



RADIO TEST REPORT

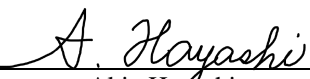
Test Report No. : 13175092S-A-R3

Applicant : Nintendo Co., Ltd.
Type of EUT : Wireless control device
Model Number of EUT : PMC-004
FCC ID : BKEPMC004
Test regulation : FCC Part 15 Subpart C
Test Result : Complied (Refer to SECTION 3.2)

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13175092S-A-R2. 13175092S-A-R2 is replaced with this report.

Date of test: March 25, 2020 to October 5, 2021

Representative test engineer: 
Shiro Kobayashi
Engineer

Approved by: 
Akio Hayashi
Manager



CERTIFICATE 1266.03

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

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REVISION HISTORY

Original Test Report No.: 13175092S-A

Revision	Test report No.	Date	Page revised	Contents								
- (Original)	13175092S-A	July 20, 2020	-	-								
1	13175092S-A-R1	November 4, 2021	P.1	Update of "Date of test" From: May 4, 2020 To: October 5, 2021								
			P.2	Update of contents page								
			P.5	Correction of Contact Person From: Yusuke Kudo To: Hideki Ohashi								
				Update of "Receipt Date of Sample" From: March 17, 2020 To: September 16, 2021: S-1092(used for Duty cycle correction factor) March 17, 2020: S-1092 and S-1093(used for test other than Duty cycle correction factor) *No modifications have been made during this period.								
			P.6	Update of "Worst margin" - Spurious Emission Restricted Band Edges From: To: 11.8 dB 3.4 dB 2400 MHz, PK, Horizontal 4804 MHz, PK, Vertical Mode: Tx BT LE 2M-PHY Mode: Tx BT LE 1M-PHY 2402 MHz 2402 MHz								
				Update of Uncertainty "Duty cycle and Time Measurement" From: 0.262 % To: 0.27 %								
			P.24	Deletion of data "Burst rate confirmation" - For Radiated Spurious Emission								
			P.25	Addition of data "Duty cycle correction factor"								
			- (full revision)	Correction of data on appendix 1. - Radiated Spurious Emission Update of "Peak with DCCF" table. It changed the results and margins. - DCCF updated from -27.46 to -6.82 (P.26, P.28 and P.29) - DCCF updated from -33.45 to -8.49 (P.31, P.33 and P.34) - Update of "Plot data, Worst case" (P.36)								
				Addition of Test equipment on appendix 2.								
				AT	SAT10-22	204926	Attenuator	Wenschel Corp.	S4A-10	-	2021-02-09	12
				AT	SCC-063	196946	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803411.2	2021-03-01	12
				AT	SJM-17	145339	Measure	ASKUL	-	-	-	-
AT	80S-27	191843	Humidity Indicator	CUSTOM, Inc	CTH-201	-	2021-08-02	12				
AT	SSA-01	146223	Spectrum Analyzer	Keysight Technologies Inc	N9010A-526	MY48031482	2021-09-09	12				
AT	STS-05	146212	Digital Histogram	HIOKI E.E. CORPORATIO N	3805-50	80997828	2021-09-14	12				
Correction of name of Photographs (appendix3) From: Worst Case Position To: Pre-check of Worst Case Position												
Addition of Photographs: Antenna Terminal Conducted Tests (appendix3)												
2	13175092S-A-R2	January 27, 2023	P.1	Deletion "2020" from FCC Part 15 Subpart C: 2020								
			Correction of a2LA CERTIFICATE No. From: 1266.01 To: 1266.03									
			P.5	Deletion of Rating "AC 100 V to 240 V, 50/60 Hz"								
			P.6	Update of "Test Specification"								
				Update of "UL Japan, Inc.'s EMI Work Procedures No."								
			P.11	Deletion of "2)"								
P.12	Correction of Semi Anechoic Chamber to Shielded Room.											
3	13175092S-A-R3	February 8, 2023	P.6	Moved the below sentence to [For above 1 GHz] "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."								
				Correction of Worst margin of "Spurious Emission Restricted Band Edges" Detector: "PK" to "Peak with DCCF"								

