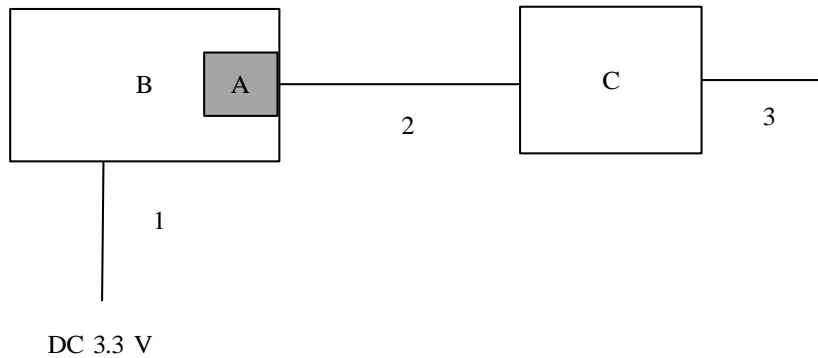
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4.2 Configuration and peripherals

Antenna Terminal Conducted 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	Remark
A	communication module	Type2AH	801156A	Murata Manufacturing Co., Ltd.	EUT
B	Jig Board	Type2AH-EVK	801156	Murata Manufacturing Co., Ltd.	-
C	Jig Board	LBCA2HN2AH-EVK	20070019	Murata Manufacturing Co., Ltd.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	0.56	Unshielded	Unshielded	-
2	Signal Cable	0.10	Unshielded	Unshielded	-
3	USB Cable	2.00	Shielded	Shielded	-

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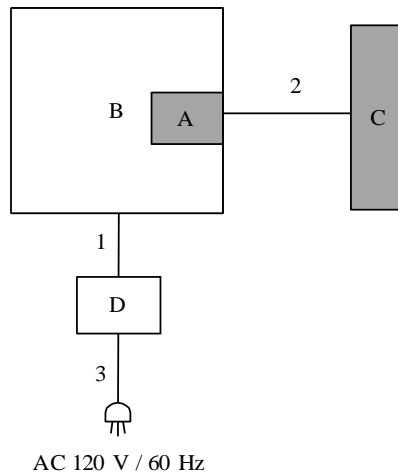
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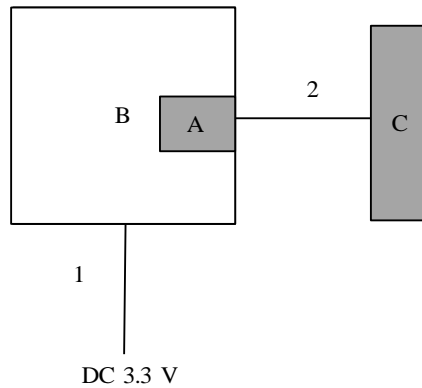
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Conducted Emission test



Radiated Emission tests



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remark
A	communication module	Type2AH	No.5 (for External Antenna) No.6 (for Internal Antenna)	Murata Manufacturing Co., Ltd.	EUT
B	Jig Board	Type2AH-EVK	801156	Murata Manufacturing Co., Ltd.	-
C	External Antenna	S171AH-2450S	2450S-001	Nearson	EUT
		AIR-ANT2460P-R	FOC1349ROMD	Cisco	
D	DC Power supply	PMC35-2A	RM000298	KIKUSUI	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	0.56	Unshielded	Unshielded	*1)
		2.00	Unshielded	Unshielded	*2)
2	Signal Cable	1.00	Unshielded	Unshielded	* Used only for External Antenna
3	AC Cable	1.20	Unshielded	Unshielded	-

*1) Used only for Conducted Emission test. *2) Used only for Radiated Emission test.

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform / a wooden table of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane.

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

1) For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

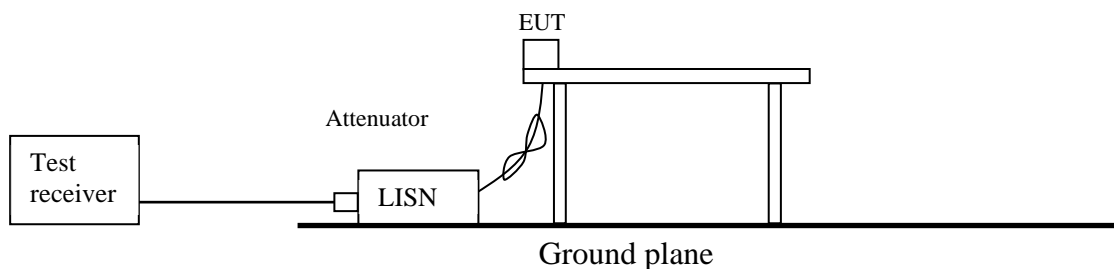
The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

Detector : QP and CISPR AV
Measurement range : 0.15 MHz - 30 MHz
Test data : APPENDIX
Test result : Pass

Figure 1: Test Setup



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SECTION 6: Radiated Spurious Emission

Test Procedure

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

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 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.

[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	<u>11,12,2,5,1</u> RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces	RBW: 100 kHz VBW: 300 kHz

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

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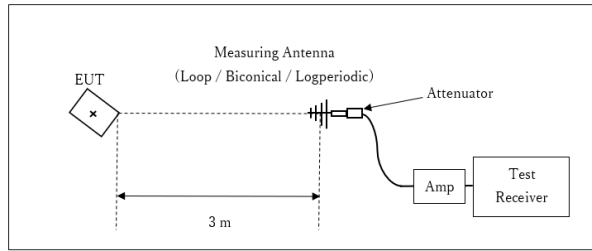
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Figure 2: Test Setup

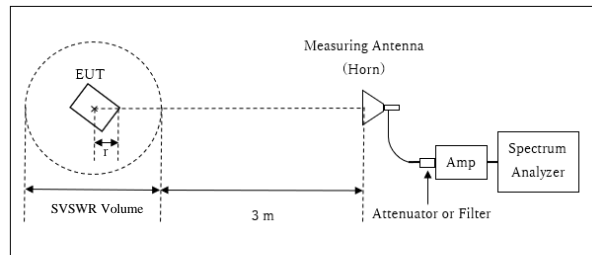
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



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

2AC :

Internal antenna

Distance Factor: $20 \times \log(3.70 \text{ m} / 3.0 \text{ m}) = 1.83 \text{ dB}$

* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.7 \text{ m}$
 $r = 0.05 \text{ m}$

External antenna: S171AH-2450S

Distance Factor: $20 \times \log(3.6 \text{ m} / 3.0 \text{ m}) = 1.59 \text{ dB}$

* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.6 \text{ m}$
 $r = 0.15 \text{ m}$

External antenna: AIR-ANT2460P-R

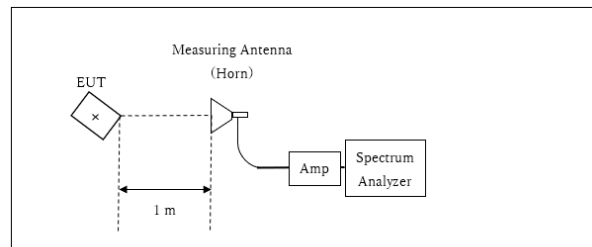
Distance Factor: $20 \times \log(3.65 \text{ m} / 3.0 \text{ m}) = 1.71 \text{ dB}$

* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.65 \text{ m}$
 $r = 0.10 \text{ m}$

SVSWR Volume : 1.5 m

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

10 GHz – 26.5 GHz



× : Center of turn table

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

*Test Distance: 1 m

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.
 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

UL Japan, Inc.

Ise EMC Lab.

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SECTION 7: 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	3 MHz/ 5 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) *4)
Conducted Spurious Emission *5) *6)	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) The test was not performed at RBW:3 kHz however the measurement is to be performed with RBW:3kHz in the regulation, because, the measurement value with RBW:3 kHz is less than the value of RBW:30 kHz and the test data met the limit with RBW:30 kHz.
 *5) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
 Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
 (9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz)
 *6) 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**

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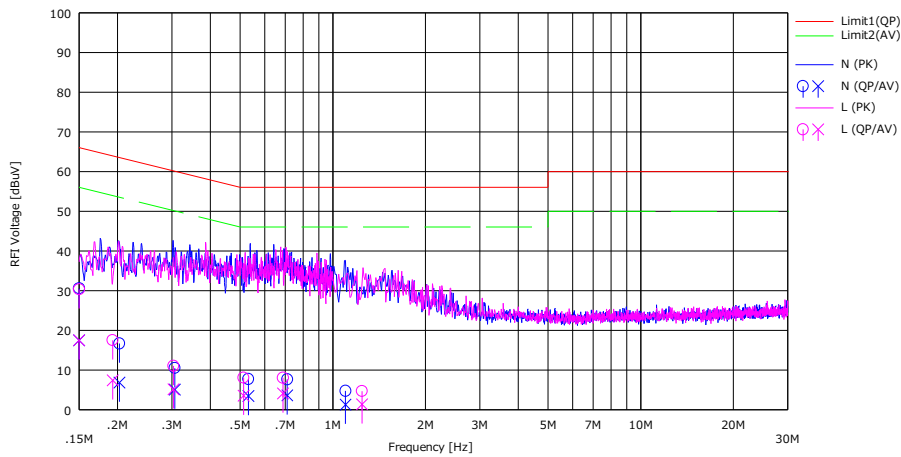
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APPENDIX 1: Test data

Conducted Emission
Internal Antenna

Report No. 13694267H
 Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
 Date February 21, 2021
 Temperature / Humidity 23 deg. C / 30 % RH
 Engineer Yuichiro Yamazaki
 Mode Tx BT LE, Uncoded 1M-PHY, 2402 MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq. [MHz]	Reading		LISN [dB]	LOSS [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]			<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]				
1	0.15000	17.40	4.30	0.07	13.13	30.60	17.50	66.00	56.00	35.40	38.50	N	
2	0.20281	3.50	-6.30	0.06	13.14	16.70	6.90	63.49	53.49	46.79	46.59	N	
3	0.30661	-2.70	-8.10	0.06	13.16	10.52	5.12	60.06	50.06	49.54	44.94	N	
4	0.53163	-5.50	-9.80	0.06	13.20	7.76	3.46	56.00	46.00	48.24	42.54	N	
5	0.71139	-5.60	-9.60	0.06	13.23	7.69	3.69	56.00	46.00	48.31	42.31	N	
6	1.09923	-8.60	-12.00	0.07	13.28	4.75	1.35	56.00	46.00	51.25	44.65	N	
7	0.15000	17.10	4.30	0.10	13.13	30.33	17.53	66.00	56.00	35.67	38.47	L	
8	0.19259	4.30	-5.80	0.10	13.14	17.54	7.44	63.92	53.92	46.38	46.48	L	
9	0.30385	-2.20	-8.10	0.10	13.16	11.06	5.16	60.14	50.14	49.08	44.98	L	
10	0.51252	-5.20	-9.70	0.10	13.20	8.10	3.60	56.00	46.00	47.90	42.40	L	
11	0.68920	-5.30	-9.20	0.11	13.23	8.04	4.14	56.00	46.00	47.96	41.86	L	
12	1.24432	-8.70	-12.00	0.12	13.30	4.72	1.42	56.00	46.00	51.28	44.58	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)
 Except for the above table: adequate margin data below the limits.

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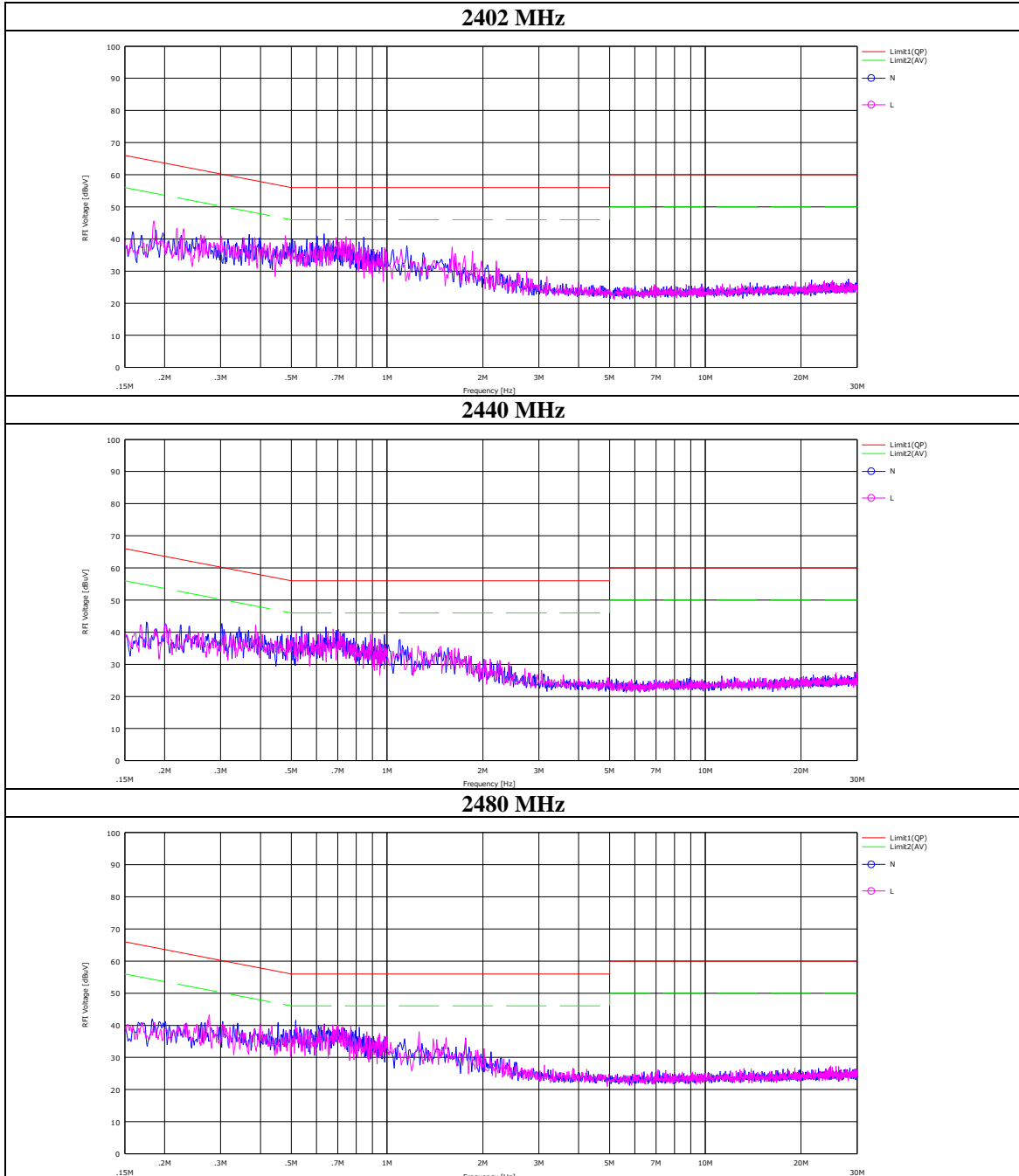
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Conducted Emission

Internal Antenna

Report No. 13694267H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date February 21, 2021
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuichiro Yamazaki
Mode Tx BT LE, Uncoded 1M-PHY



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Ise EMC Lab.

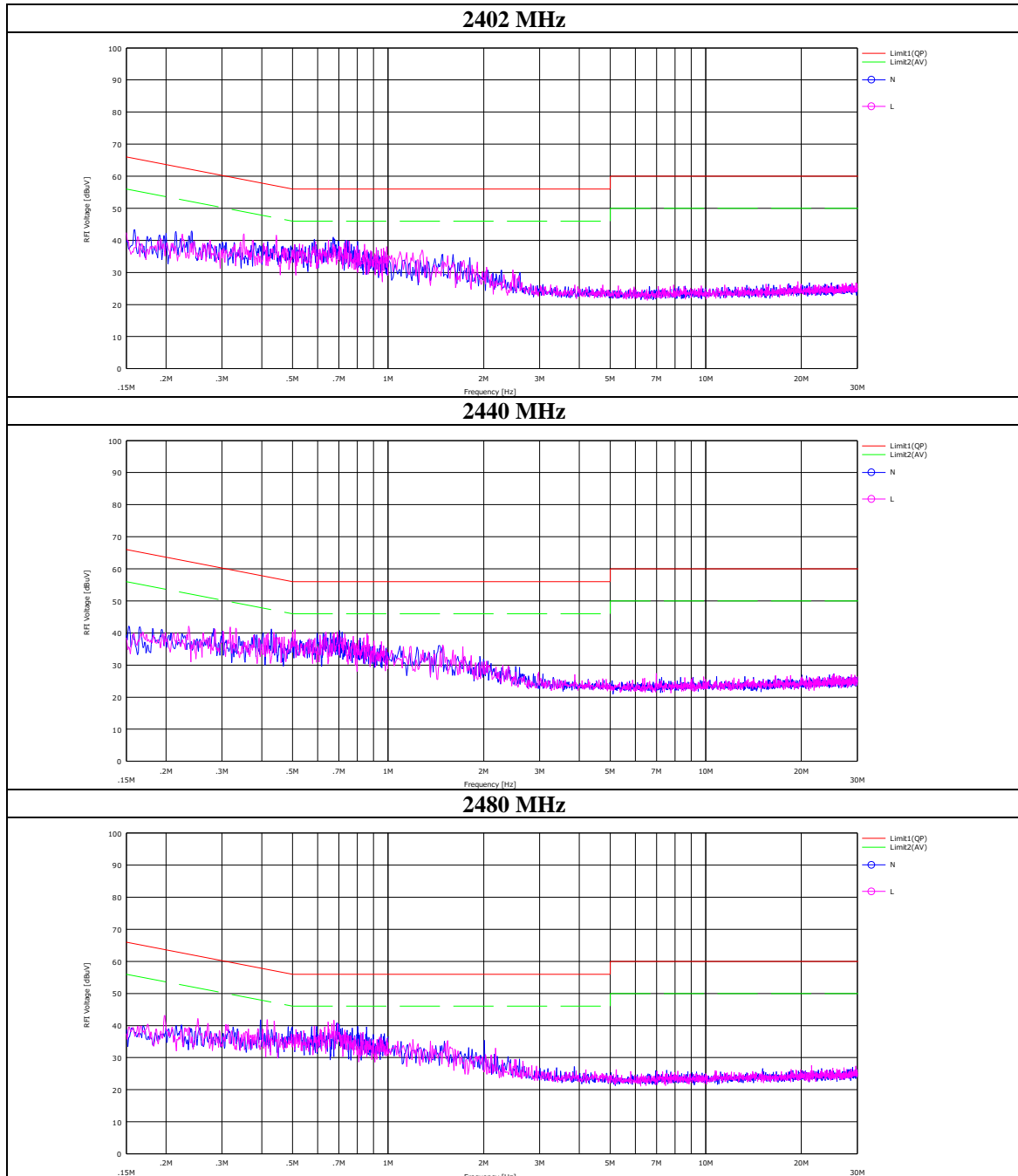
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Conducted Emission
External Antenna (S171AH-2450S)

Report No. 13694267H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date February 21, 2021
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuichiro Yamazaki
Mode Tx BT LE, Uncoded 1M-PHY



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Ise EMC Lab.

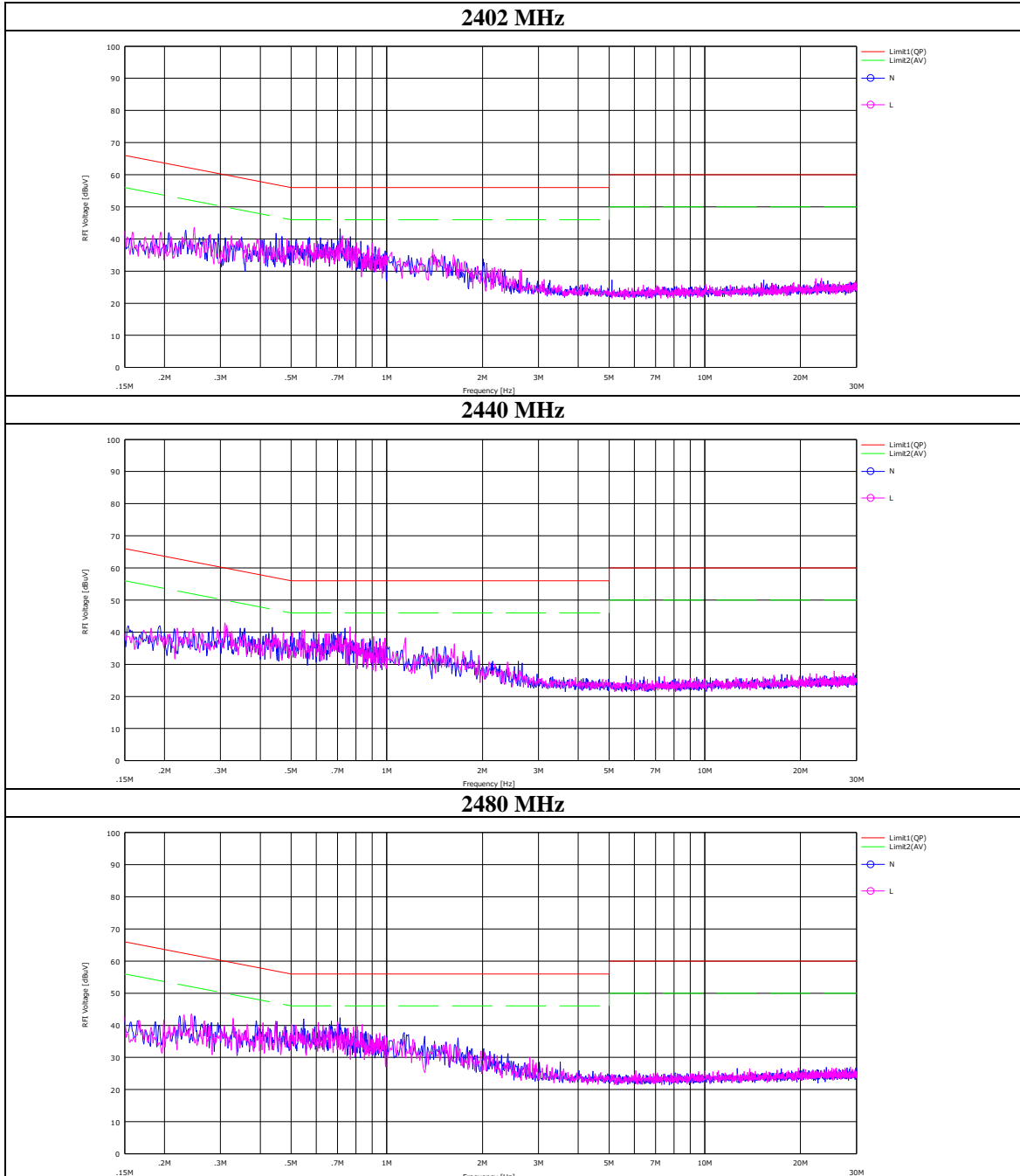
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Conducted Emission
External Antenna (AIR-ANT2460P-R)

Report No. 13694267H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date February 21, 2021
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuichiro Yamazaki
Mode Tx BT LE, Uncoded 1M-PHY