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 : Nintendo Co., Ltd.
Address : 11-1 Hokotate-cho, Kamitoba, Minami-ku, Kyoto 601-8501, Japan
Telephone Number : +81-75-662-9600
Facsimile Number : +81-75-662-9624
Contact Person : Hideki Ohashi

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)
- 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 of Equipment : Wireless control device
Model No. : PMC-004
Serial No. : Refer to SECTION 4.2
Rating : DC 3.7 V (Battery), DC 5.0 V (USB)
Receipt Date of Sample : September 16, 2021: S-1092(used for Duty cycle correction factor)
(Information from test lab.) : March 17, 2020: S-1092 and S-1093(used for test other than Duty cycle correction factor)
*No modifications have been made during this period.
Country of Mass-production : China
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab.

2.2 Product Description

Model: PMC-004 (referred to as the EUT in this report) is a Wireless control device.

The clock frequencies used in the EUT: 64 MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2402 MHz - 2480 MHz
Modulation : GFSK
Antenna type : Inverted-F Antenna on PCB
Antenna Gain : 1.326 dBi
Antenna connector : U.FL connector
Operating temperature : 0 deg. C to +40 deg. C

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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 April 1, 2022 and effective May 2, 2022

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.

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods ----- ISED: RSS-Gen 8.8	FCC: Section 15.207 ----- ISED: RSS-Gen 8.8	13.0 dB 0.25250 MHz, N, QP Mode: Tx BT LE 2M-PHY 2440 MHz	Complied a)	-
6 dB 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	3.4 dB 4804 MHz, Peak with DCCF, Vertical Mode: Tx BT LE 1M-PHY 2402 MHz	Complied# e), f)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
<p>Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593. *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 part regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Bandwidth	ISED: RSS-Gen 6.7	ISED: -	N/A	- b)	Conducted
b) 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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Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4,5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.5 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	3.0 dB	3.0 dB	-
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.0 dB	-
	1 GHz-6 GHz	4.9 dB	4.9 dB	4.9 dB	-
	6 GHz-18 GHz	5.5 dB	5.5 dB	5.5 dB	-
	18 GHz-40 GHz	5.4 dB	5.4 dB	5.4 dB	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.8 dB	5.8 dB	5.8 dB	-
	18 GHz-40 GHz	5.7 dB	5.7 dB	5.7 dB	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.98 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.75 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.12 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.06 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.24 dB
Spurious emission (Conducted) below 1GHz	0.9 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.9 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.9 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.0 dB
Bandwidth Measurement	0.07 %
Duty cycle and Time Measurement	0.27 %

3.5 Test Location

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A2LA Certificate Number: 1266.03 (FCC Test Firm Registration Number: 626366, ISED Lab Company Number: 2973D)

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

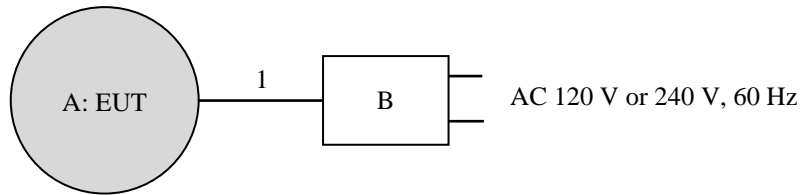
4.1 Operating Mode(s)

Mode	Remarks*
Bluetooth Low Energy (BT LE)	1 M-PHY, Maximum Packet Size, PRBS9
	2 M-PHY, Maximum Packet Size, PRBS9
<p>*Power of the EUT was set by the software as follows; Power settings: Fixed Software: TotalEvaluation_Ver.1.22 Test Program : EvaluationTool_Ver.2.7 (Date: 2020/03/03, 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 Spurious Emission 6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	Tx BT LE (1 M-PHY/2 M-PHY)	2402 MHz 2440 MHz 2480 MHz

4.2 Configuration and peripherals



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

*As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with AC 240 V of the worst voltage as representative.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless control device	PMC-004	S-1092 *1) S-1093 *2)	Nintendo	EUT
B	AC Adapter	CLV-003(JPN)	S-1067	Nintendo	-

*1) Used for Antenna Terminal conducted test

*2) Used for Conducted Emission test and Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	0.3	Shielded	Shielded	Model Number: HAC-010, Type A-Type C Sold as bundled with EUT

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a platform of nominal size, 1.0 m by 2.0 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).