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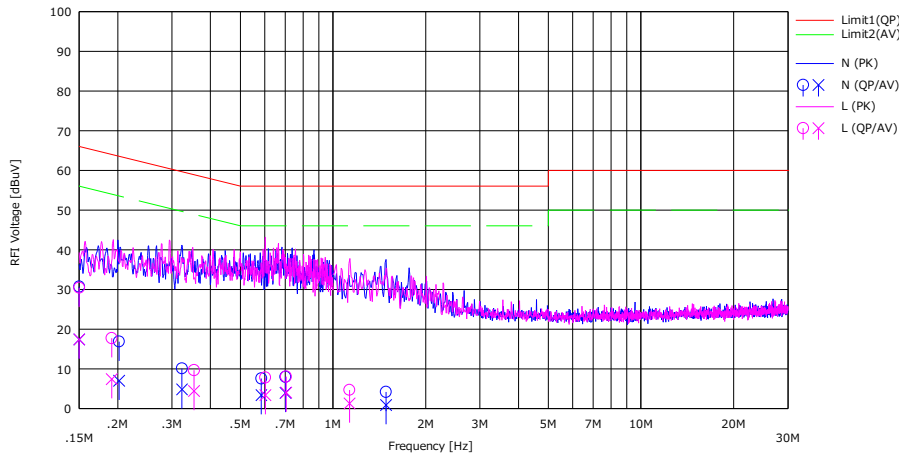
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Facsimile : +81 596 24 8124

Conducted Emission
Internal Antenna

Report No. 13694267H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date February 21, 2021
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuichiro Yamazaki
Mode Tx BT LE, Uncoded 2M-PHY, 2402 MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq. [MHz]	Reading		LISN [dB]	LOSS [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]			<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]				
1	0.15000	17.50	4.20	0.07	13.13	30.70	17.40	66.00	56.00	35.30	38.60	N	
2	0.20212	3.70	-6.20	0.06	13.14	16.90	7.00	63.52	53.52	46.62	46.52	N	
3	0.32341	-3.10	-8.40	0.06	13.16	10.12	4.82	59.62	49.62	49.50	44.80	N	
4	0.58544	-5.70	-9.90	0.06	13.21	7.57	3.37	56.00	46.00	48.43	42.63	N	
5	0.70123	-5.30	-9.30	0.06	13.23	7.99	3.99	56.00	46.00	48.01	42.01	N	
6	1.48632	-9.20	-12.50	0.08	13.32	4.20	0.90	56.00	46.00	51.80	45.10	N	
7	0.15000	17.20	4.20	0.10	13.13	30.43	17.43	66.00	56.00	35.57	38.57	L	
8	0.19133	4.50	-5.80	0.10	13.14	17.74	7.44	63.98	53.98	46.24	46.54	L	
9	0.35421	-3.60	-8.80	0.10	13.17	9.67	4.47	58.86	48.86	49.19	44.39	L	
10	0.60305	-5.50	-9.90	0.10	13.22	7.82	3.42	56.00	46.00	48.18	42.58	L	
11	0.70462	-5.30	-9.30	0.11	13.23	8.04	4.04	56.00	46.00	47.96	41.96	L	
12	1.13121	-8.70	-12.10	0.12	13.28	4.70	1.30	56.00	46.00	51.30	44.70	L	

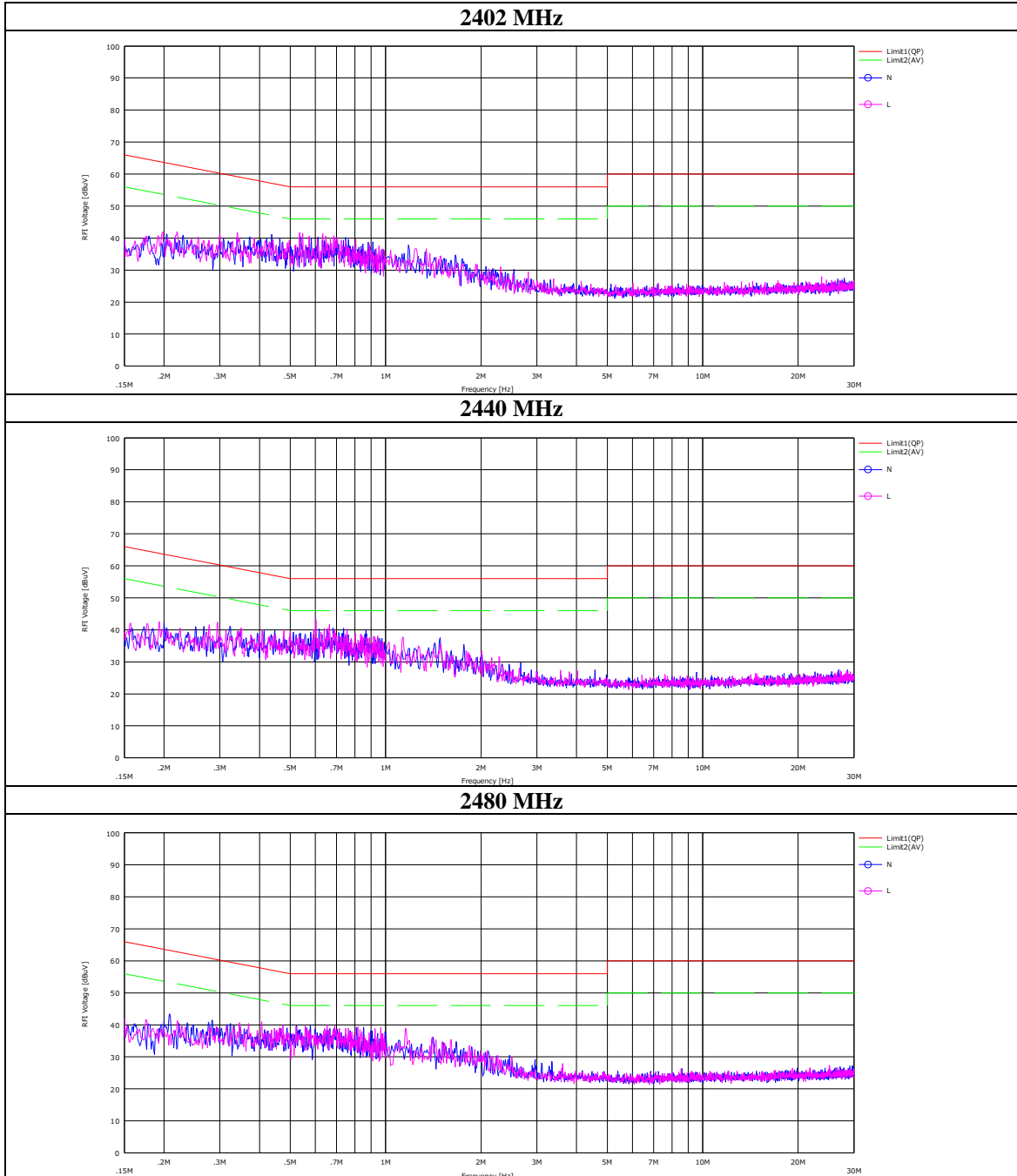
CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)
Except for the above table: adequate margin data below the limits.

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Ise EMC Lab.

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Conducted Emission
Internal Antenna

Report No. 13694267H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date February 21, 2021
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuichiro Yamazaki
Mode Tx BT LE, Uncoded 2M-PHY



UL Japan, Inc.

Ise EMC Lab.

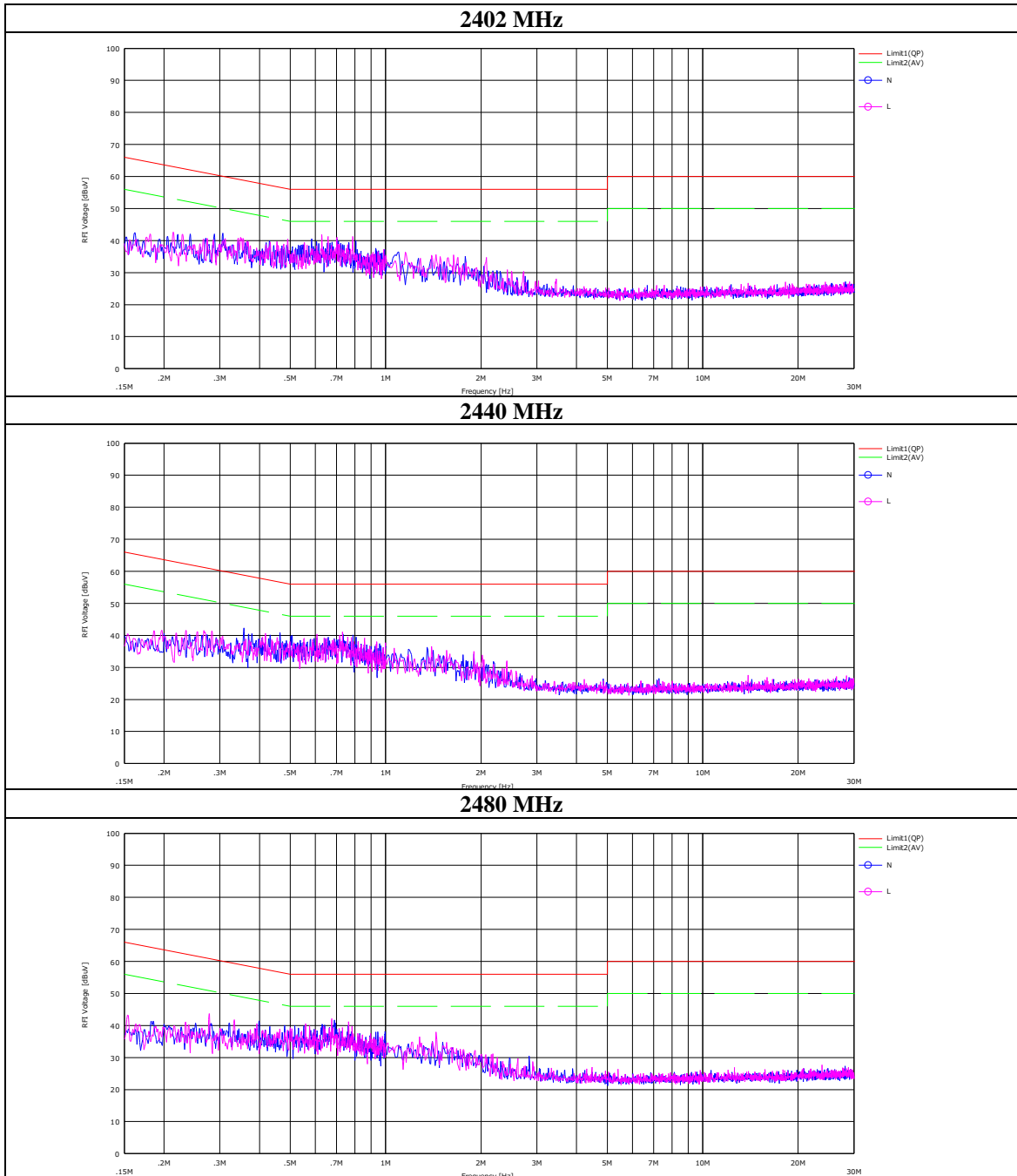
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Conducted Emission
External Antenna (S171AH-2450S)

Report No. 13694267H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date February 21, 2021
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuichiro Yamazaki
Mode Tx BT LE, Uncoded 2M-PHY



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Ise EMC Lab.

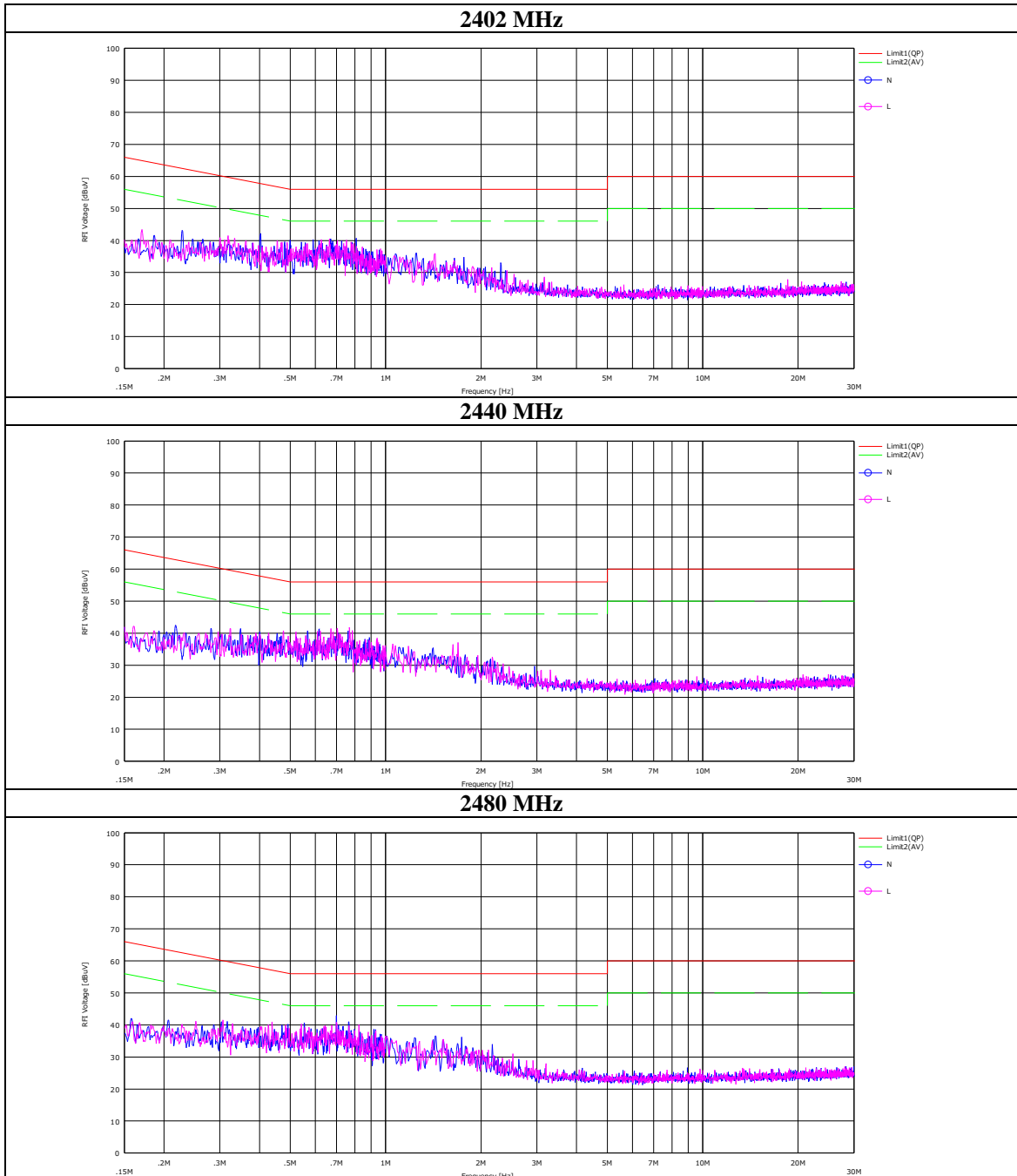
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Conducted Emission
External Antenna (AIR-ANT2460P-R)

Report No. 13694267H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date February 21, 2021
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuichiro Yamazaki
Mode Tx BT LE, Uncoded 2M-PHY



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6 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13694267H
Test place Ise EMC Lab. No.5 Measurement Room
Date February 2, 2021
Temperature / Humidity 23 deg. C / 36 % RH
Engineer Shinya Watanabe
Mode Tx BT LE

Mode	Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
Uncoded 1M-PHY	2402	1046.5	0.698	> 0.5000
	2440	1053.2	0.736	> 0.5000
	2480	1058.0	0.726	> 0.5000
Uncoded 2M-PHY	2402	2089.4	1.264	> 0.5000
	2440	2082.0	1.239	> 0.5000
	2480	2087.7	1.247	> 0.5000

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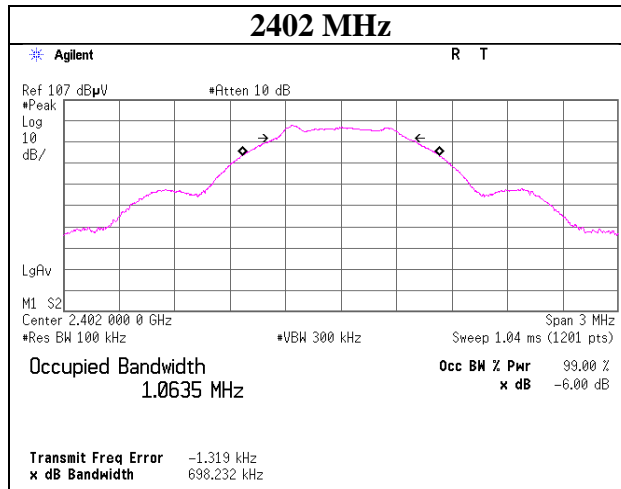
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

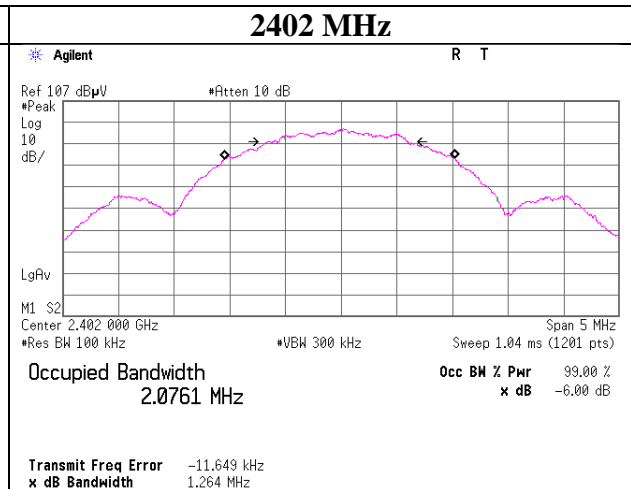
Facsimile : +81 596 24 8124

6 dB Bandwidth

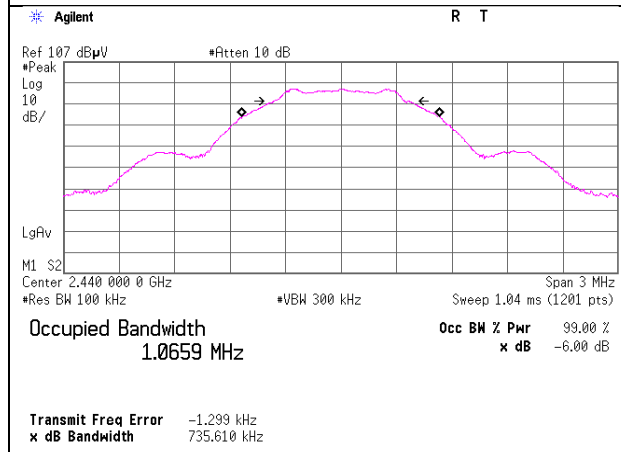
BT LE Uncoded 1M-PHY



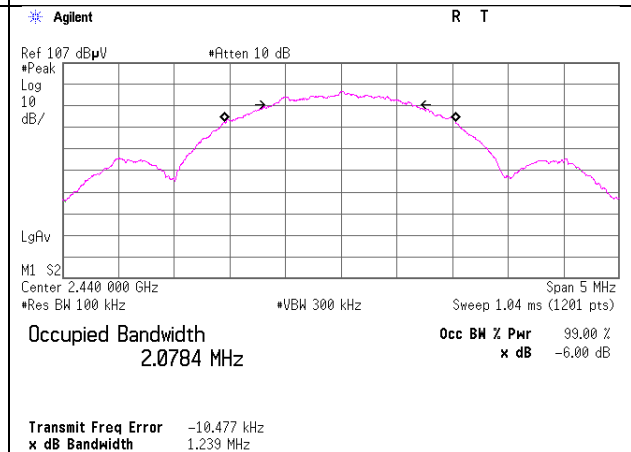
BT LE Uncoded 2M-PHY



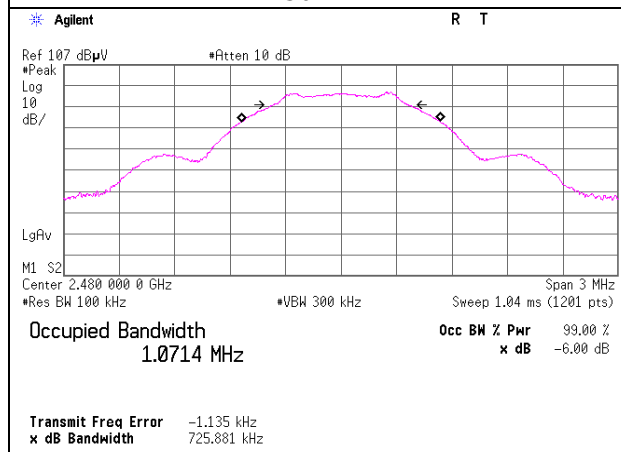
2440 MHz



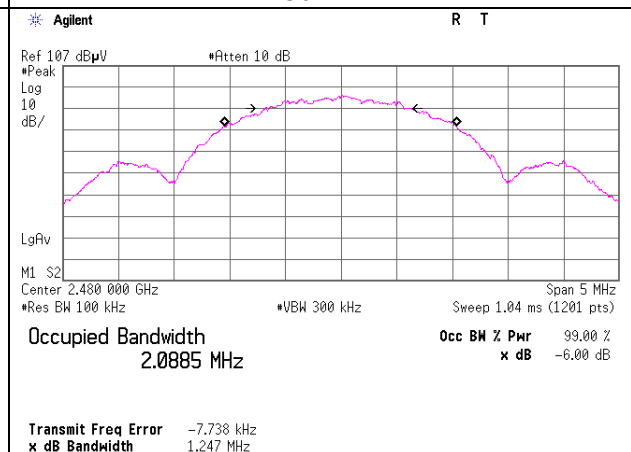
2440 MHz



2480 MHz



2480 MHz



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Ise EMC Lab.