For the tests on EUT itself (as a standalone equipment)

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN / (AMN) to the input power source.

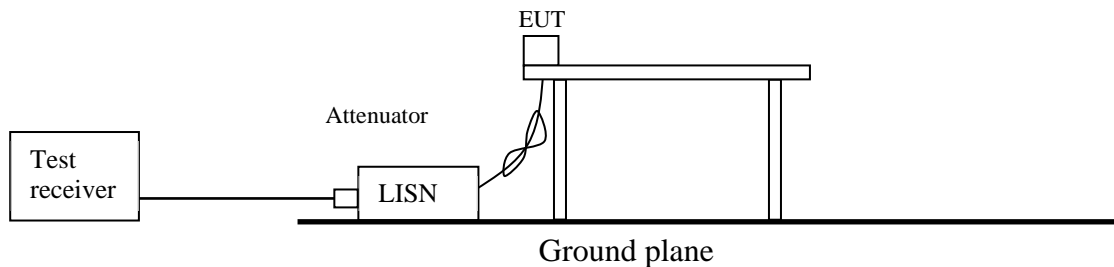
The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Shielded Room. The EUT was connected to a LISN (AMN).

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



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, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

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

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.

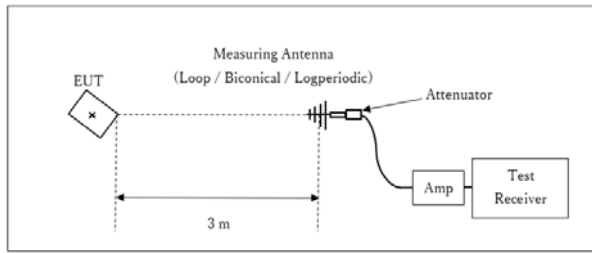
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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	-	RBW: 100 kHz VBW: 300 kHz

*1) Measurement with Average detector was not performed. The limit for Average detector is applied to the measurement value with Peak detector used Duty cycle correction factor (DCCF) on ANSI C63.10-2013 7.5.

Figure 2: Test Setup

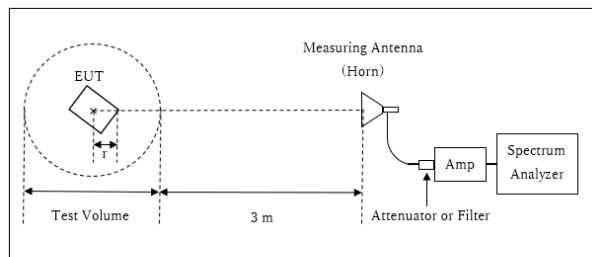
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 13 GHz

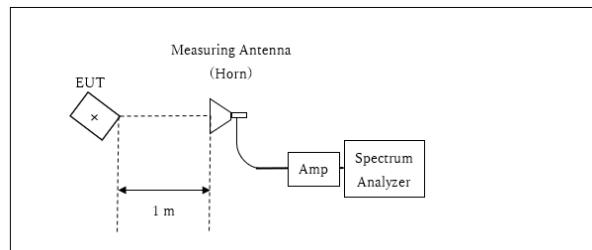


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: $20 \times \log(3.965 \text{ m} / 3.0 \text{ m}) = 2.43 \text{ dB}$
* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.965 \text{ m}$

Test Volume : 2.0 m
(Test Volume has been calibrated based on CISPR 16-1-4.)
r = 0.035m

13 GHz – 26.5 GHz



× : Center of turn table

Distance Factor: $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$
*Test Distance: 1 m

- The carrier level and noise levels were confirmed at each position of 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.