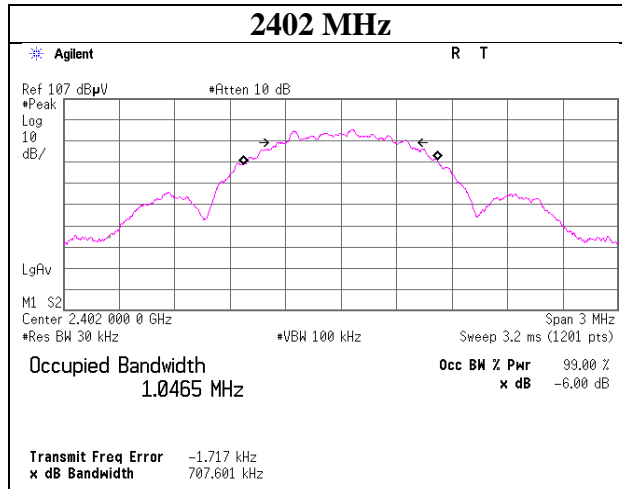
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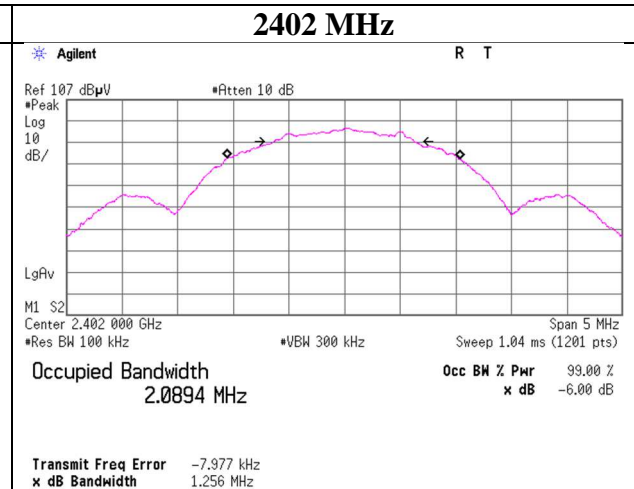
Facsimile : +81 596 24 8124

99 % Occupied Bandwidth

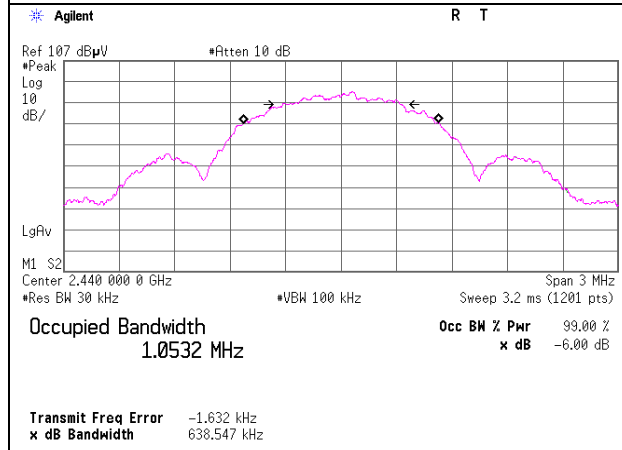
BT LE Uncoded 1M-PHY



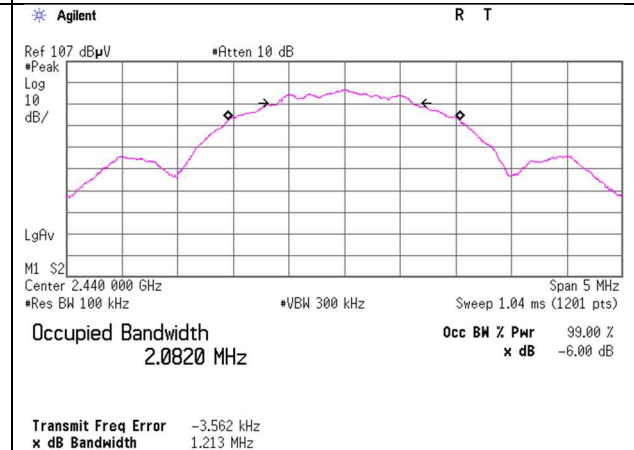
BT LE Uncoded 2M-PHY



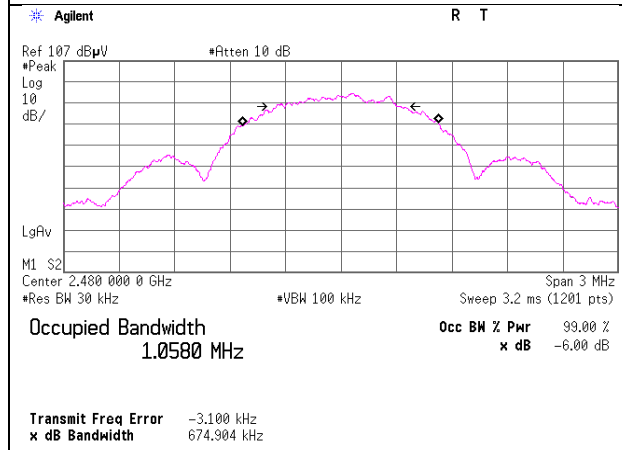
2440 MHz



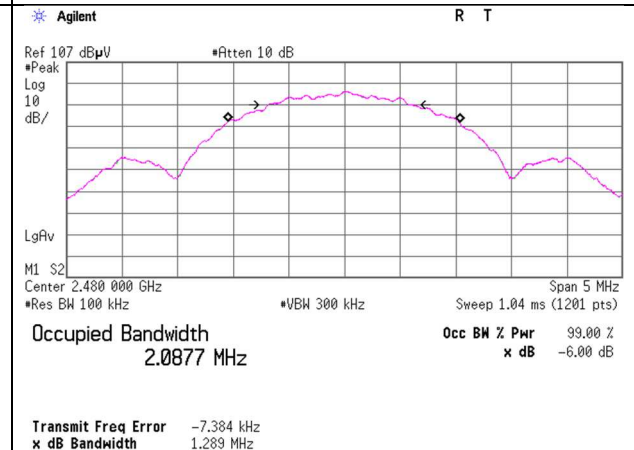
2440 MHz



2480 MHz



2480 MHz



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Maximum Peak Output Power

Report No. 13694267H
Test place Ise EMC Lab. No.5 Measurement Room
Date February 8, 2021
Temperature / Humidity 24 deg. C / 35 RH
Engineer Shinya Watanabe
Mode Tx BT LE Uncoded 1M-PHY

Max : 0				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2402	-11.53	0.36	9.50	-1.67	0.68	29.50	891	31.17	6.50	4.83	3.04	36.02	4000	31.19
2440	-11.92	0.36	9.50	-2.06	0.62	29.50	891	31.56	6.50	4.44	2.78	36.02	4000	31.58
2480	-12.19	0.36	9.50	-2.33	0.58	29.50	891	31.83	6.50	4.17	2.61	36.02	4000	31.85

Sample Calculation:

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

The Conducted Power limit was reduced by the amount in dB (1.00dB)

*This Limit was reduced by the amount in dB (1.0dB)

that the directional gain of the antenna/antenna array exceeding 6dBi

Min : -40				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2402	-51.16	0.36	9.50	-41.30	0.0000741	29.50	891	70.80	6.50	-34.80	0.0003311	36.02	4000	70.82
2440	-51.33	0.36	9.50	-41.47	0.0000713	29.50	891	70.97	6.50	-34.97	0.0003184	36.02	4000	70.99
2480	-51.71	0.36	9.50	-41.85	0.0000653	29.50	891	71.35	6.50	-35.35	0.0002917	36.02	4000	71.37

Sample Calculation:

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

*This Limit was reduced by the amount in dB (1.0dB)

that the directional gain of the antenna/antenna array exceeding 6dBi

UL Japan, Inc.

Ise EMC Lab.

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Maximum Peak Output Power

Report No. 13694267H
Test place Ise EMC Lab. No.5 Measurement Room
Date February 8, 2021
Temperature / Humidity 24 deg. C / 35 RH
Engineer Shinya Watanabe
Mode Tx BT LE Uncoded 2M-PHY

Max : 0				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2402	-11.53	0.36	9.50	-1.67	0.68	29.50	891	31.17	6.50	4.83	3.04	36.02	4000	31.19
2440	-11.86	0.36	9.50	-2.00	0.63	29.50	891	31.50	6.50	4.50	2.82	36.02	4000	31.52
2480	-12.17	0.36	9.50	-2.31	0.59	29.50	891	31.81	6.50	4.19	2.62	36.02	4000	31.83

Sample Calculation:

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

The Conducted Power limit was reduced by the amount in dB (1.00dB)

*This Limit was reduced by the amount in dB (1.0dB)

that the directional gain of the antenna/antenna array exceeding 6dBi

Min : -40				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2402	-50.91	0.36	9.50	-41.05	0.0000785	29.50	891	70.55	6.50	-34.55	0.0003508	36.02	4000	70.57
2440	-51.24	0.36	9.50	-41.38	0.0000728	29.50	891	70.88	6.50	-34.88	0.0003251	36.02	4000	70.90
2480	-51.64	0.36	9.50	-41.78	0.0000664	29.50	891	71.28	6.50	-35.28	0.0002965	36.02	4000	71.30

Sample Calculation:

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

*This Limit was reduced by the amount in dB (1.0dB)

that the directional gain of the antenna/antenna array exceeding 6dBi

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Ise EMC Lab.

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Average Output Power
(Reference data for RF Exposure)

Report No. 13694267H
Test place Ise EMC Lab. No.5 Measurement Room
Date February 8, 2021
Temperature / Humidity 24 deg. C / 35 RH
Engineer Shinya Watanabe
Mode Tx BT LE Uncoded 1M-PHY

Max : 0

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst power average)	
				[dBm]	[mW]
2402	-11.85	0.36	9.50	-1.99	0.63
2440	-12.24	0.36	9.50	-2.38	0.58
2480	-12.51	0.36	9.50	-2.65	0.54

Min : -40

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst power average)	
				[dBm]	[mW]
2402	-59.95	0.36	9.50	-50.09	0.0000098
2440	-60.18	0.36	9.50	-50.32	0.0000093
2480	-60.26	0.36	9.50	-50.40	0.0000091

Sample Calculation:

Result (Burst power average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

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Average Output Power
(Reference data for RF Exposure)

Report No. 13694267H
Test place Ise EMC Lab. No.5 Measurement Room
Date February 2, 2021
Temperature / Humidity 23 deg. C / 36 % RH
Engineer Shinya Watanabe
Mode Tx BT LE Uncoded 2M-PHY

Max : 0

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst power average)	
				[dBm]	[mW]
2402	-11.83	0.36	9.50	-1.97	0.64
2440	-12.25	0.36	9.50	-2.39	0.58
2480	-12.51	0.36	9.50	-2.65	0.54

Min : -40

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst power average)	
				[dBm]	[mW]
2402	-62.12	0.36	9.50	-52.26	0.0000059
2400	-62.66	0.36	9.50	-52.80	0.0000053
2480	-62.72	0.36	9.50	-52.86	0.0000052

Sample Calculation:

Result (Burst power average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

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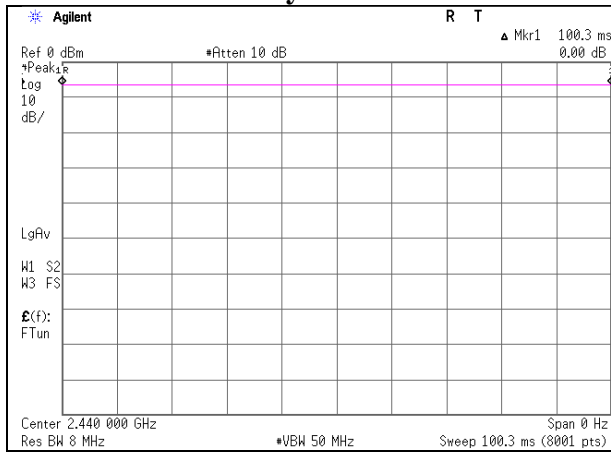
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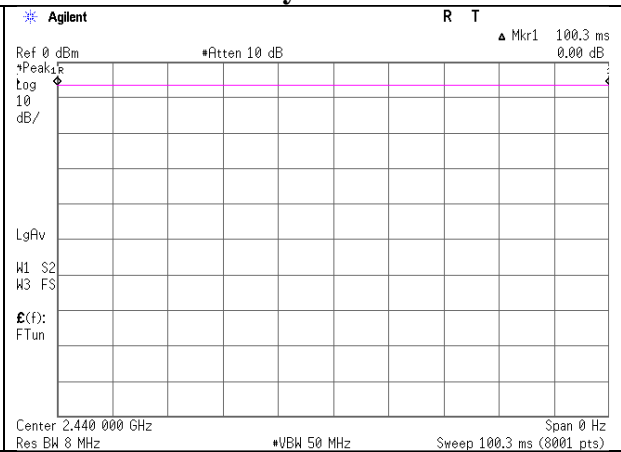
Burst rate confirmation

Report No. 13694267H
Test place Ise EMC Lab. No.5 Measurement Room
Date February 8, 2021
Temperature / Humidity 24 deg. C / 35 RH
Engineer Shinya Watanabe
Mode Tx BT LE

**BT LE
Uncoded 1M-PHY
Duty 100 %**



**BT LE
Uncoded 2M-PHY
Duty 100 %**



* 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
Internal Antenna

Report No. 13694267H
 Test place Ise EMC Lab.
 Semi Anechoic Chamber No.2 No.2 No.2
 Date March 9, 2021 February 17, 2021 February 18, 2021
 Temperature / Humidity 22 deg. C / 30 % RH 20 deg. C / 34 % RH 20 deg. C / 30 % RH
 Engineer Yuichiro Yamazaki Yuichiro Yamazaki Yuichiro Yamazaki
 (1 GHz - 10 GHz) (Above 10 GHz) (Below 1 GHz)
 Mode Tx BT LE, Uncoded IM-PHY, 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.	40.000	QP	21.0	14.9	6.9	28.6	-	14.1	40.0	25.9	
Hori.	140.000	QP	20.7	14.1	7.8	28.3	-	14.3	43.5	29.3	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Hori.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Hori.	960.000	QP	20.2	22.2	11.5	28.8	-	25.1	46.0	20.9	
Hori.	2390.000	PK	45.3	27.6	5.1	35.1	-	42.9	73.9	31.0	
Hori.	4804.000	PK	43.6	31.6	7.3	34.4	-	48.1	73.9	25.8	Floor noise
Hori.	7206.000	PK	47.4	35.8	8.6	34.4	-	57.4	73.9	16.5	
Hori.	9608.000	PK	43.4	38.6	9.1	35.0	-	56.1	73.9	17.8	Floor noise
Hori.	2390.000	AV	35.4	27.6	5.1	35.1	-	33.0	53.9	20.9	
Hori.	4804.000	AV	33.9	31.6	7.3	34.4	-	38.4	53.9	15.5	Floor noise
Hori.	7206.000	AV	40.5	35.8	8.6	34.4	-	50.5	53.9	3.4	
Hori.	9608.000	AV	34.8	38.6	9.1	35.0	-	47.5	53.9	6.4	Floor noise
Vert.	40.000	QP	21.1	14.9	6.9	28.6	-	14.2	40.0	25.8	
Vert.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Vert.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Vert.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Vert.	600.000	QP	21.2	19.4	10.2	29.4	-	21.4	46.0	24.6	
Vert.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Vert.	2390.000	PK	45.7	27.6	5.1	35.1	-	43.2	73.9	30.7	
Vert.	4804.000	PK	42.6	31.6	7.3	34.4	-	47.1	73.9	26.8	Floor noise
Vert.	7206.000	PK	46.0	35.8	8.6	34.4	-	56.1	73.9	17.9	
Vert.	9608.000	PK	43.3	38.6	9.1	35.0	-	56.0	73.9	17.9	Floor noise
Vert.	2390.000	AV	35.4	27.6	5.1	35.1	-	33.0	53.9	20.9	
Vert.	4804.000	AV	33.7	31.6	7.3	34.4	-	38.2	53.9	15.7	Floor noise
Vert.	7206.000	AV	39.2	35.8	8.6	34.4	-	49.2	53.9	4.7	
Vert.	9608.000	AV	34.6	38.6	9.1	35.0	-	47.4	53.9	6.5	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 20log(3.7 m / 3.0 m) = 1.83 dB
 10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 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	94.0	27.5	5.1	35.1	91.5	-	-	Carrier
Hori.	2400.000	PK	40.9	27.6	5.1	35.1	38.4	71.5	33.1	
Vert.	2402.000	PK	93.3	27.5	5.1	35.1	90.8	-	-	Carrier
Vert.	2400.000	PK	40.7	27.6	5.1	35.1	38.2	70.8	32.7	

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

Distance factor: 1 GHz - 10 GHz 20log(3.7 m / 3.0 m) = 1.83 dB

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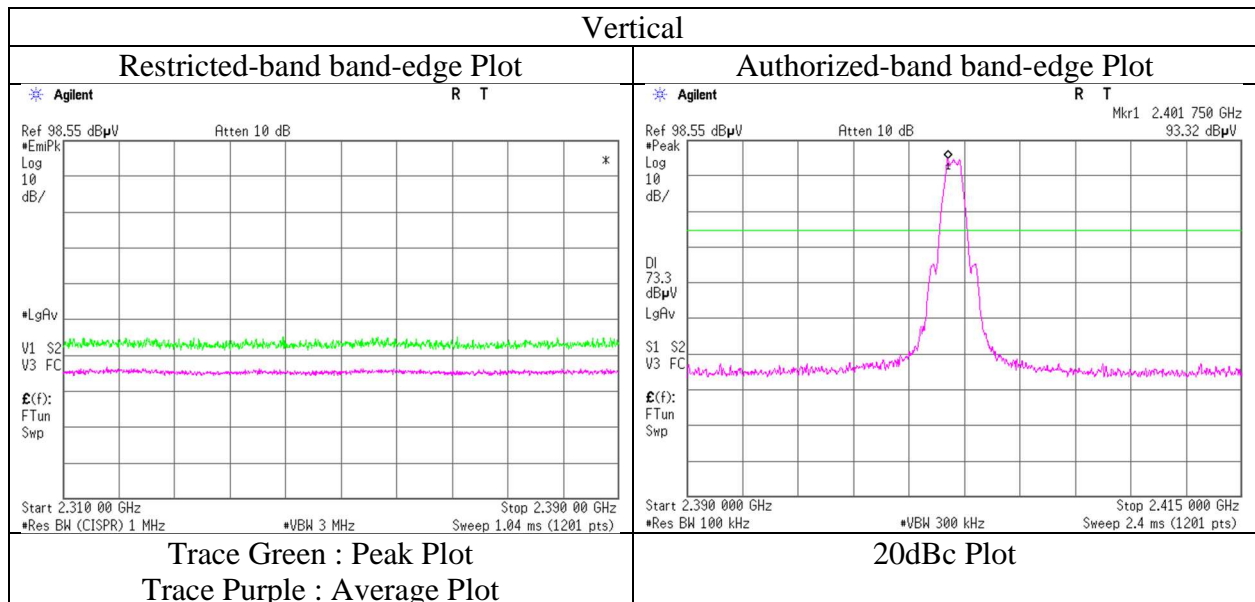
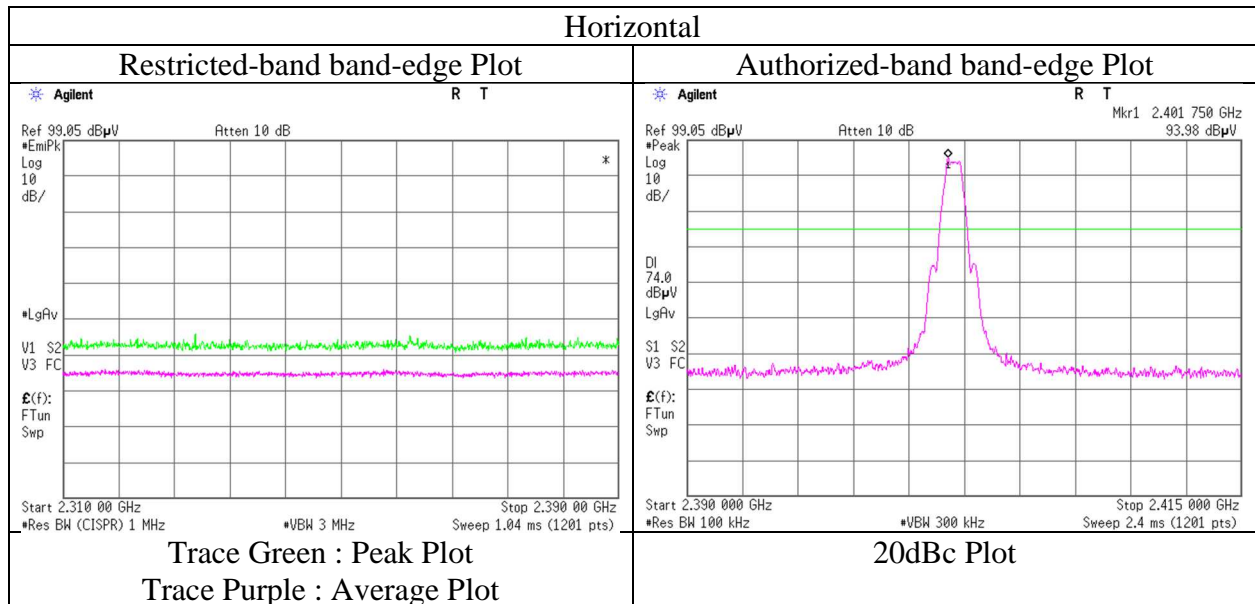
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Radiated Spurious Emission
(Reference Plot for band-edge)
Internal Antenna

Report No.	13694267H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	March 9, 2021
Temperature / Humidity	22 deg. C / 30 % RH
Engineer	Yuichiro Yamazaki
Mode	Tx BT LE, Uncoded 1M-PHY 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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Radiated Spurious Emission
Internal Antenna

Report No. 13694267H
 Test place Ise EMC Lab.
 Semi Anechoic Chamber No.2 No.2 No.2
 Date March 9, 2021 February 17, 2021 February 18, 2021
 Temperature / Humidity 22 deg. C / 30 % RH 20 deg. C / 34 % RH 20 deg. C / 30 % RH
 Engineer Yuichiro Yamazaki Yuichiro Yamazaki Yuichiro Yamazaki
 (1 GHz - 10 GHz) (Above 10 GHz) (Below 1 GHz)
 Mode Tx BT LE, Uncoded IM-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.7	14.1	7.8	28.3	-	14.3	43.5	29.3	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Hori.	600.000	QP	21.2	19.4	10.2	29.4	-	21.4	46.0	24.6	
Hori.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Hori.	4880.000	PK	43.1	31.6	7.3	34.4	-	47.6	73.9	26.3	Floor noise
Hori.	7320.000	PK	46.2	36.2	8.5	34.4	-	56.6	73.9	17.4	
Hori.	9760.000	PK	43.8	38.8	9.1	35.0	-	56.8	73.9	17.1	Floor noise
Hori.	4880.000	AV	34.1	31.6	7.3	34.4	-	38.6	53.9	15.3	Floor noise
Hori.	7320.000	AV	38.6	36.2	8.5	34.4	-	49.0	53.9	4.9	
Hori.	9760.000	AV	34.4	38.8	9.1	35.0	-	47.4	53.9	6.5	Floor noise
Vert.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Vert.	140.000	QP	20.5	14.1	7.8	28.3	-	14.1	43.5	29.5	
Vert.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Vert.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Vert.	600.000	QP	21.2	19.4	10.2	29.4	-	21.4	46.0	24.6	
Vert.	960.000	QP	20.2	22.2	11.5	28.8	-	25.1	46.0	20.9	
Vert.	4880.000	PK	42.7	31.6	7.3	34.4	-	47.2	73.9	26.7	Floor noise
Vert.	7320.000	PK	46.3	36.2	8.5	34.4	-	56.6	73.9	17.3	
Vert.	9760.000	PK	43.6	38.8	9.1	35.0	-	56.5	73.9	17.4	Floor noise
Vert.	4880.000	AV	34.0	31.6	7.3	34.4	-	38.5	53.9	15.4	Floor noise
Vert.	7320.000	AV	37.2	36.2	8.5	34.4	-	47.5	53.9	6.4	
Vert.	9760.000	AV	34.5	38.8	9.1	35.0	-	47.4	53.9	6.5	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 20log(3.7 m / 3.0 m) = 1.83 dB
 10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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Radiated Spurious Emission
Internal Antenna

Report No. 13694267H
 Test place Ise EMC Lab.
 Semi Anechoic Chamber No.2 No.2 No.2
 Date March 9, 2021 February 17, 2021 February 18, 2021
 Temperature / Humidity 22 deg. C / 30 % RH 20 deg. C / 34 % RH 20 deg. C / 30 % RH
 Engineer Yuichiro Yamazaki Yuichiro Yamazaki Yuichiro Yamazaki
 (1 GHz - 10 GHz) (Above 10 GHz) (Below 1 GHz)
 Mode Tx BT LE, Uncoded IM-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Hori.	600.000	QP	21.0	19.4	10.2	29.4	-	21.2	46.0	24.8	
Hori.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Hori.	2483.500	PK	45.0	27.4	5.1	35.0	-	42.5	73.9	31.4	
Hori.	4960.000	PK	42.9	31.6	7.3	34.4	-	47.4	73.9	26.5	Floor noise
Hori.	7440.000	PK	45.1	36.0	8.5	34.4	-	55.2	73.9	18.7	Floor noise
Hori.	9920.000	PK	43.7	38.9	9.2	35.1	-	56.8	73.9	17.2	Floor noise
Hori.	2483.500	AV	35.8	27.4	5.1	35.0	-	33.2	53.9	20.7	
Hori.	4960.000	AV	34.0	31.6	7.3	34.4	-	38.5	53.9	15.4	Floor noise
Hori.	7440.000	AV	35.8	36.0	8.5	34.4	-	46.0	53.9	7.9	Floor noise
Hori.	9920.000	AV	34.6	38.9	9.2	35.1	-	47.6	53.9	6.3	Floor noise
Vert.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Vert.	140.000	QP	20.5	14.1	7.8	28.3	-	14.1	43.5	29.5	
Vert.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Vert.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Vert.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Vert.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Vert.	2483.500	PK	45.7	27.4	5.1	35.0	-	43.2	73.9	30.7	
Vert.	4960.000	PK	43.5	31.6	7.3	34.4	-	48.0	73.9	25.9	Floor noise
Vert.	7440.000	PK	45.9	36.0	8.5	34.4	-	56.0	73.9	17.9	Floor noise
Vert.	9920.000	PK	43.2	38.9	9.2	35.1	-	56.3	73.9	17.6	Floor noise
Vert.	2483.500	AV	35.9	27.4	5.1	35.0	-	33.4	53.9	20.6	
Vert.	4960.000	AV	33.8	31.6	7.3	34.4	-	38.3	53.9	15.6	Floor noise
Vert.	7440.000	AV	36.0	36.0	8.5	34.4	-	46.2	53.9	7.7	Floor noise
Vert.	9920.000	AV	34.2	38.9	9.2	35.1	-	47.3	53.9	6.7	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 20log(3.7 m / 3.0 m) = 1.83 dB
 10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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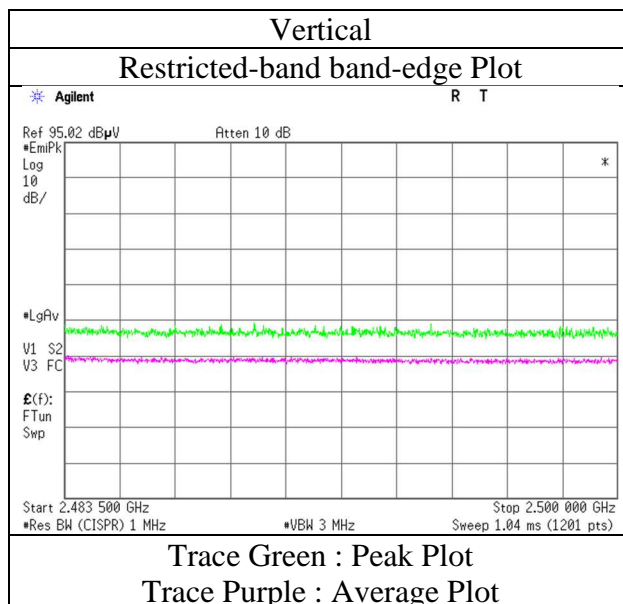
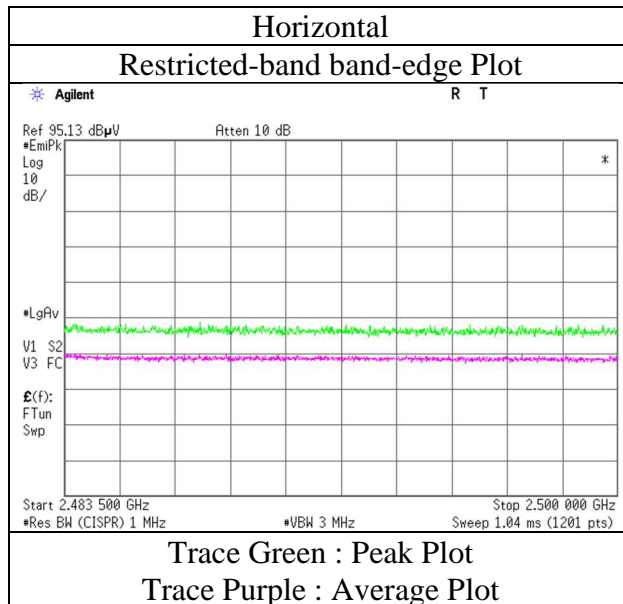
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Radiated Spurious Emission
(Reference Plot for band-edge)
Internal Antenna

Report No. 13694267H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date March 9, 2021
Temperature / Humidity 22 deg. C / 30 % RH
Engineer Yuichiro Yamazaki
Mode Tx BT LE, Uncoded 1M-PHY, 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.

UL Japan, Inc.

Ise EMC Lab.

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Radiated Spurious Emission
Internal Antenna

Report No. 13694267H
 Test place Ise EMC Lab.
 Semi Anechoic Chamber No.2 No.2 No.2
 Date February 5, 2021 February 17, 2021 February 18, 2021
 Temperature / Humidity 21 deg. C / 38 % RH 20 deg. C / 34 % RH 20 deg. C / 30 % RH
 Engineer Tomohisa Nakagawa Yuichiro Yamazaki Yuichiro Yamazaki
 (1 GHz - 10 GHz) (Above 10 GHz) (Below 1 GHz)
 Mode Tx BT LE, Uncoded 2M-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Hori.	600.000	QP	21.0	19.4	10.2	29.4	-	21.2	46.0	24.8	
Hori.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Hori.	2390.000	PK	44.6	27.6	4.8	34.6	-	42.4	73.9	31.5	
Hori.	4804.000	PK	41.9	31.6	6.9	33.7	-	46.7	73.9	27.2	Floor noise
Hori.	7206.000	PK	47.7	35.8	8.3	33.6	-	58.2	73.9	15.7	
Hori.	9608.000	PK	42.6	38.6	8.8	34.2	-	55.9	73.9	18.1	Floor noise
Hori.	2390.000	AV	37.3	27.6	4.8	34.6	-	35.1	53.9	18.8	
Hori.	4804.000	AV	32.1	31.6	6.9	33.7	-	36.9	53.9	17.0	Floor noise
Hori.	7206.000	AV	40.4	35.8	8.3	33.6	-	50.9	53.9	3.0	
Hori.	9608.000	AV	32.0	38.6	8.8	34.2	-	45.3	53.9	8.6	Floor noise
Vert.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Vert.	140.000	QP	20.5	14.1	7.8	28.3	-	14.1	43.5	29.5	
Vert.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Vert.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Vert.	600.000	QP	21.0	19.4	10.2	29.4	-	21.2	46.0	24.8	
Vert.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Vert.	2390.000	PK	45.3	27.6	4.8	34.6	-	43.1	73.9	30.8	
Vert.	4804.000	PK	41.9	31.6	6.9	33.7	-	46.6	73.9	27.3	Floor noise
Vert.	7206.000	PK	46.3	35.8	8.3	33.6	-	56.8	73.9	17.1	
Vert.	9608.000	PK	42.7	38.6	8.8	34.2	-	55.9	73.9	18.0	Floor noise
Vert.	2390.000	AV	36.1	27.6	4.8	34.6	-	33.9	53.9	20.0	
Vert.	4804.000	AV	34.2	31.6	6.9	33.7	-	38.9	53.9	15.0	Floor noise
Vert.	7206.000	AV	39.8	35.8	8.3	33.6	-	50.3	53.9	3.6	
Vert.	9608.000	AV	34.6	38.6	8.8	34.2	-	47.8	53.9	6.1	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 20log(3.7 m / 3.0 m) = 1.83 dB
 10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 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	93.8	27.5	4.8	34.6	91.6	-	-	Carrier
Hori.	2400.000	PK	62.5	27.6	4.8	34.6	60.2	71.6	11.3	
Vert.	2402.000	PK	92.8	27.5	4.8	34.6	90.6	-	-	Carrier
Vert.	2400.000	PK	61.8	27.6	4.8	34.6	59.6	70.6	11.0	

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

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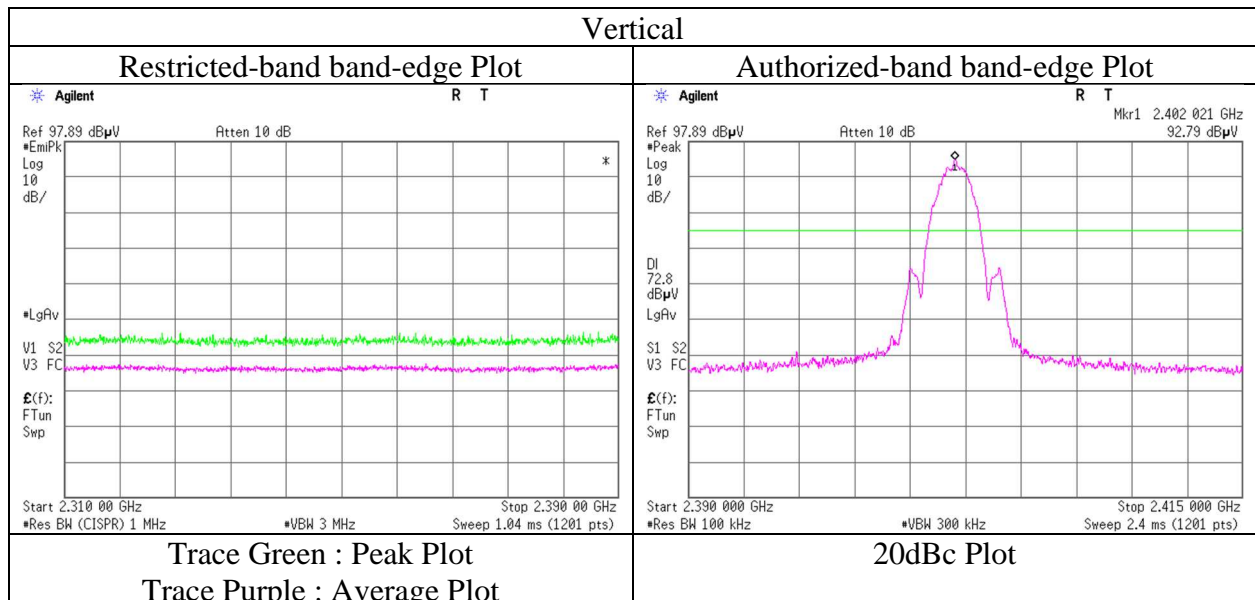
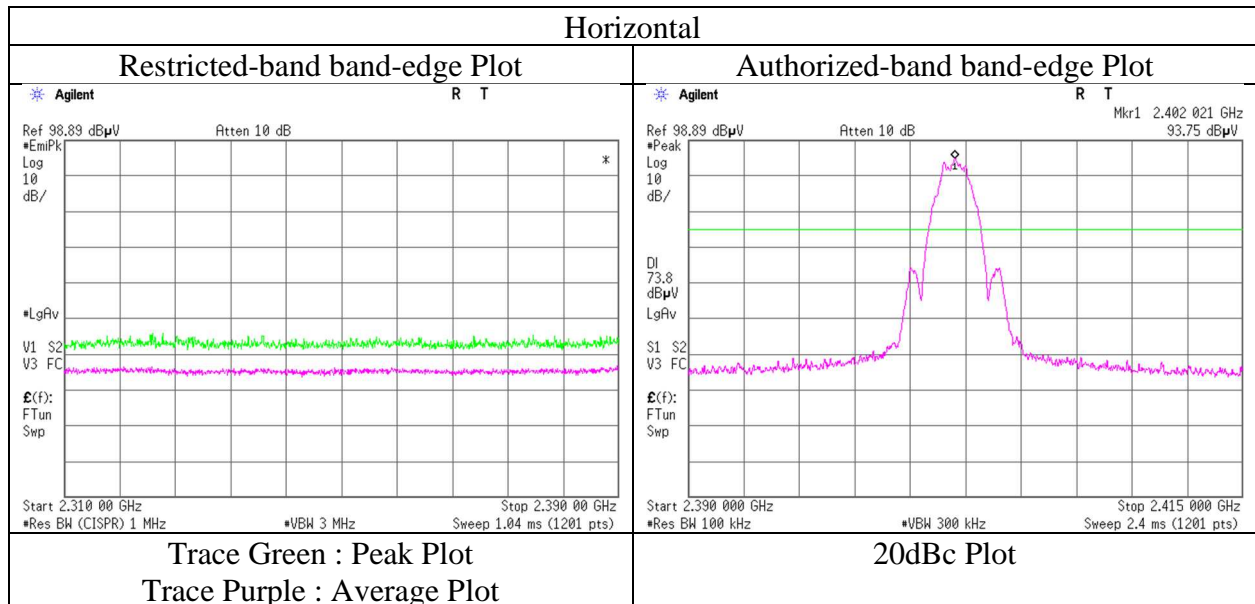
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Radiated Spurious Emission
(Reference Plot for band-edge)
Internal Antenna

Report No. 13694267H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date February 5, 2021
Temperature / Humidity 21 deg. C / 38 % RH
Engineer Tomohisa Nakagawa
(1 GHz - 10 GHz)
Mode Tx BT LE, Uncoded 2M-PHY, 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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Radiated Spurious Emission
Internal Antenna

Report No.	13694267H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	February 4, 2021	February 17, 2021	February 18, 2021
Temperature / Humidity	20 deg. C / 40 % RH	20 deg. C / 34 % RH	20 deg. C / 30 % RH
Engineer	Tomohisa Nakagawa (1 GHz - 10 GHz)	Yuichiro Yamazaki (Above 10 GHz)	Yuichiro Yamazaki (Below 1 GHz)
Mode	Tx BT LE, Uncoded 2M-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Hori.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Hori.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Hori.	600.000	QP	21.0	19.4	10.2	29.4	-	21.2	46.0	24.8	
Hori.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Hori.	4880.000	PK	42.8	31.6	6.9	33.8	-	47.5	73.9	26.4	Floor noise
Hori.	7320.000	PK	44.5	36.2	8.3	33.6	-	55.3	73.9	18.6	
Hori.	9760.000	PK	42.6	38.8	8.9	34.2	-	56.0	73.9	17.9	Floor noise
Hori.	4880.000	AV	35.0	31.6	6.9	33.8	-	39.7	53.9	14.2	Floor noise
Hori.	7320.000	AV	37.5	36.2	8.3	33.6	-	48.4	53.9	5.5	
Hori.	9760.000	AV	34.9	38.8	8.9	34.2	-	48.4	53.9	5.5	Floor noise
Vert.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Vert.	140.000	QP	20.5	14.1	7.8	28.3	-	14.1	43.5	29.5	
Vert.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Vert.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Vert.	600.000	QP	21.0	19.4	10.2	29.4	-	21.2	46.0	24.8	
Vert.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Vert.	4880.000	PK	43.9	31.6	6.9	33.8	-	48.6	73.9	25.3	Floor noise
Vert.	7320.000	PK	45.9	36.2	8.3	33.6	-	56.7	73.9	17.2	
Vert.	9760.000	PK	44.1	38.8	8.9	34.2	-	57.5	73.9	16.4	Floor noise
Vert.	4880.000	AV	34.4	31.6	6.9	33.8	-	39.2	53.9	14.8	Floor noise
Vert.	7320.000	AV	36.4	36.2	8.3	33.6	-	47.3	53.9	6.6	
Vert.	9760.000	AV	34.3	38.8	8.9	34.2	-	47.8	53.9	6.1	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 20log(3.7 m / 3.0 m) = 1.83 dB
10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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Ise EMC Lab.

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Radiated Spurious Emission
Internal Antenna

Report No. 13694267H
 Test place Ise EMC Lab.
 Semi Anechoic Chamber No.2 No.2 No.2
 Date February 4, 2021 February 17, 2021 February 18, 2021
 Temperature / Humidity 20 deg. C / 40 % RH 20 deg. C / 34 % RH 20 deg. C / 30 % RH
 Engineer Tomohisa Nakagawa Yuichiro Yamazaki Yuichiro Yamazaki
 (1 GHz - 10 GHz) (Above 10 GHz) (Below 1 GHz)
 Mode Tx BT LE, Uncoded 2M-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Hori.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Hori.	960.000	QP	20.2	22.2	11.5	28.8	-	25.1	46.0	20.9	
Hori.	2483.500	PK	48.1	27.4	4.9	34.6	-	45.8	73.9	28.1	
Hori.	4960.000	PK	43.1	31.6	6.9	33.8	-	47.8	73.9	26.1	Floor noise
Hori.	7440.000	PK	43.0	36.0	8.3	33.7	-	53.7	73.9	20.3	Floor noise
Hori.	9920.000	PK	41.6	38.9	9.0	34.3	-	55.3	73.9	18.7	Floor noise
Hori.	2483.500	AV	39.4	27.4	4.9	34.6	-	37.1	53.9	16.9	
Hori.	4960.000	AV	34.3	31.6	6.9	33.8	-	39.0	53.9	14.9	Floor noise
Hori.	7440.000	AV	35.2	36.0	8.3	33.7	-	45.9	53.9	8.0	Floor noise
Hori.	9920.000	AV	35.1	38.9	9.0	34.3	-	48.7	53.9	5.2	Floor noise
Vert.	40.000	QP	21.0	14.9	6.9	28.6	-	14.1	40.0	25.9	
Vert.	140.000	QP	20.5	14.1	7.8	28.3	-	14.1	43.5	29.5	
Vert.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Vert.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Vert.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Vert.	960.000	QP	20.2	22.2	11.5	28.8	-	25.1	46.0	20.9	
Vert.	2483.500	PK	47.0	27.4	4.9	34.6	-	44.7	73.9	29.2	
Vert.	4960.000	PK	42.0	31.6	6.9	33.8	-	46.7	73.9	27.2	Floor noise
Vert.	7440.000	PK	41.7	36.0	8.3	33.7	-	52.3	73.9	21.6	Floor noise
Vert.	9920.000	PK	42.0	38.9	9.0	34.3	-	55.6	73.9	18.3	Floor noise
Vert.	2483.500	AV	39.1	27.4	4.9	34.6	-	36.8	53.9	17.2	
Vert.	4960.000	AV	34.6	31.6	6.9	33.8	-	39.3	53.9	14.6	Floor noise
Vert.	7440.000	AV	34.6	36.0	8.3	33.7	-	45.2	53.9	8.7	Floor noise
Vert.	9920.000	AV	34.9	38.9	9.0	34.3	-	48.5	53.9	5.4	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 20log(3.7 m / 3.0 m) = 1.83 dB
 10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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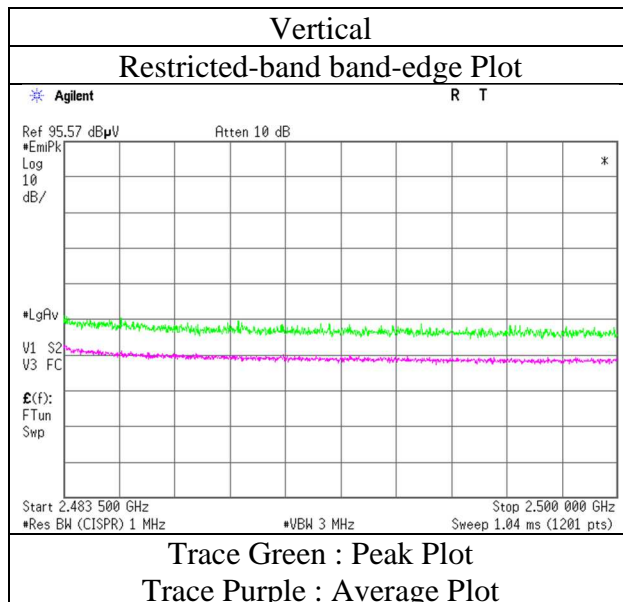
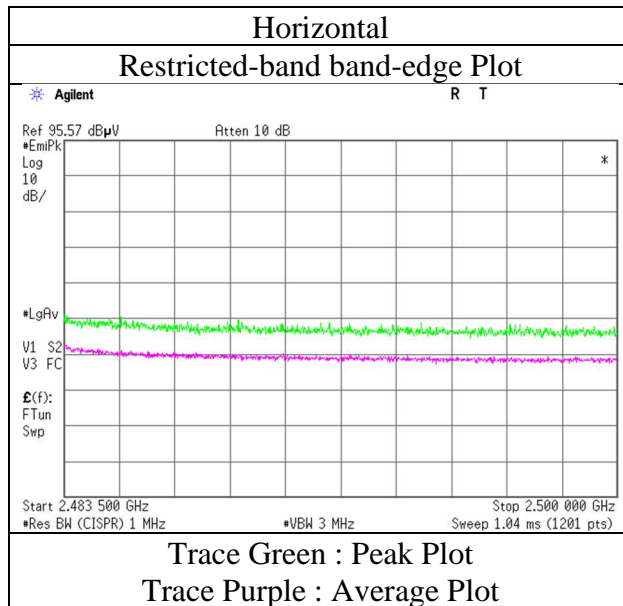
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Radiated Spurious Emission
(Reference Plot for band-edge)
Internal Antenna

Report No. 13694267H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date February 4, 2021
Temperature / Humidity 20 deg. C / 40 % RH
Engineer Tomohisa Nakagawa
(1 GHz - 10 GHz)
Mode Tx BT LE, Uncoded 2M-PHY, 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.

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Ise EMC Lab.