Antenna polarization	Carrier	Spurious (30 MHz - 1 GHz)	Spurious (1 GHz - 2.8 GHz)	Spurious (2.8 GHz - 13 GHz)	Spurious (13 GHz - 18 GHz)	Spurious (18 GHz - 26.5 GHz)
Horizontal	X	X	X	X	X	X
Vertical	Z	X	Z	Z	X	X

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

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
6 dB Bandwidth	10 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: 160 MHz BW)
Peak Power Density	1.5 times the 6 dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4) *5)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".
*4) In the frequency range below 30 MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)
*5) "The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohms. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to $45.5 - 51.5 = -6.0$ dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit."

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

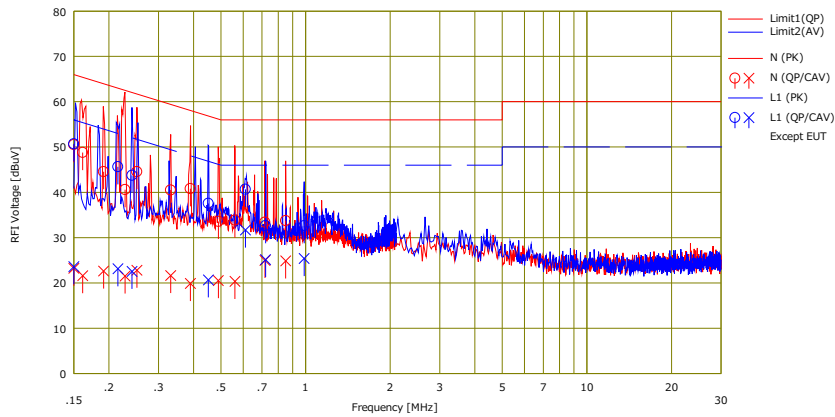
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2020/05/04

Mode : Tx RT I F 1 M-PHY 2440 MHz
Power : AC 240 V / 60 Hz
Temp./Humi. : 22 deg.C / 54 %RH