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Facsimile : +81 596 24 8124

Radiated Spurious Emission
External Antenna (S171AH-2450S)

Report No.	13694267H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	February 7, 2021	February 17, 2021	February 18, 2021
Temperature / Humidity	23 deg. C / 36 % RH	20 deg. C / 34 % RH	20 deg. C / 30 % RH
Engineer	Nachi Konegawa (1 GHz - 10 GHz)	Yuichiro Yamazaki (Above 10 GHz)	Yuichiro Yamazaki (Below 1 GHz)
Mode	Tx BT LE, Uncoded 1M-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Hori.	600.000	QP	21.2	19.4	10.2	29.4	-	21.4	46.0	24.6	
Hori.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Hori.	2390.000	PK	45.3	27.6	4.6	34.6	-	42.9	73.9	31.0	
Hori.	4804.000	PK	43.8	31.6	6.7	33.7	-	48.3	73.9	25.6	Floor noise
Hori.	7206.000	PK	47.2	35.8	8.0	33.6	-	57.5	73.9	16.4	
Hori.	9608.000	PK	43.0	38.6	8.6	34.2	-	56.0	73.9	17.9	Floor noise
Hori.	2390.000	AV	36.6	27.6	4.6	34.6	-	34.1	53.9	19.8	
Hori.	4804.000	AV	34.7	31.6	6.7	33.7	-	39.2	53.9	14.7	Floor noise
Hori.	7206.000	AV	40.2	35.8	8.0	33.6	-	50.5	53.9	3.4	
Hori.	9608.000	AV	33.1	38.6	8.6	34.2	-	46.1	53.9	7.8	Floor noise
Vert.	40.000	QP	21.0	14.9	6.9	28.6	-	14.1	40.0	25.9	
Vert.	140.000	QP	20.5	14.1	7.8	28.3	-	14.1	43.5	29.5	
Vert.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Vert.	400.000	QP	20.1	15.7	9.5	28.6	-	16.8	46.0	29.2	
Vert.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Vert.	960.000	QP	20.0	22.2	11.5	28.8	-	24.9	46.0	21.1	
Vert.	2390.000	PK	45.5	27.6	4.6	34.6	-	43.1	73.9	30.8	
Vert.	4804.000	PK	43.8	31.6	6.7	33.7	-	48.3	73.9	25.6	Floor noise
Vert.	7206.000	PK	46.1	35.8	8.0	33.6	-	56.4	73.9	17.5	
Vert.	9608.000	PK	43.2	38.6	8.6	34.2	-	56.2	73.9	17.7	Floor noise
Vert.	2390.000	AV	34.4	27.6	4.6	34.6	-	31.9	53.9	22.0	
Vert.	4804.000	AV	34.8	31.6	6.7	33.7	-	39.3	53.9	14.6	Floor noise
Vert.	7206.000	AV	38.1	35.8	8.0	33.6	-	48.4	53.9	5.6	
Vert.	9608.000	AV	34.0	38.6	8.6	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)
 *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(3.6 m / 3.0 m) = 1.59 dB
 10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 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	101.2	27.5	4.6	34.6	98.7	-	-	Carrier
Hori.	2400.000	PK	46.8	27.6	4.6	34.6	44.3	78.7	34.4	
Vert.	2402.000	PK	101.8	27.5	4.6	34.6	99.3	-	-	Carrier
Vert.	2400.000	PK	47.0	27.6	4.6	34.6	44.5	79.3	34.8	

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

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Ise EMC Lab.

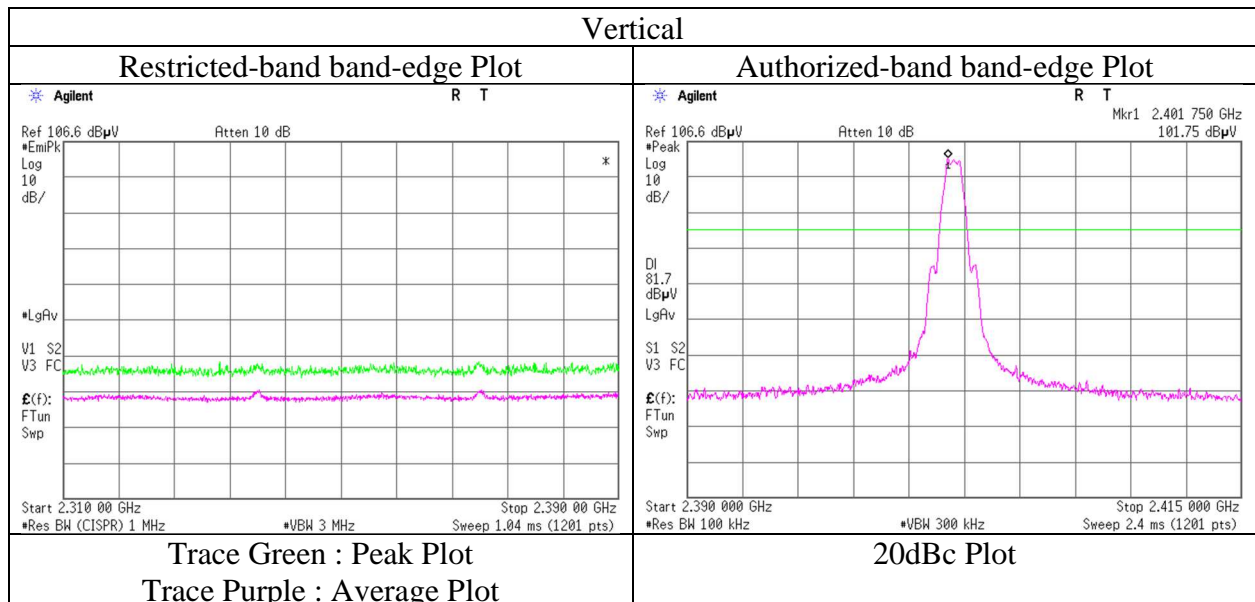
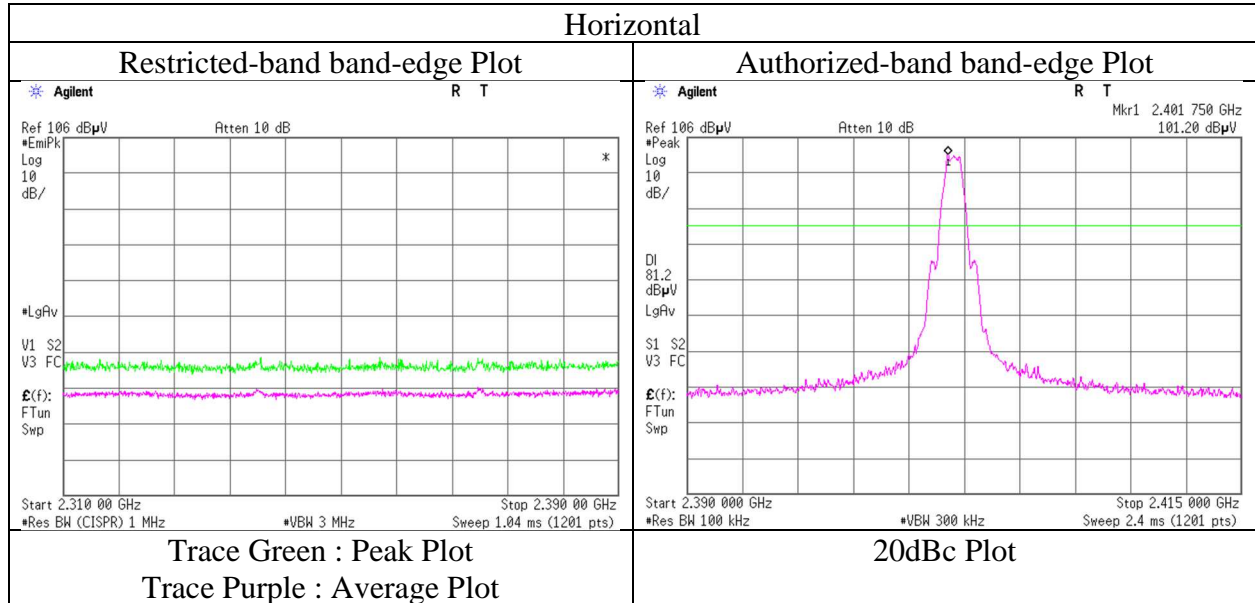
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Radiated Spurious Emission
(Reference Plot for band-edge)
External Antenna (S171AH-2450S)

Report No.	13694267H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	February 7, 2021
Temperature / Humidity	23 deg. C / 36 % RH
Engineer	Nachi Konegawa
	(1 GHz - 10 GHz)
Mode	Tx BT LE, Uncoded 1M-PHY, 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.

UL Japan, Inc.

Ise EMC Lab.

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

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Facsimile : +81 596 24 8124

Radiated Spurious Emission
External Antenna (S171AH-2450S)

Report No.	13694267H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	February 7, 2021	February 17, 2021	February 18, 2021
Temperature / Humidity	23 deg. C / 36 % RH	20 deg. C / 34 % RH	20 deg. C / 30 % RH
Engineer	Nachi Konegawa (1 GHz - 10 GHz)	Yuichiro Yamazaki (Above 10 GHz)	Yuichiro Yamazaki (Below 1 GHz)
Mode	Tx BT LE, Uncoded 1M-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.7	14.1	7.8	28.3	-	14.3	43.5	29.3	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Hori.	600.000	QP	21.0	19.4	10.2	29.4	-	21.2	46.0	24.8	
Hori.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Hori.	4880.000	PK	43.4	31.6	6.7	33.8	-	47.8	73.9	26.1	Floor noise
Hori.	7320.000	PK	45.5	36.2	8.0	33.6	-	56.1	73.9	17.8	
Hori.	9760.000	PK	43.1	38.8	8.7	34.2	-	56.4	73.9	17.5	Floor noise
Hori.	4880.000	AV	35.0	31.6	6.7	33.8	-	39.5	53.9	14.4	Floor noise
Hori.	7320.000	AV	37.5	36.2	8.0	33.6	-	48.1	53.9	5.8	
Hori.	9760.000	AV	33.1	38.8	8.7	34.2	-	46.4	53.9	7.5	Floor noise
Vert.	40.000	QP	21.0	14.9	6.9	28.6	-	14.1	40.0	25.9	
Vert.	140.000	QP	20.5	14.1	7.8	28.3	-	14.1	43.5	29.5	
Vert.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Vert.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Vert.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Vert.	960.000	QP	20.2	22.2	11.5	28.8	-	25.1	46.0	20.9	
Vert.	4880.000	PK	43.4	31.6	6.7	33.8	-	47.9	73.9	26.0	Floor noise
Vert.	7320.000	PK	45.3	36.2	8.0	33.6	-	55.9	73.9	18.0	
Vert.	9760.000	PK	42.8	38.8	8.7	34.2	-	56.0	73.9	17.9	Floor noise
Vert.	4880.000	AV	34.8	31.6	6.7	33.8	-	39.3	53.9	14.6	Floor noise
Vert.	7320.000	AV	36.7	36.2	8.0	33.6	-	47.3	53.9	6.6	
Vert.	9760.000	AV	32.9	38.8	8.7	34.2	-	46.1	53.9	7.8	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 20log(3.6 m / 3.0 m) = 1.59 dB
 10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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Ise EMC Lab.

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Radiated Spurious Emission
External Antenna (S171AH-2450S)

Report No.	13694267H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	February 7, 2021	February 17, 2021	February 18, 2021
Temperature / Humidity	23 deg. C / 36 % RH	20 deg. C / 34 % RH	20 deg. C / 30 % RH
Engineer	Nachi Konegawa (1 GHz - 10 GHz)	Yuichiro Yamazaki (Above 10 GHz)	Yuichiro Yamazaki (Below 1 GHz)
Mode	Tx BT LE, Uncoded 1M-PHY, 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.	40.000	QP	20.8	14.9	6.9	28.6	-	13.9	40.0	26.1	
Hori.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Hori.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Hori.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Hori.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Hori.	960.000	QP	20.2	22.2	11.5	28.8	-	25.1	46.0	20.9	
Hori.	2483.500	PK	50.8	27.4	4.6	34.6	-	48.2	73.9	25.7	
Hori.	4960.000	PK	43.3	31.6	6.7	33.8	-	47.8	73.9	26.1	Floor noise
Hori.	7440.000	PK	44.3	36.0	8.0	33.7	-	54.7	73.9	19.2	
Hori.	9920.000	PK	42.6	38.9	8.7	34.3	-	56.0	73.9	17.9	Floor noise
Hori.	2483.500	AV	41.4	27.4	4.6	34.6	-	38.9	53.9	15.0	
Hori.	4960.000	AV	34.5	31.6	6.7	33.8	-	39.0	53.9	15.0	Floor noise
Hori.	7440.000	AV	35.7	36.0	8.0	33.7	-	46.1	53.9	7.8	
Hori.	9920.000	AV	32.9	38.9	8.7	34.3	-	46.3	53.9	7.6	Floor noise
Vert.	40.000	QP	21.0	14.9	6.9	28.6	-	14.1	40.0	25.9	
Vert.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Vert.	210.000	QP	20.0	11.2	8.3	28.0	-	11.4	43.5	32.1	
Vert.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Vert.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Vert.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Vert.	2483.500	PK	49.9	27.4	4.6	34.6	-	47.4	73.9	26.5	
Vert.	4960.000	PK	43.6	31.6	6.7	33.8	-	48.0	73.9	25.9	Floor noise
Vert.	7440.000	PK	44.3	36.0	8.0	33.7	-	54.7	73.9	19.3	
Vert.	9920.000	PK	43.1	38.9	8.7	34.3	-	56.5	73.9	17.4	Floor noise
Vert.	2483.500	AV	41.7	27.4	4.6	34.6	-	39.2	53.9	14.7	
Vert.	4960.000	AV	34.4	31.6	6.7	33.8	-	38.9	53.9	15.0	Floor noise
Vert.	7440.000	AV	35.1	36.0	8.0	33.7	-	45.5	53.9	8.4	
Vert.	9920.000	AV	33.0	38.9	8.7	34.3	-	46.4	53.9	7.5	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 20log(3.6 m / 3.0 m) = 1.59 dB
 10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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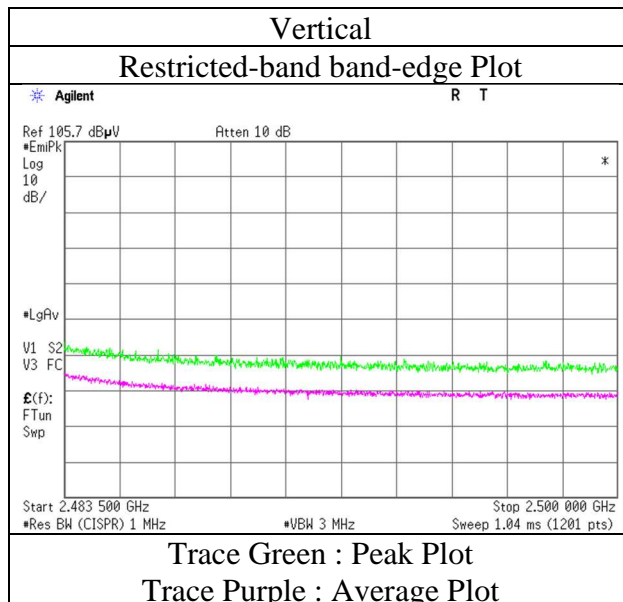
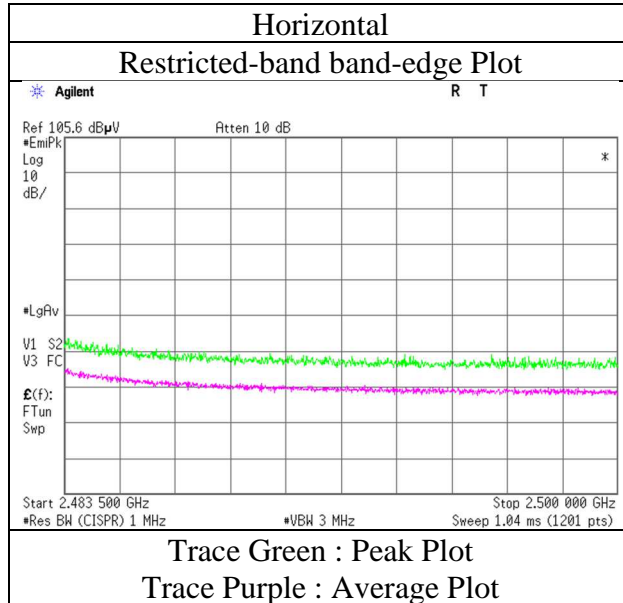
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Radiated Spurious Emission
(Reference Plot for band-edge)
External Antenna (S171AH-2450S)

Report No. 13694267H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date February 7, 2021
Temperature / Humidity 23 deg. C / 36 % RH
Engineer Nachi Konegawa
(1 GHz - 10 GHz)
Mode Tx BT LE, Uncoded 1M-PHY, 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.

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Radiated Spurious Emission
External Antenna (S171AH-2450S)

Report No.	13694267H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	February 16, 2021	February 17, 2021	February 18, 2021
Temperature / Humidity	18 deg. C / 40 % RH	20 deg. C / 34 % RH	20 deg. C / 30 % RH
Engineer	Yuichiro Yamazaki (1 GHz - 10 GHz)	Yuichiro Yamazaki (Above 10 GHz)	Yuichiro Yamazaki (Below 1 GHz)
Mode	Tx BT LE, Uncoded 2M-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Hori.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Hori.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Hori.	2390.000	PK	47.5	27.6	4.6	35.1	-	44.5	73.9	29.4	
Hori.	4804.000	PK	43.4	31.6	6.7	34.4	-	47.3	73.9	26.6	
Hori.	7206.000	PK	47.6	35.8	8.0	34.4	-	57.1	73.9	16.8	
Hori.	9608.000	PK	44.0	38.6	8.6	35.0	-	56.2	73.9	17.7	Floor noise
Hori.	2390.000	AV	37.0	27.6	4.6	35.1	-	34.1	53.9	19.8	
Hori.	4804.000	AV	33.2	31.6	6.7	34.4	-	37.1	53.9	16.8	
Hori.	7206.000	AV	38.6	35.8	8.0	34.4	-	48.1	53.9	5.8	
Hori.	9608.000	AV	33.6	38.6	8.6	35.0	-	45.8	53.9	8.1	Floor noise
Vert.	40.000	QP	21.0	14.9	6.9	28.6	-	14.1	40.0	25.9	
Vert.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Vert.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Vert.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Vert.	600.000	QP	21.0	19.4	10.2	29.4	-	21.2	46.0	24.8	
Vert.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Vert.	2390.000	PK	48.6	27.6	4.6	35.1	-	45.6	73.9	28.3	
Vert.	4804.000	PK	43.7	31.6	6.7	34.4	-	47.6	73.9	26.3	
Vert.	7206.000	PK	44.9	35.8	8.0	34.4	-	54.4	73.9	19.5	
Vert.	9608.000	PK	43.8	38.6	8.6	35.0	-	56.0	73.9	17.9	Floor noise
Vert.	2390.000	AV	37.9	27.6	4.6	35.1	-	35.0	53.9	18.9	
Vert.	4804.000	AV	33.9	31.6	6.7	34.4	-	37.8	53.9	16.1	
Vert.	7206.000	AV	36.5	35.8	8.0	34.4	-	46.0	53.9	7.9	
Vert.	9608.000	AV	33.8	38.6	8.6	35.0	-	46.0	53.9	7.9	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 20log(3.6 m / 3.0 m) = 1.59 dB
10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 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	99.3	27.5	4.6	35.1	96.3	-	-	Carrier
Hori.	2400.000	PK	68.6	27.6	4.6	35.1	65.7	76.3	10.7	
Vert.	2402.000	PK	101.1	27.5	4.6	35.1	98.1	-	-	Carrier
Vert.	2400.000	PK	70.3	27.6	4.6	35.1	67.4	78.1	10.8	

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

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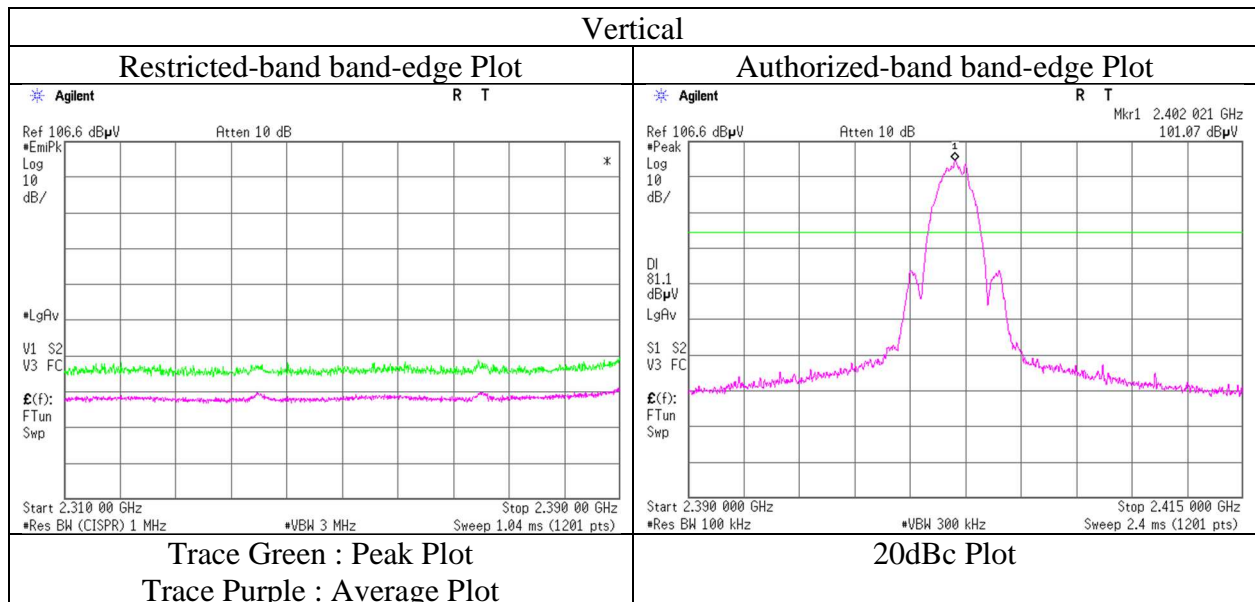
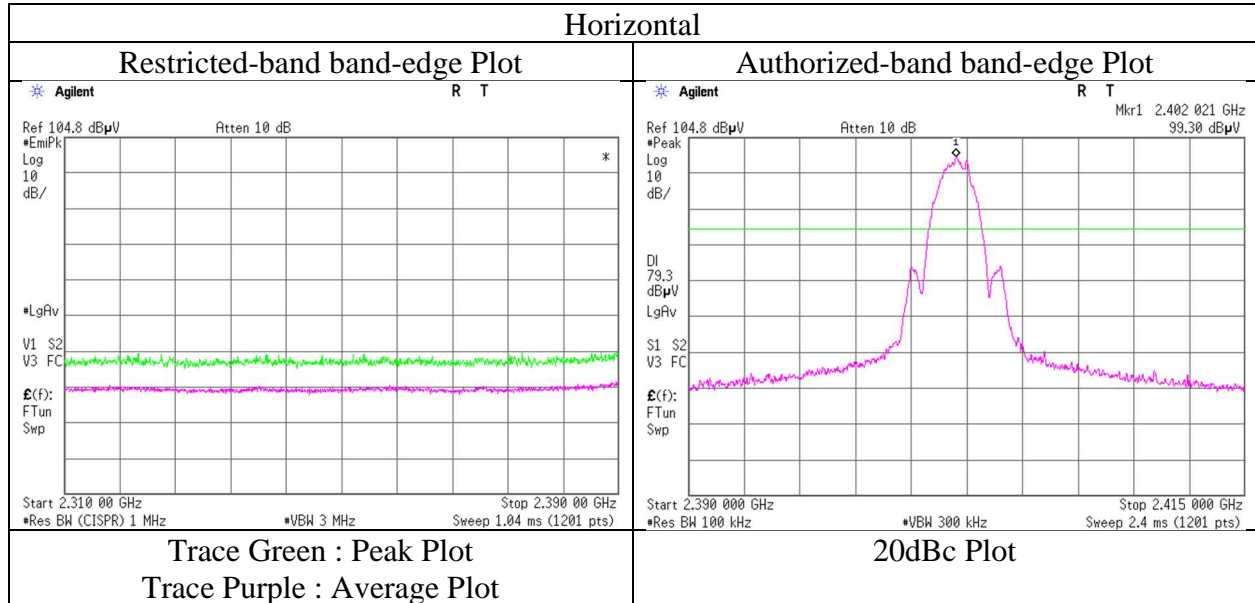
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Radiated Spurious Emission
(Reference Plot for band-edge)
External Antenna (S171AH-2450S)

Report No. 13694267H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date February 16, 2021
Temperature / Humidity 18 deg. C / 40 % RH
Engineer Yuichiro Yamazaki
(1 GHz - 10 GHz)
Mode Tx BT LE, Uncoded 2M-PHY, 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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Radiated Spurious Emission
External Antenna (S171AH-2450S)

Report No. 13694267H
 Test place Ise EMC Lab.
 Semi Anechoic Chamber No.2 No.2 No.2
 Date February 16, 2021 February 17, 2021 February 18, 2021
 Temperature / Humidity 18 deg. C / 40 % RH 20 deg. C / 34 % RH 20 deg. C / 30 % RH
 Engineer Yuichiro Yamazaki Yuichiro Yamazaki Yuichiro Yamazaki
 (1 GHz - 10 GHz) (Above 10 GHz) (Below 1 GHz)
 Mode Tx BT LE, Uncoded 2M-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.7	14.1	7.8	28.3	-	14.3	43.5	29.3	
Hori.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Hori.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Hori.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Hori.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Hori.	4880.000	PK	45.2	31.6	6.7	34.4	-	49.1	73.9	24.9	
Hori.	7320.000	PK	46.3	36.2	8.0	34.4	-	56.1	73.9	17.8	
Hori.	9760.000	PK	43.6	38.8	8.7	35.0	-	56.1	73.9	17.8	Floor noise
Hori.	4880.000	AV	35.7	31.6	6.7	34.4	-	39.6	53.9	14.3	
Hori.	7320.000	AV	37.4	36.2	8.0	34.4	-	47.3	53.9	6.7	
Hori.	9760.000	AV	34.1	38.8	8.7	35.0	-	46.5	53.9	7.4	Floor noise
Vert.	40.000	QP	21.0	14.9	6.9	28.6	-	14.1	40.0	25.9	
Vert.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Vert.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Vert.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Vert.	600.000	QP	21.0	19.4	10.2	29.4	-	21.2	46.0	24.8	
Vert.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Vert.	4880.000	PK	44.0	31.6	6.7	34.4	-	47.9	73.9	26.1	
Vert.	7320.000	PK	45.2	36.2	8.0	34.4	-	55.1	73.9	18.8	
Vert.	9760.000	PK	43.7	38.8	8.7	35.0	-	56.1	73.9	17.8	Floor noise
Vert.	4880.000	AV	35.2	31.6	6.7	34.4	-	39.0	53.9	14.9	
Vert.	7320.000	AV	36.7	36.2	8.0	34.4	-	46.6	53.9	7.3	
Vert.	9760.000	AV	34.1	38.8	8.7	35.0	-	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 20log(3.6 m / 3.0 m) = 1.59 dB
 10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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Radiated Spurious Emission
External Antenna (S171AH-2450S)

Report No. 13694267H
 Test place Ise EMC Lab.
 Semi Anechoic Chamber No.2 No.2 No.2
 Date February 16, 2021 February 17, 2021 February 18, 2021
 Temperature / Humidity 18 deg. C / 40 % RH 20 deg. C / 34 % RH 20 deg. C / 30 % RH
 Engineer Yuichiro Yamazaki Yuichiro Yamazaki Yuichiro Yamazaki
 (1 GHz - 10 GHz) (Above 10 GHz) (Below 1 GHz)
 Mode Tx BT LE, Uncoded 2M-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Hori.	600.000	QP	21.0	19.4	10.2	29.4	-	21.2	46.0	24.8	
Hori.	960.000	QP	20.2	22.2	11.5	28.8	-	25.1	46.0	20.9	
Hori.	2483.500	PK	54.8	27.4	4.6	35.0	-	51.8	73.9	22.1	
Hori.	4960.000	PK	44.9	31.6	6.7	34.4	-	48.8	73.9	25.1	
Hori.	7440.000	PK	43.7	36.0	8.0	34.4	-	53.4	73.9	20.6	
Hori.	9920.000	PK	43.9	38.9	8.7	35.1	-	56.5	73.9	17.4	Floor noise
Hori.	2483.500	AV	46.4	27.4	4.6	35.0	-	43.4	53.9	10.5	
Hori.	4960.000	AV	35.0	31.6	6.7	34.4	-	38.9	53.9	15.0	
Hori.	7440.000	AV	35.0	36.0	8.0	34.4	-	44.6	53.9	9.3	
Hori.	9920.000	AV	33.9	38.9	8.7	35.1	-	46.5	53.9	7.4	Floor noise
Vert.	40.000	QP	21.0	14.9	6.9	28.6	-	14.1	40.0	25.9	
Vert.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Vert.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Vert.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Vert.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Vert.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Vert.	2483.500	PK	56.0	27.4	4.6	35.0	-	53.0	73.9	20.9	
Vert.	4960.000	PK	43.9	31.6	6.7	34.4	-	47.8	73.9	26.1	
Vert.	7440.000	PK	44.6	36.0	8.0	34.4	-	54.2	73.9	19.7	
Vert.	9920.000	PK	43.3	38.9	8.7	35.1	-	55.9	73.9	18.0	Floor noise
Vert.	2483.500	AV	47.2	27.4	4.6	35.0	-	44.2	53.9	9.7	
Vert.	4960.000	AV	34.7	31.6	6.7	34.4	-	38.6	53.9	15.4	
Vert.	7440.000	AV	35.3	36.0	8.0	34.4	-	44.9	53.9	9.0	
Vert.	9920.000	AV	34.0	38.9	8.7	35.1	-	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 $20\log(3.6\text{ m} / 3.0\text{ m}) = 1.59\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

UL Japan, Inc.

Ise EMC Lab.

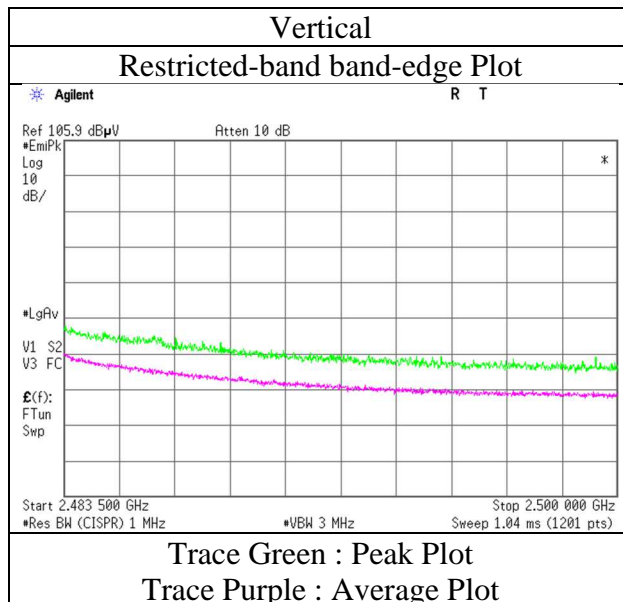
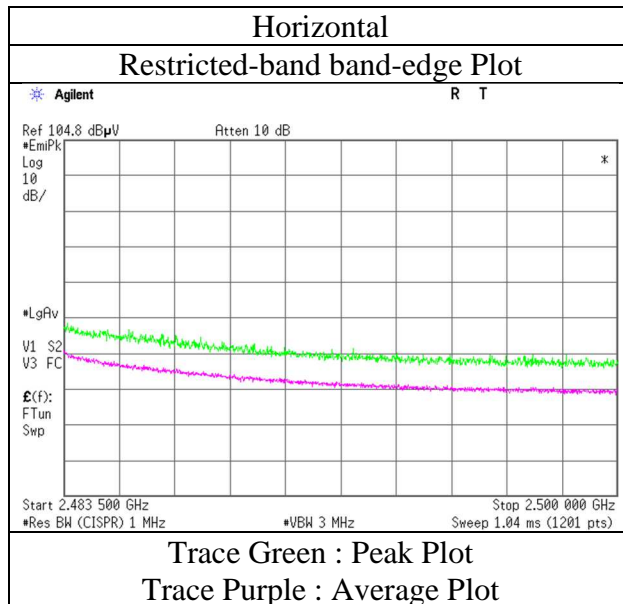
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Radiated Spurious Emission
(Reference Plot for band-edge)
External Antenna (S171AH-2450S)

Report No. 13694267H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date February 16, 2021
Temperature / Humidity 18 deg. C / 40 % RH
Engineer Yuichiro Yamazaki
Mode Tx BT LE, Uncoded 2M-PHY, 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.

UL Japan, Inc.

Ise EMC Lab.

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Telephone : +81 596 24 8999

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Radiated Spurious Emission
External Antenna (AIR-ANT2460P-R)

Report No. 13694267H
 Test place Ise EMC Lab.
 Semi Anechoic Chamber No.2 No.2
 Date February 17, 2021 February 18, 2021
 Temperature / Humidity 20 deg. C / 34 % RH 20 deg. C / 30 % RH
 Engineer Yuichiro Yamazaki Yuichiro Yamazaki
 (Above 1 GHz) (Below 1 GHz)
 Mode Tx BT LE, Uncoded IM-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.7	14.1	7.8	28.3	-	14.3	43.5	29.3	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Hori.	600.000	QP	21.2	19.4	10.2	29.4	-	21.4	46.0	24.6	
Hori.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Hori.	2390.000	PK	46.7	27.6	4.7	35.1	-	43.9	73.9	30.0	
Hori.	4804.000	PK	43.7	31.6	6.8	34.4	-	47.7	73.9	26.2	
Hori.	7206.000	PK	46.7	35.8	8.2	34.4	-	56.3	73.9	17.6	
Hori.	9608.000	PK	43.3	38.6	8.7	35.0	-	55.6	73.9	18.3	Floor noise
Hori.	2390.000	AV	37.0	27.6	4.7	35.1	-	34.2	53.9	19.7	
Hori.	4804.000	AV	36.0	31.6	6.8	34.4	-	40.0	53.9	13.9	
Hori.	7206.000	AV	39.8	35.8	8.2	34.4	-	49.4	53.9	4.5	
Hori.	9608.000	AV	33.9	38.6	8.7	35.0	-	46.3	53.9	7.6	Floor noise
Vert.	40.000	QP	21.0	14.9	6.9	28.6	-	14.1	40.0	25.9	
Vert.	140.000	QP	20.7	14.1	7.8	28.3	-	14.3	43.5	29.3	
Vert.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Vert.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Vert.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Vert.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Vert.	2390.000	PK	46.1	27.6	4.7	35.1	-	43.3	73.9	30.6	
Vert.	4804.000	PK	43.3	31.6	6.8	34.4	-	47.3	73.9	26.6	
Vert.	7206.000	PK	46.3	35.8	8.2	34.4	-	55.9	73.9	18.0	
Vert.	9608.000	PK	43.8	38.6	8.7	35.0	-	56.1	73.9	17.8	Floor noise
Vert.	2390.000	AV	37.2	27.6	4.7	35.1	-	34.4	53.9	19.5	
Vert.	4804.000	AV	34.9	31.6	6.8	34.4	-	38.9	53.9	15.0	
Vert.	7206.000	AV	38.0	35.8	8.2	34.4	-	47.6	53.9	6.3	
Vert.	9608.000	AV	33.8	38.6	8.7	35.0	-	46.1	53.9	7.8	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 $20\log(3.65\text{ m} / 3.0\text{ m}) = 1.71\text{ dB}$
 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	101.6	27.54	4.7	35.08	98.8	-	-	Carrier
Hori.	2400.000	PK	47.1	27.55	4.7	35.08	44.3	78.8	34.5	
Vert.	2402.000	PK	100.6	27.54	4.7	35.08	97.8	-	-	Carrier
Vert.	2400.000	PK	46.7	27.55	4.7	35.08	43.9	77.8	33.9	

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

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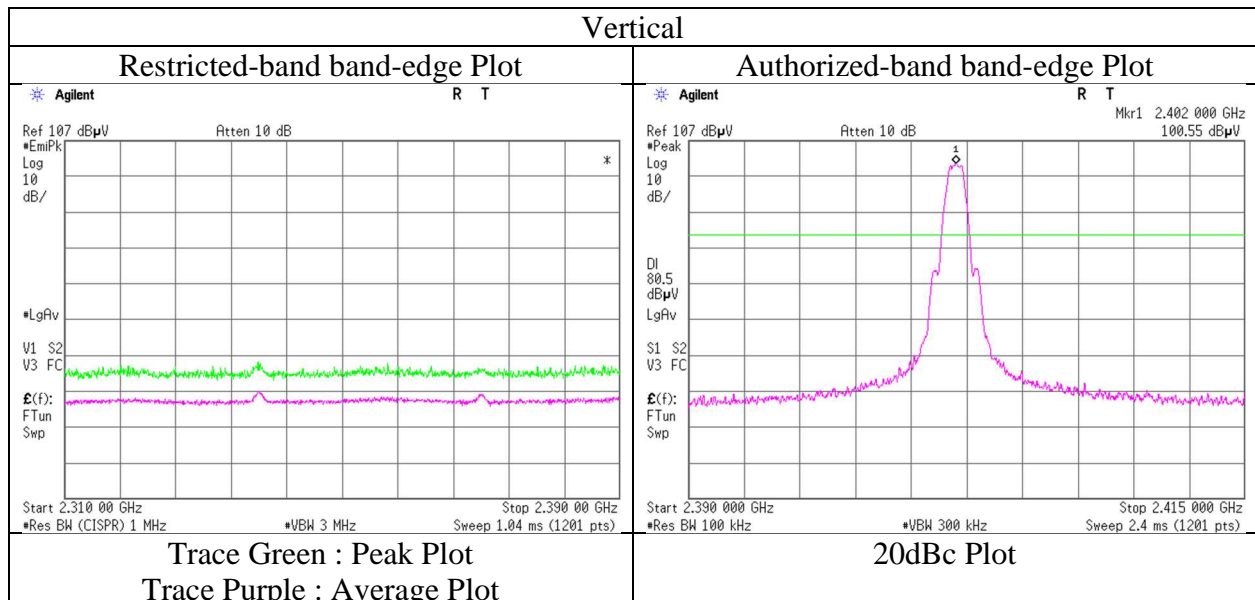
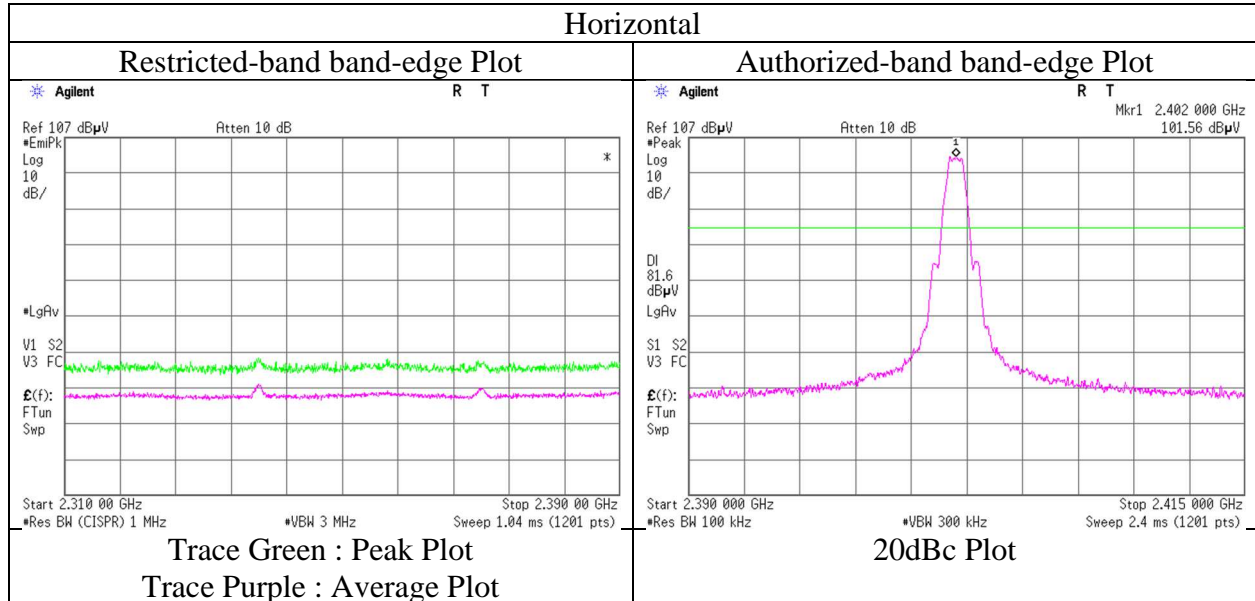
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Radiated Spurious Emission
(Reference Plot for band-edge)
External Antenna (AIR-ANT2460P-R)

Report No.	13694267H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	February 17, 2021
Temperature / Humidity	20 deg. C / 34 % RH
Engineer	Yuichiro Yamazaki
Mode	Tx BT LE, Uncoded 1M-PHY, 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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Radiated Spurious Emission
External Antenna (AIR-ANT2460P-R)

Report No. 13694267H
 Test place Ise EMC Lab.
 Semi Anechoic Chamber No.2 No.2
 Date February 17, 2021 February 18, 2021
 Temperature / Humidity 20 deg. C / 34 % RH 20 deg. C / 30 % RH
 Engineer Yuichiro Yamazaki Yuichiro Yamazaki
 (Above 1 GHz) (Below 1 GHz)
 Mode Tx BT LE, Uncoded IM-PHY, 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.	40.000	QP	21.2	14.9	6.9	28.6	-	14.3	40.0	25.7	
Hori.	140.000	QP	20.8	14.1	7.8	28.3	-	14.4	43.5	29.2	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Hori.	600.000	QP	21.0	19.4	10.2	29.4	-	21.2	46.0	24.8	
Hori.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Hori.	4880.000	PK	44.1	31.6	6.8	34.4	-	48.1	73.9	25.8	
Hori.	7320.000	PK	45.8	36.2	8.2	34.4	-	55.8	73.9	18.1	
Hori.	9760.000	PK	43.5	38.8	8.8	35.0	-	56.1	73.9	17.8	Floor noise
Hori.	4880.000	AV	35.3	31.6	6.8	34.4	-	39.3	53.9	14.6	
Hori.	7320.000	AV	37.1	36.2	8.2	34.4	-	47.0	53.9	6.9	
Hori.	9760.000	AV	34.0	38.8	8.8	35.0	-	46.6	53.9	7.3	Floor noise
Vert.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Vert.	140.000	QP	20.5	14.1	7.8	28.3	-	14.1	43.5	29.5	
Vert.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Vert.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Vert.	600.000	QP	21.2	19.4	10.2	29.4	-	21.4	46.0	24.6	
Vert.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Vert.	4880.000	PK	43.8	31.6	6.8	34.4	-	47.7	73.9	26.2	
Vert.	7320.000	PK	45.8	36.2	8.2	34.4	-	55.7	73.9	18.2	
Vert.	9760.000	PK	43.5	38.8	8.8	35.0	-	56.1	73.9	17.8	Floor noise
Vert.	4880.000	AV	34.6	31.6	6.8	34.4	-	38.6	53.9	15.3	
Vert.	7320.000	AV	37.4	36.2	8.2	34.4	-	47.4	53.9	6.5	
Vert.	9760.000	AV	34.2	38.8	8.8	35.0	-	46.8	53.9	7.1	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 20log(3.65 m / 3.0 m) = 1.71 dB
 10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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Radiated Spurious Emission
External Antenna (AIR-ANT2460P-R)

Report No. 13694267H
 Test place Ise EMC Lab.
 Semi Anechoic Chamber No.2 No.2
 Date February 17, 2021 February 18, 2021
 Temperature / Humidity 20 deg. C / 34 % RH 20 deg. C / 30 % RH
 Engineer Yuichiro Yamazaki Yuichiro Yamazaki
 (Above 1 GHz) (Below 1 GHz)
 Mode Tx BT LE, Uncoded IM-PHY, 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.	40.000	QP	21.0	14.9	6.9	28.6	-	14.1	40.0	25.9	
Hori.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Hori.	600.000	QP	21.2	19.4	10.2	29.4	-	21.4	46.0	24.6	
Hori.	960.000	QP	21.1	22.2	11.5	28.8	-	26.0	46.0	20.0	
Hori.	2483.500	PK	51.5	27.4	4.8	35.0	-	48.6	73.9	25.3	
Hori.	4960.000	PK	43.9	31.6	6.8	34.4	-	47.9	73.9	26.0	
Hori.	7440.000	PK	45.0	36.0	8.1	34.4	-	54.8	73.9	19.1	
Hori.	9920.000	PK	43.3	38.9	8.8	35.1	-	56.0	73.9	17.9	Floor noise
Hori.	2483.500	AV	40.8	27.4	4.8	35.0	-	37.9	53.9	16.0	
Hori.	4960.000	AV	33.5	31.6	6.8	34.4	-	37.5	53.9	16.4	
Hori.	7440.000	AV	34.4	36.0	8.1	34.4	-	44.1	53.9	9.8	
Hori.	9920.000	AV	33.8	38.9	8.8	35.1	-	46.5	53.9	7.4	Floor noise
Vert.	40.000	QP	21.1	14.9	6.9	28.6	-	14.2	40.0	25.8	
Vert.	140.000	QP	20.5	14.1	7.8	28.3	-	14.1	43.5	29.5	
Vert.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Vert.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Vert.	600.000	QP	21.2	19.4	10.2	29.4	-	21.4	46.0	24.6	
Vert.	960.000	QP	20.1	22.2	11.5	28.8	-	25.0	46.0	21.0	
Vert.	2483.500	PK	51.7	27.4	4.8	35.0	-	48.8	73.9	25.1	
Vert.	4960.000	PK	43.2	31.6	6.8	34.4	-	47.1	73.9	26.8	
Vert.	7440.000	PK	45.1	36.0	8.1	34.4	-	54.9	73.9	19.0	
Vert.	9920.000	PK	43.4	38.9	8.8	35.1	-	56.1	73.9	17.8	Floor noise
Vert.	2483.500	AV	41.0	27.4	4.8	35.0	-	38.1	53.9	15.8	
Vert.	4960.000	AV	34.2	31.6	6.8	34.4	-	38.2	53.9	15.7	
Vert.	7440.000	AV	36.4	36.0	8.1	34.4	-	46.2	53.9	7.7	
Vert.	9920.000	AV	34.2	38.9	8.8	35.1	-	47.0	53.9	7.0	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 $20\log(3.65\text{ m} / 3.0\text{ m}) = 1.71\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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Ise EMC Lab.

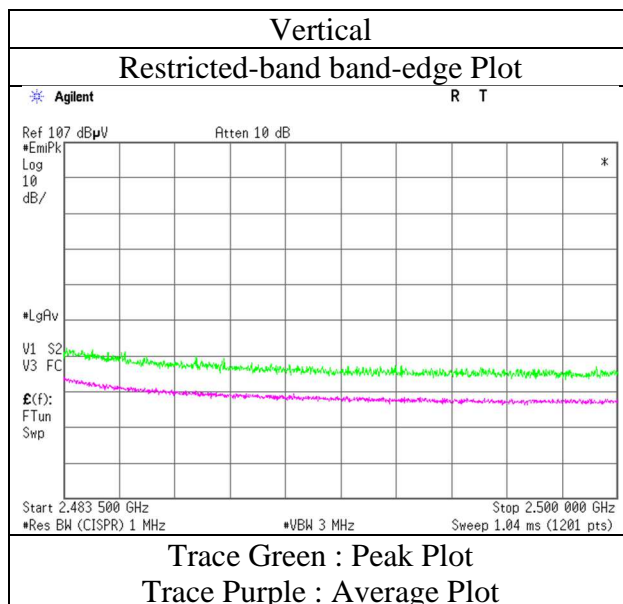
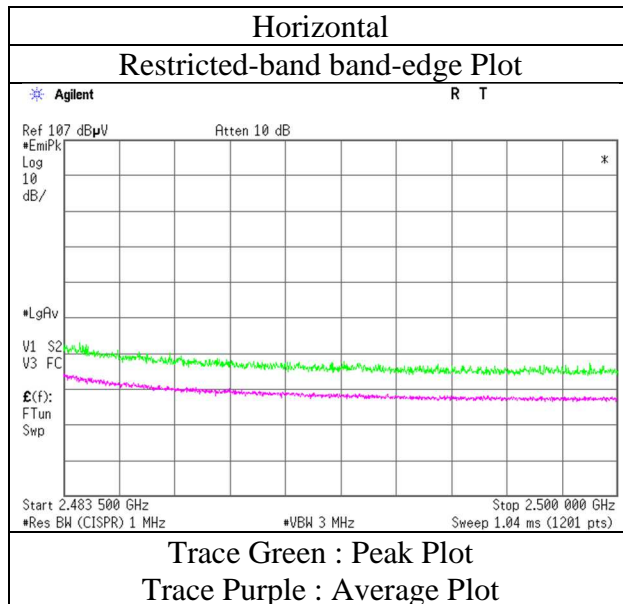
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Radiated Spurious Emission
(Reference Plot for band-edge)
External Antenna (AIR-ANT2460P-R)

Report No. 13694267H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date February 17, 2021
Temperature / Humidity 20 deg. C / 34 % RH
Engineer Yuichiro Yamazaki
Mode Tx BT LE, Uncoded 1M-PHY, 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.

UL Japan, Inc.

Ise EMC Lab.

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Radiated Spurious Emission
External Antenna (AIR-ANT2460P-R)

Report No. 13694267H
 Test place Ise EMC Lab.
 Semi Anechoic Chamber No.2 No.2 No.2
 Date February 16, 2021 February 17, 2021 February 18, 2021
 Temperature / Humidity 18 deg. C / 40 % RH 20 deg. C / 34 % RH 20 deg. C / 30 % RH
 Engineer Yuichiro Yamazaki Yuichiro Yamazaki Yuichiro Yamazaki
 (1 GHz - 10 GHz) (Above 10 GHz) (Below 1 GHz)
 Mode Tx BT LE, Uncoded 2M-PHY, 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.	40.000	QP	21.1	14.9	6.9	28.6	-	14.2	40.0	25.8	
Hori.	140.000	QP	20.8	14.1	7.8	28.3	-	14.4	43.5	29.2	
Hori.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Hori.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Hori.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Hori.	960.000	QP	20.2	22.2	11.5	28.8	-	25.1	46.0	20.9	
Hori.	2390.000	PK	48.0	27.6	4.7	35.1	-	45.2	73.9	28.7	
Hori.	4804.000	PK	46.6	31.6	6.8	34.4	-	50.6	73.9	23.3	
Hori.	7206.000	PK	46.5	35.8	8.2	34.4	-	56.1	73.9	17.8	
Hori.	9608.000	PK	43.7	38.6	8.7	35.0	-	56.0	73.9	17.9	Floor noise
Hori.	2390.000	AV	37.2	27.6	4.7	35.1	-	34.4	53.9	19.5	
Hori.	4804.000	AV	35.3	31.6	6.8	34.4	-	39.3	53.9	14.6	
Hori.	7206.000	AV	37.9	35.8	8.2	34.4	-	47.5	53.9	6.4	
Hori.	9608.000	AV	33.4	38.6	8.7	35.0	-	45.8	53.9	8.1	Floor noise
Vert.	40.000	QP	21.0	14.9	6.9	28.6	-	14.1	40.0	25.9	
Vert.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Vert.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Vert.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Vert.	600.000	QP	21.2	19.4	10.2	29.4	-	21.4	46.0	24.6	
Vert.	960.000	QP	20.0	22.2	11.5	28.8	-	24.9	46.0	21.1	
Vert.	2390.000	PK	47.7	27.6	4.7	35.1	-	44.9	73.9	29.0	
Vert.	4804.000	PK	43.5	31.6	6.8	34.4	-	47.5	73.9	26.4	
Vert.	7206.000	PK	44.7	35.8	8.2	34.4	-	54.3	73.9	19.6	
Vert.	9608.000	PK	43.4	38.6	8.7	35.0	-	55.8	73.9	18.1	Floor noise
Vert.	2390.000	AV	37.5	27.6	4.7	35.1	-	34.7	53.9	19.2	
Vert.	4804.000	AV	34.3	31.6	6.8	34.4	-	38.3	53.9	15.6	
Vert.	7206.000	AV	36.0	35.8	8.2	34.4	-	45.6	53.9	8.3	
Vert.	9608.000	AV	33.8	38.6	8.7	35.0	-	46.2	53.9	7.7	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 20log(3.65 m / 3.0 m) = 1.71 dB
 10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

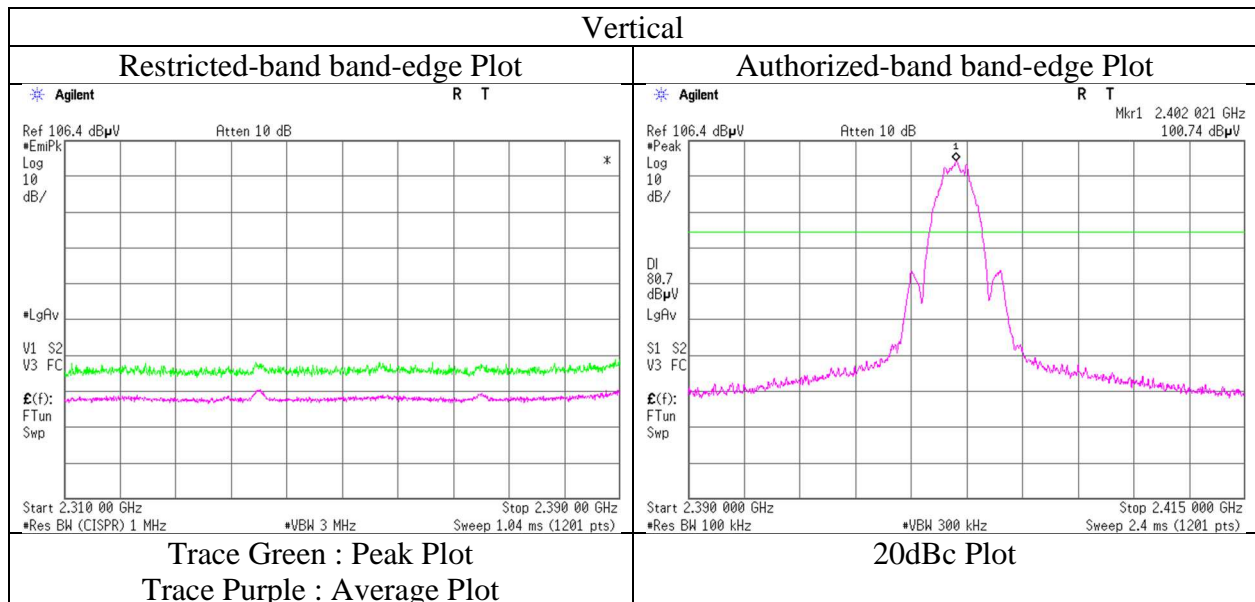
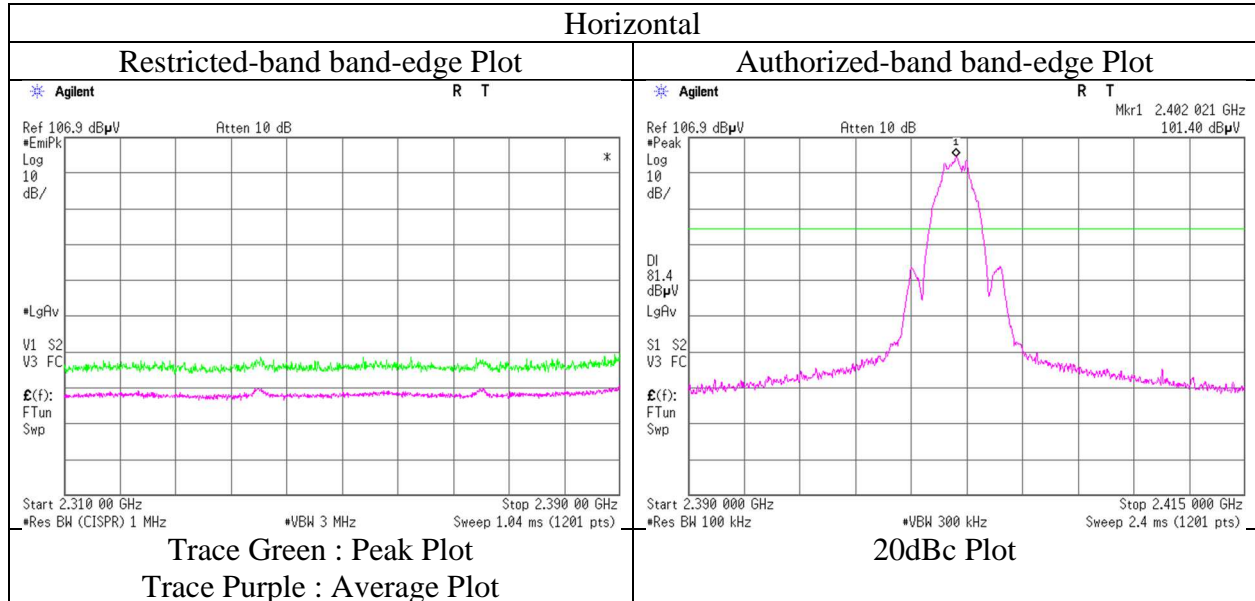
20dBc Data Sheet

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	101.4	27.54	4.7	35.08	98.6	-	-	Carrier
Hori.	2400.000	PK	70.3	27.55	4.7	35.08	67.5	78.6	11.1	
Vert.	2402.000	PK	100.7	27.54	4.7	35.08	97.9	-	-	Carrier
Vert.	2400.000	PK	69.8	27.55	4.7	35.08	67.0	77.9	10.9	

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

Radiated Spurious Emission
(Reference Plot for band-edge)
External Antenna (AIR-ANT2460P-R)

Report No.	13694267H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	February 16, 2021
Temperature / Humidity	18 deg. C / 40 % RH
Engineer	Yuichiro Yamazaki
Mode	Tx BT LE, Uncoded 2M-PHY, 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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Radiated Spurious Emission
External Antenna (AIR-ANT2460P-R)

Report No.	13694267H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	February 16, 2021	February 17, 2021	February 18, 2021
Temperature / Humidity	18 deg. C / 40 % RH	20 deg. C / 34 % RH	20 deg. C / 30 % RH
Engineer	Yuichiro Yamazaki (1 GHz - 10 GHz)	Yuichiro Yamazaki (Above 10 GHz)	Yuichiro Yamazaki (Below 1 GHz)
Mode	Tx BT LE, Uncoded 2M-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.7	14.1	7.8	28.3	-	14.3	43.5	29.3	
Hori.	210.000	QP	20.3	11.2	8.3	28.0	-	11.7	43.5	31.8	
Hori.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Hori.	600.000	QP	21.2	19.4	10.2	29.4	-	21.4	46.0	24.6	
Hori.	960.000	QP	20.2	22.2	11.5	28.8	-	25.1	46.0	20.9	
Hori.	4880.000	PK	44.9	31.6	6.8	34.4	-	48.9	73.9	25.0	
Hori.	7320.000	PK	45.5	36.2	8.2	34.4	-	55.5	73.9	18.4	
Hori.	9760.000	PK	43.3	38.8	8.8	35.0	-	55.9	73.9	18.0	Floor noise
Hori.	4880.000	AV	35.3	31.6	6.8	34.4	-	39.3	53.9	14.6	
Hori.	7320.000	AV	36.1	36.2	8.2	34.4	-	46.1	53.9	7.8	
Hori.	9760.000	AV	34.0	38.8	8.8	35.0	-	46.6	53.9	7.3	Floor noise
Vert.	40.000	QP	21.0	14.9	6.9	28.6	-	14.1	40.0	25.9	
Vert.	140.000	QP	20.2	14.1	7.8	28.3	-	13.8	43.5	29.8	
Vert.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Vert.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Vert.	600.000	QP	21.3	19.4	10.2	29.4	-	21.5	46.0	24.5	
Vert.	960.000	QP	20.0	22.2	11.5	28.8	-	24.9	46.0	21.1	
Vert.	4880.000	PK	43.6	31.6	6.8	34.4	-	47.6	73.9	26.3	
Vert.	7320.000	PK	44.0	36.2	8.2	34.4	-	53.9	73.9	20.0	
Vert.	9760.000	PK	43.4	38.8	8.8	35.0	-	55.9	73.9	18.0	Floor noise
Vert.	4880.000	AV	34.9	31.6	6.8	34.4	-	38.9	53.9	15.0	
Vert.	7320.000	AV	34.7	36.2	8.2	34.4	-	44.6	53.9	9.3	
Vert.	9760.000	AV	34.2	38.8	8.8	35.0	-	46.8	53.9	7.1	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 $20\log(3.65\text{ m} / 3.0\text{ m}) = 1.71\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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Ise EMC Lab.

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Radiated Spurious Emission
External Antenna (AIR-ANT2460P-R)

Report No.	13694267H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	February 16, 2021	February 17, 2021	February 18, 2021
Temperature / Humidity	18 deg. C / 40 % RH	20 deg. C / 34 % RH	20 deg. C / 30 % RH
Engineer	Yuichiro Yamazaki (1 GHz - 10 GHz)	Yuichiro Yamazaki (Above 10 GHz)	Yuichiro Yamazaki (Below 1 GHz)
Mode	Tx BT LE, Uncoded 2M-PHY, 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.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Hori.	140.000	QP	20.6	14.1	7.8	28.3	-	14.2	43.5	29.4	
Hori.	210.000	QP	20.1	11.2	8.3	28.0	-	11.5	43.5	32.0	
Hori.	400.000	QP	20.3	15.7	9.5	28.6	-	17.0	46.0	29.0	
Hori.	600.000	QP	21.2	19.4	10.2	29.4	-	21.4	46.0	24.6	
Hori.	960.000	QP	20.2	22.2	11.5	28.8	-	25.1	46.0	20.9	
Hori.	2483.500	PK	56.5	27.4	4.8	35.0	-	53.6	73.9	20.3	
Hori.	4960.000	PK	44.7	31.6	6.8	34.4	-	48.6	73.9	25.3	
Hori.	7440.000	PK	45.5	36.0	8.1	34.4	-	55.3	73.9	18.6	
Hori.	9920.000	PK	43.6	38.9	8.8	35.1	-	56.3	73.9	17.6	Floor noise
Hori.	2483.500	AV	48.4	27.4	4.8	35.0	-	45.5	53.9	8.4	
Hori.	4960.000	AV	35.2	31.6	6.8	34.4	-	39.1	53.9	14.8	
Hori.	7440.000	AV	36.4	36.0	8.1	34.4	-	46.1	53.9	7.8	
Hori.	9920.000	AV	33.9	38.9	8.8	35.1	-	46.6	53.9	7.3	Floor noise
Vert.	40.000	QP	20.9	14.9	6.9	28.6	-	14.0	40.0	26.0	
Vert.	140.000	QP	20.5	14.1	7.8	28.3	-	14.1	43.5	29.5	
Vert.	210.000	QP	20.2	11.2	8.3	28.0	-	11.6	43.5	31.9	
Vert.	400.000	QP	20.2	15.7	9.5	28.6	-	16.9	46.0	29.1	
Vert.	600.000	QP	21.1	19.4	10.2	29.4	-	21.3	46.0	24.7	
Vert.	960.000	QP	20.0	22.2	11.5	28.8	-	24.9	46.0	21.1	
Vert.	2483.500	PK	57.3	27.4	4.8	35.0	-	54.4	73.9	19.5	
Vert.	4960.000	PK	43.4	31.6	6.8	34.4	-	47.4	73.9	26.5	
Vert.	7440.000	PK	44.5	36.0	8.1	34.4	-	54.3	73.9	19.6	
Vert.	9920.000	PK	43.2	38.9	8.8	35.1	-	55.9	73.9	18.0	Floor noise
Vert.	2483.500	AV	48.5	27.4	4.8	35.0	-	45.6	53.9	8.3	
Vert.	2544.000	AV	37.1	27.5	4.8	35.0	-	34.4	53.9	19.5	
Vert.	4960.000	AV	34.3	31.6	6.8	34.4	-	38.3	53.9	15.6	
Vert.	7440.000	AV	35.0	36.0	8.1	34.4	-	44.7	53.9	9.2	
Vert.	9920.000	AV	33.9	38.9	8.8	35.1	-	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 20log(3.65 m / 3.0 m) = 1.71 dB
10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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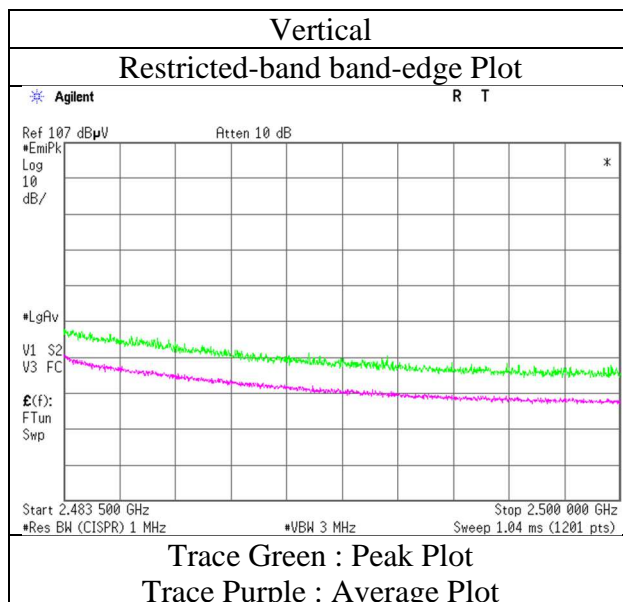
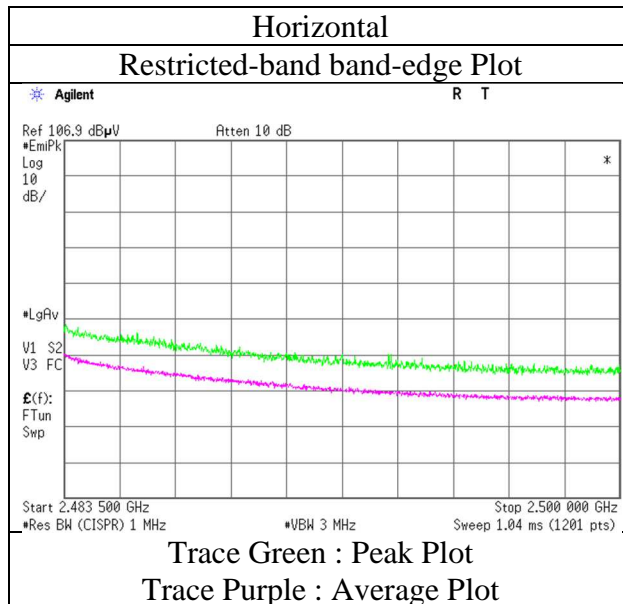
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Radiated Spurious Emission
(Reference Plot for band-edge)
External Antenna (AIR-ANT2460P-R)

Report No. 13694267H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date February 16, 2021
Temperature / Humidity 18 deg. C / 40 % RH
Engineer Yuichiro Yamazaki
Mode Tx BT LE, Uncoded 2M-PHY, 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.

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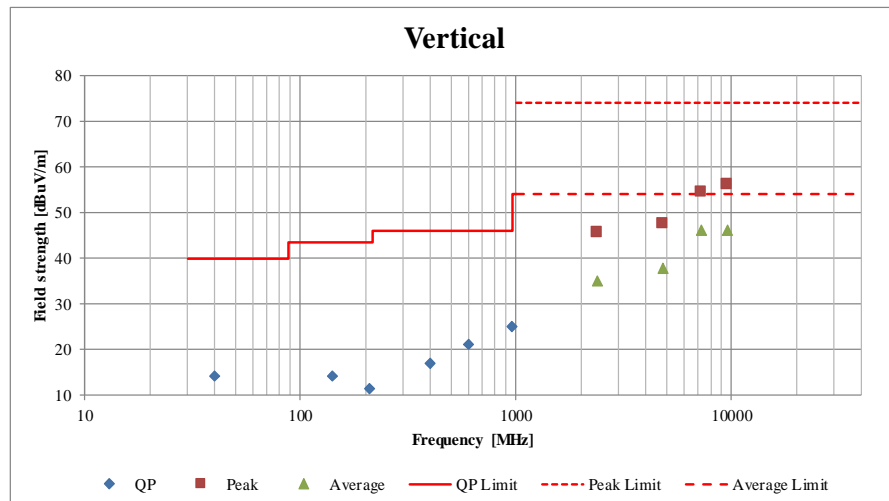
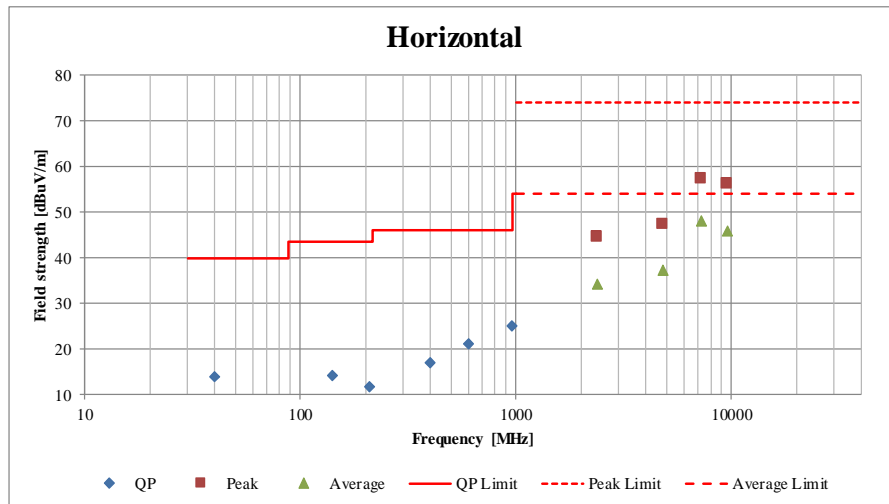
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Radiated Spurious Emission
(Plot data, Worst case)
Extreme Antenna (S171AH-2450S)

Report No.	13694267H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	February 16, 2021	February 17, 2021	February 18, 2021
Temperature / Humidity	18 deg. C / 40 % RH	20 deg. C / 34 % RH	20 deg. C / 30 % RH
Engineer	Yuichiro Yamazaki	Yuichiro Yamazaki	Yuichiro Yamazaki
	(1 GHz - 10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx BT LE, Uncoded 2M-PHY, 2402 MHz		



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

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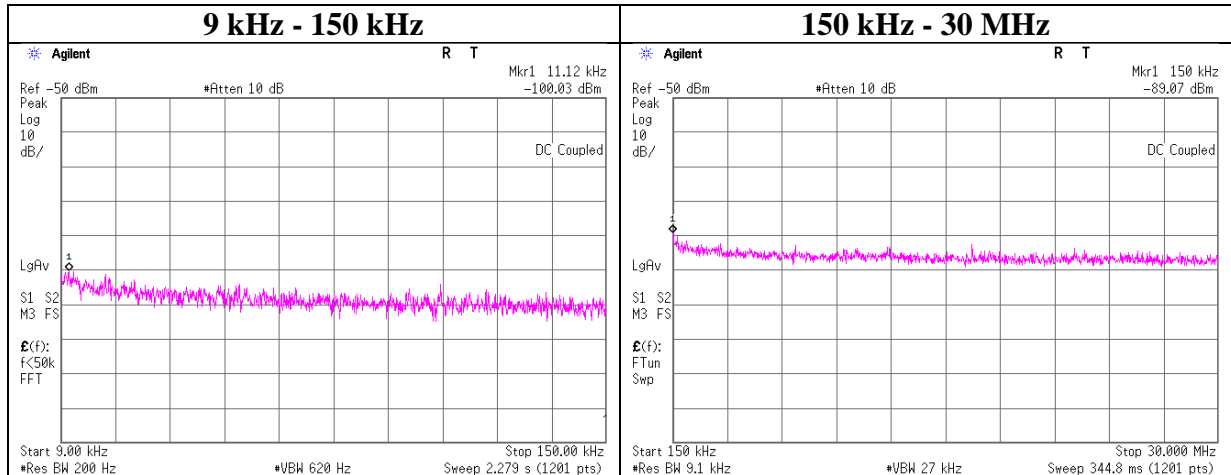
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Conducted Spurious Emission

Report No.	13694267H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	February 8, 2021
Temperature / Humidity	24 deg. C / 35 RH
Engineer	Shinya Watanabe
Mode	Tx BT LE, Uncoded 1M-PHY, 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
11.12	-100.0	0.36	9.5	6.5	1	-83.7	300	6.0	-22.4	46.6	69.0	
150.00	-89.1	0.36	9.5	6.5	1	-72.7	300	6.0	-11.5	24.0	35.5	

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

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

N: Number of output

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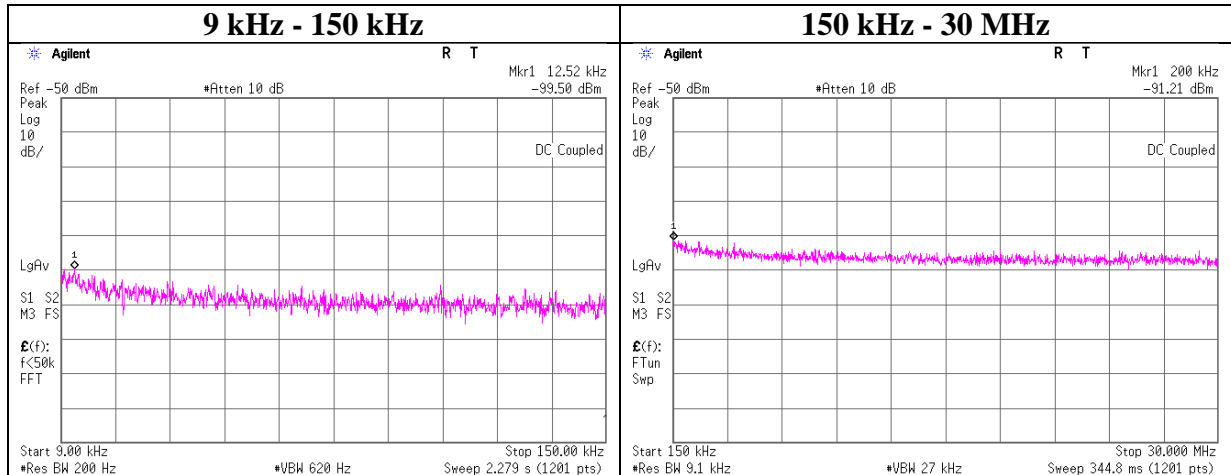
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Conducted Spurious Emission

Report No.	13694267H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	February 8, 2021
Temperature / Humidity	24 deg. C / 35 RH
Engineer	Shinya Watanabe
Mode	Tx BT LE, Uncoded 1M-PHY, 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
12.52	-99.5	0.36	9.5	6.5	1	-83.1	300	6.0	-21.9	45.6	67.5	
200.00	-91.2	0.36	9.5	6.5	1	-74.9	300	6.0	-13.6	21.5	35.1	

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

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

N: Number of output

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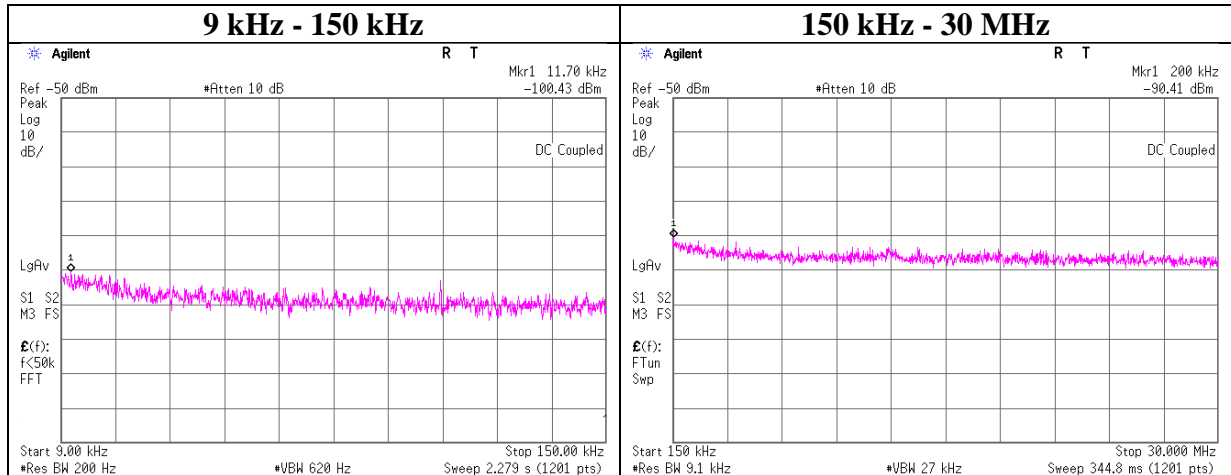
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Conducted Spurious Emission

Report No.	13694267H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	February 8, 2021
Temperature / Humidity	24 deg. C / 35 RH
Engineer	Shinya Watanabe
Mode	Tx BT LE, Uncoded 1M-PHY, 2480 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
11.70	-100.4	0.36	9.5	6.5	1	-84.1	300	6.0	-22.8	46.2	69.0	
200.00	-90.4	0.36	9.5	6.5	1	-74.1	300	6.0	-12.8	21.5	34.3	

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

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

N: Number of output

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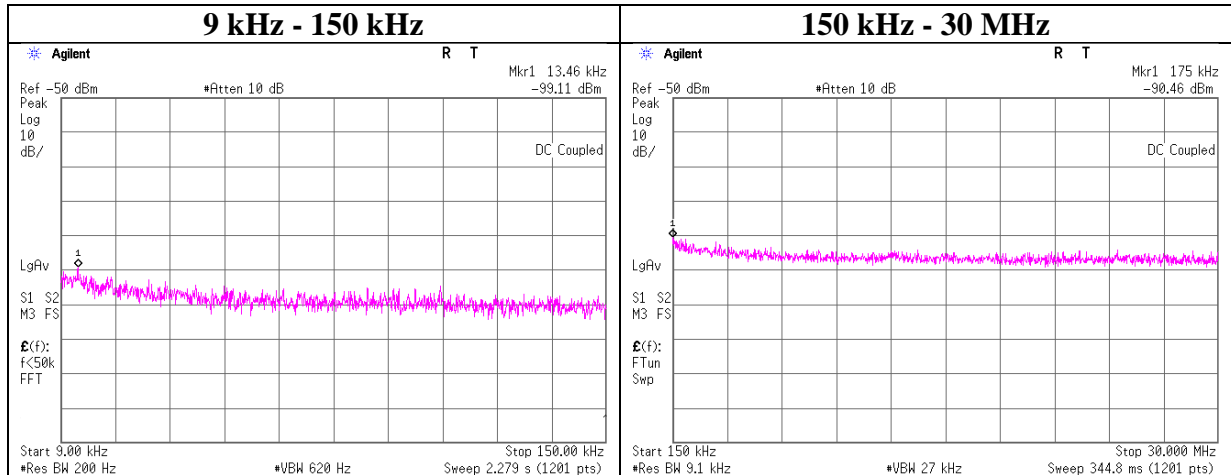
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Conducted Spurious Emission

Report No.	13694267H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	February 8, 2021
Temperature / Humidity	24 deg. C / 35 RH
Engineer	Shinya Watanabe
Mode	Tx BT LE, Uncoded 2M-PHY, 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
13.46	-99.1	0.36	9.5	6.5	1	-82.8	300	6.0	-21.5	45.0	66.5	
175.00	-90.5	0.36	9.5	6.5	1	-74.1	300	6.0	-12.8	22.7	35.5	

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

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

N: Number of output

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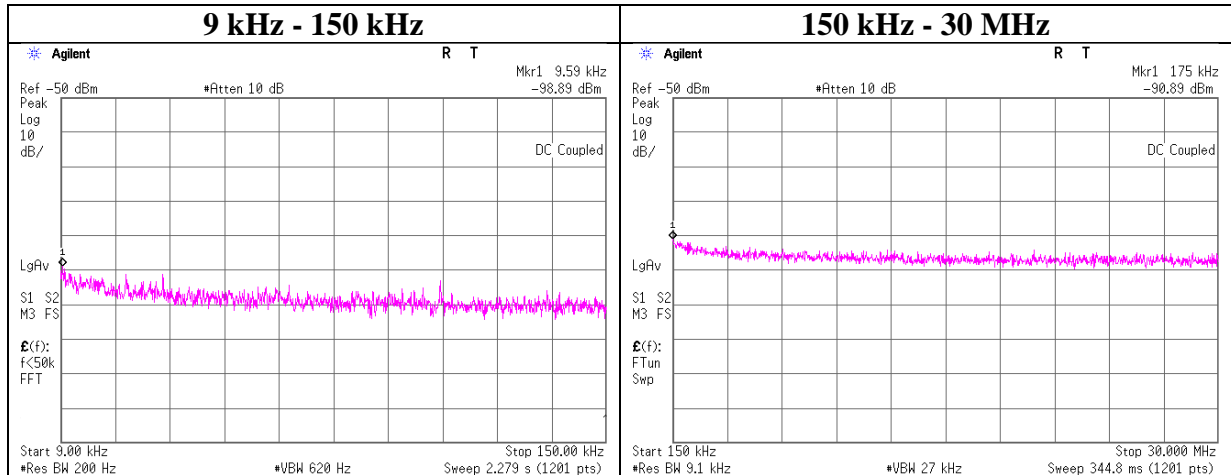
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Conducted Spurious Emission

Report No.	13694267H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	February 8, 2021
Temperature / Humidity	24 deg. C / 35 RH
Engineer	Shinya Watanabe
Mode	Tx BT LE, Uncoded 2M-PHY, 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
9.59	-98.9	0.36	9.5	6.5	1	-82.5	300	6.0	-21.3	47.9	69.2	
175.00	-90.9	0.36	9.5	6.5	1	-74.5	300	6.0	-13.3	22.7	36.0	

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

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

N: Number of output

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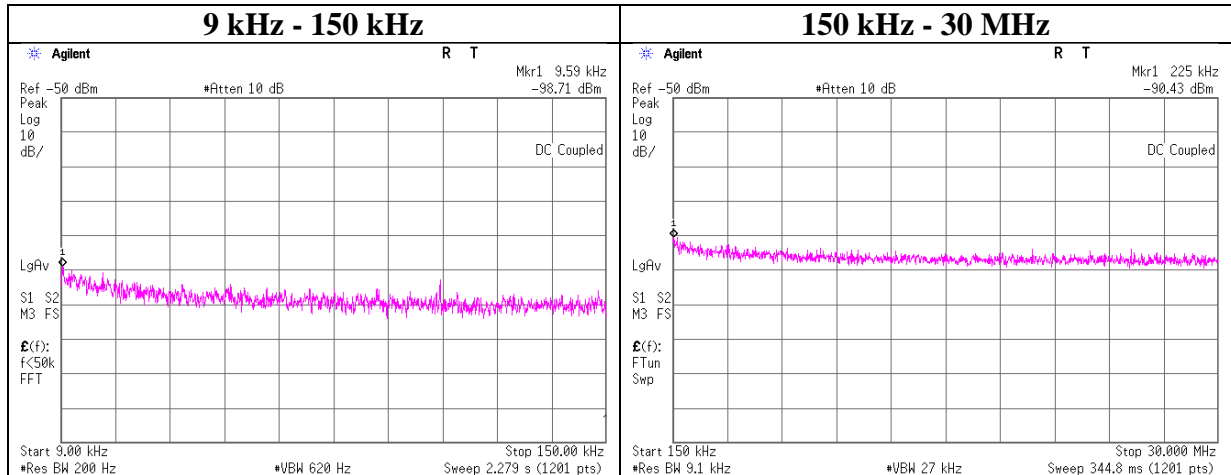
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Conducted Spurious Emission

Report No.	13694267H
Test place	Ise EMC Lab. No.5 Measurement Room
Date	February 8, 2021
Temperature / Humidity	24 deg. C / 35 RH
Engineer	Shinya Watanabe
Mode	Tx BT LE, Uncoded 2M-PHY, 2480 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
9.59	-98.7	0.36	9.5	6.5	1	-82.4	300	6.0	-21.1	47.9	69.0	
225.00	-90.4	0.36	9.5	6.5	1	-74.1	300	6.0	-12.8	20.5	33.3	

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

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

N: Number of output

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Power Density

Report No. 13694267H
Test place Ise EMC Lab. No.5 Measurement Room
Date February 8, 2021
Temperature / Humidity 24 deg. C / 35 RH
Engineer Shinya Watanabe
Mode Tx BT LE

Uncoded 1M-PHY

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2402	-25.13	0.36	9.50	-15.27	8.00	23.27
2440	-25.08	0.36	9.50	-15.22	8.00	23.22
2480	-25.25	0.36	9.50	-15.39	8.00	23.39

Uncoded 2M-PHY

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2402	-27.17	0.36	9.50	-17.31	8.00	25.31
2440	-27.12	0.36	9.50	-17.26	8.00	25.26
2480	-26.70	0.36	9.50	-16.84	8.00	24.84

Sample Calculation:

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

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

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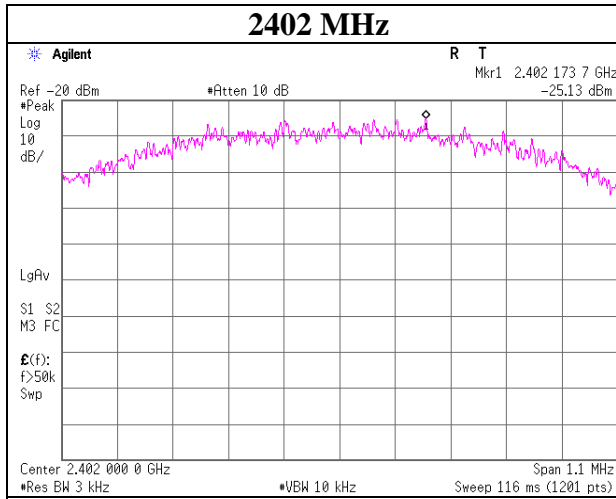
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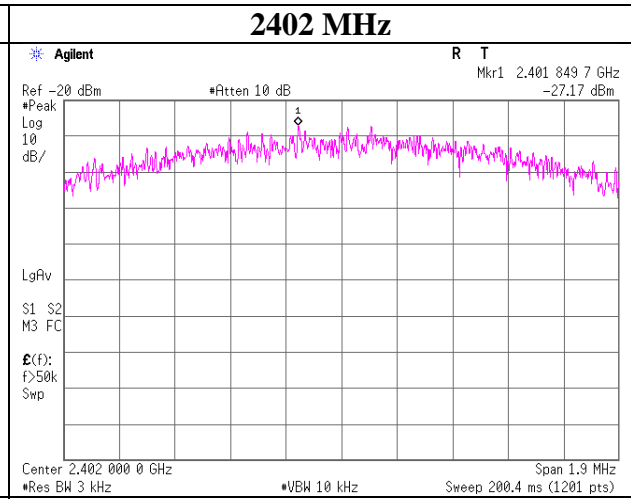
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Power Density

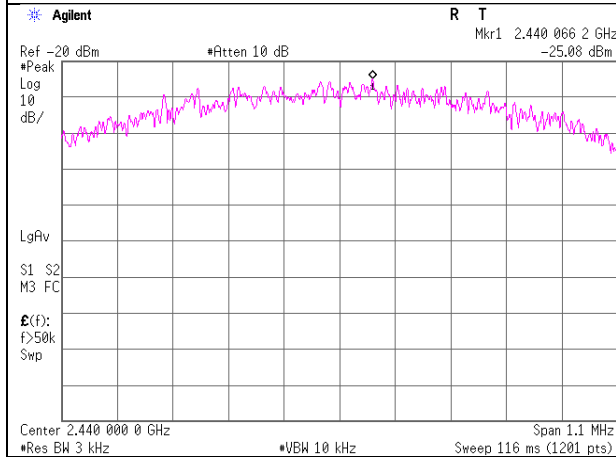
**BT LE
Uncoded 1M-PHY**



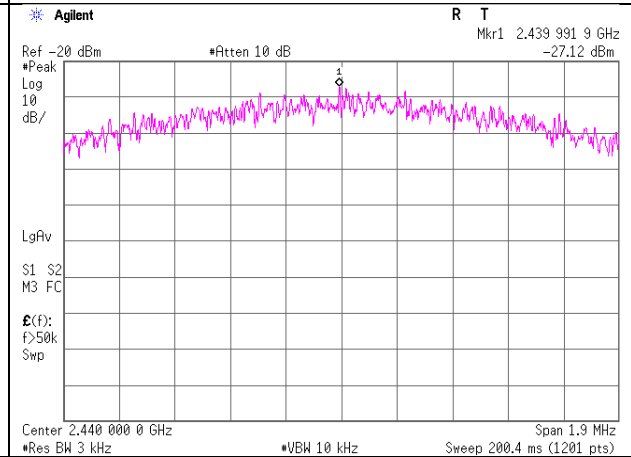
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Uncoded 2M-PHY**



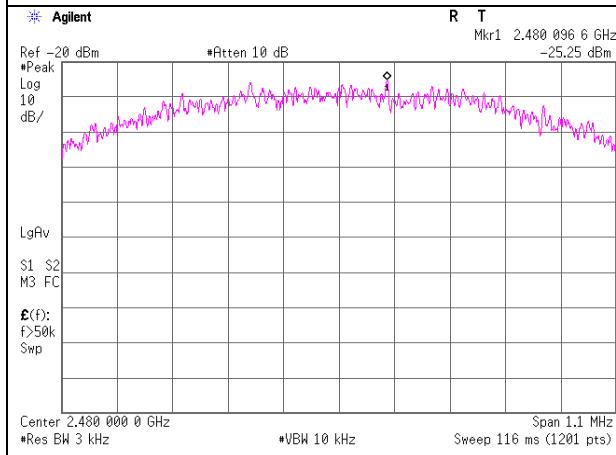
2440 MHz



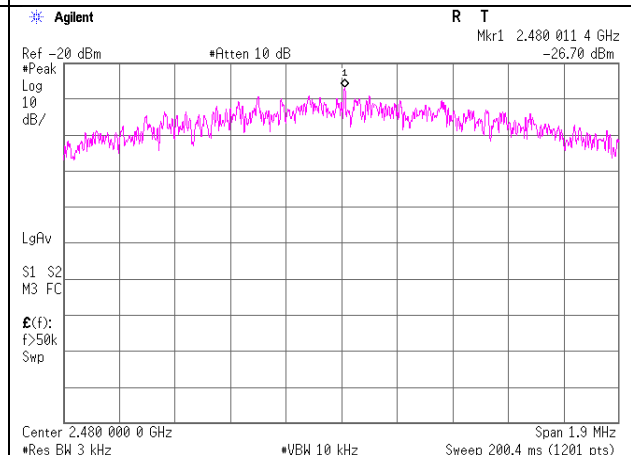
2440 MHz



2480 MHz



2480 MHz



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APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE/CE	MAEC-02	142004	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	05/26/2020	24
RE/CE	MOS-41	192300	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0013	12/06/2020	12
RE/CE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/18/2020	12
RE/CE	MJM-27	142228	Measure	KOMELON	KMC-36	-	-	-
RE/CE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE/CE	MTR-08	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	08/18/2020	12
RE	MAEC-02-SVSWR	142006	Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/01/2020	24
RE	MAT-07	141203	Attenuator(6dB)	Weinschel Corp	2	BK7970	11/13/2020	12
RE	MBA-08	141427	Biconical Antenna	Schwarzbeck	VHA9103B	8031	07/29/2020	12
RE	MCC-12	141317	Coaxial Cable	Fujikura/Agilent	-	-	09/25/2020	12
RE	MLA-21	141265	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	07/29/2020	12
RE	MPA-24	141594	Pre Amplifier	AGILENT	8447D	2944A10150	02/18/2021	12
RE	MSA-16	141901	Spectrum Analyzer	AGILENT	E4440A	MY48250080	12/18/2020	12
RE	MSA-14	141901	Spectrum Analyzer	AGILENT	E4440A	MY48250080	12/18/2020	12
RE	MHA-06	141512	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	09/14/2020	12
RE	MCC-216	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	02/03/2021	12
RE	MPA-10	141579	Pre Amplifier	AGILENT	8449B	3008A02142	01/12/2021	12
RE	MHA-02	141503	Horn Antenna 18-26.5GHz	EMCO	22160	1265	06/15/2020	12
RE	MHF-25	141232	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	1	09/23/2020	12
RE	MSA-15	141902	Spectrum Analyzer	AGILENT	E4440A	MY46187105	10/15/2020	12
RE	MAJ-01	142236	Antenna Tilt Jig	Intelligent System Engineering Co., Ltd	Antenna Tilt Jig	T-0001	-	-
CE	MAT-67	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	12/07/2020	12
CE	MCC-13	141222	Coaxial Cable	FUJIKURA	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	02/11/2021	12
CE	MLS-23	141357	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	07/22/2020	12
CE	MSA-03	141884	Spectrum Analyzer	AGILENT	E4448A	MY44020357	03/04/2020	12
AT	MPM-16	141812	Power Meter	AGILENT	8990B	MY51000271	08/20/2020	12
AT	MPSE-22	141842	Power sensor	AGILENT	N1923A	MY54070003	08/20/2020	12
AT	MCC-98	141377	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	30819/2	06/18/2020	12
AT	MAT-90	141223	Attenuator	Weinschel Associates	WA56-10	56100306	05/25/2020	12
AT	MOS-17	141563	Thermo-Hygrometer	CUSTOM	CTH-180	1701	01/15/2021	12
AT	MMM-11	141546	Digital HiTESTER	HIOKI	3805	60100600	05/07/2020	12
AT	MJM-28	142229	Measure	KOMELON	KMC-36	-	-	-

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*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: CE: Conducted Emission test
 RE: Radiated Emission test
 AT: Antenna Terminal Conducted test

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