Remarks : -

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Takahiro Suzuki

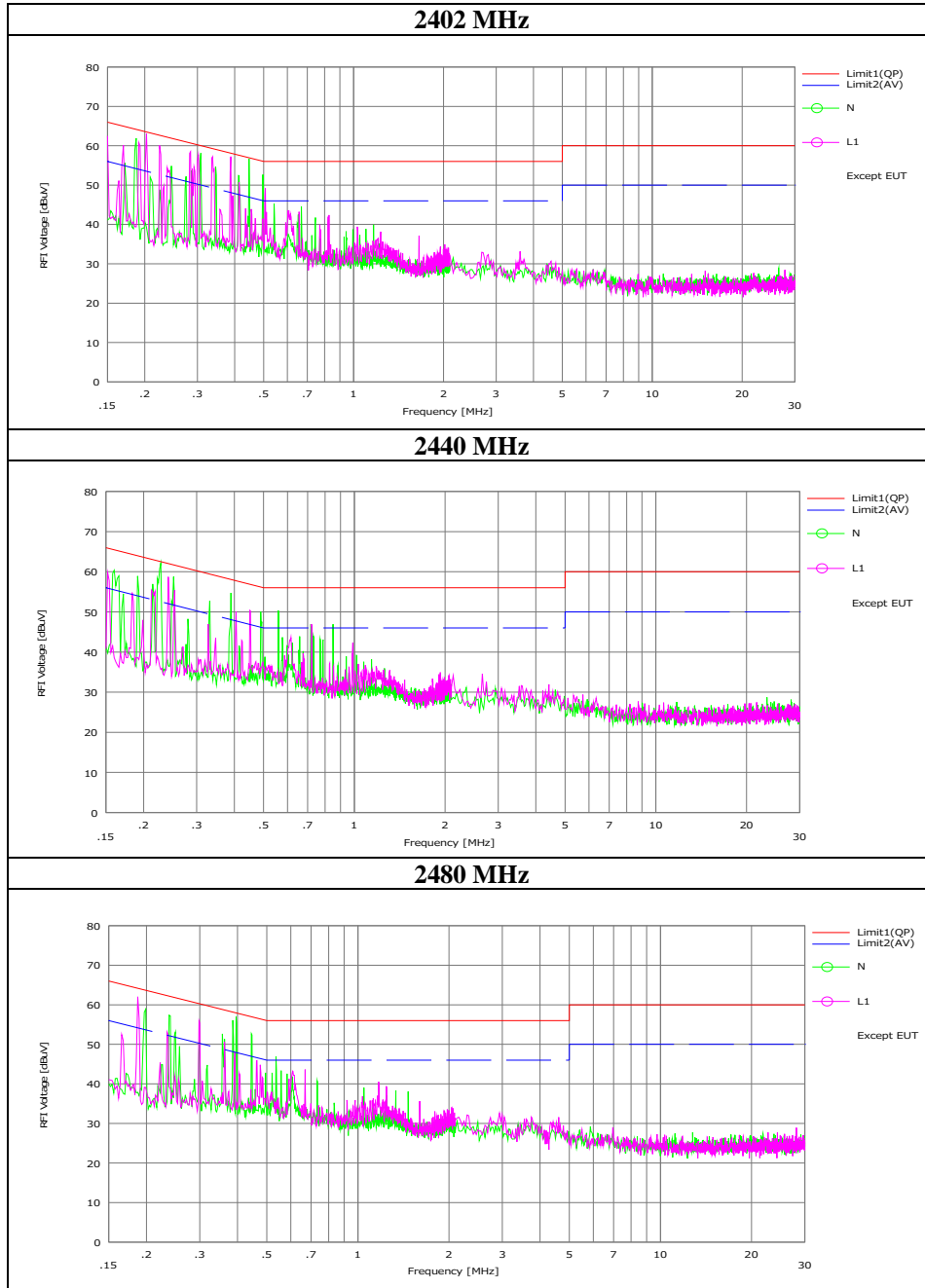


No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		(QP) [dBuV]	(CAV) [dBuV]		(QP) [dBuV]	(CAV) [dBuV]	(QP) [dBuV]	(AV) [dBuV]	(QP) [dB]	(AV) [dB]		
1	0.15000	37.93	10.66	12.57	50.50	23.23	66.00	56.00	15.5	32.7	N	
2	0.16142	36.23	9.04	12.56	48.79	21.60	65.39	55.39	16.6	33.7	N	
3	0.19136	32.00	10.08	12.55	44.55	22.63	63.98	53.98	19.4	31.3	N	
4	0.22826	28.03	8.97	12.56	40.59	21.53	62.51	52.51	21.9	30.9	N	
5	0.25144	31.99	10.25	12.56	44.55	22.81	61.71	51.71	17.1	28.9	N	
6	0.33172	27.94	9.06	12.57	40.51	21.63	59.41	49.41	18.9	27.7	N	
7	0.38950	28.23	7.32	12.56	40.79	19.88	58.07	48.07	17.2	28.1	N	
8	0.48974	21.00	7.95	12.57	33.57	20.52	56.17	46.17	22.6	25.6	N	
9	0.56084	21.27	7.78	12.57	33.84	20.35	56.00	46.00	22.1	25.6	N	
10	0.71742	20.82	12.38	12.59	33.41	24.97	56.00	46.00	22.5	21.0	N	
11	0.85006	21.14	12.28	12.60	33.74	24.88	56.00	46.00	22.2	21.1	N	
12	0.15000	38.13	11.05	12.55	50.68	23.60	66.00	56.00	15.3	32.4	L1	
13	0.21522	33.08	10.57	12.55	45.63	23.12	63.00	53.00	17.3	29.8	L1	
14	0.24160	31.19	10.00	12.55	43.74	22.55	62.04	52.04	18.3	29.4	L1	
15	0.45113	24.99	8.09	12.58	37.57	20.67	56.85	46.85	19.2	26.1	L1	
16	0.61151	28.05	19.09	12.60	40.65	31.69	56.00	46.00	15.3	14.3	L1	
17	0.72110	20.02	12.56	12.61	32.63	25.17	56.00	46.00	23.3	20.8	L1	
18	0.98877	19.98	12.76	12.63	32.61	25.39	56.00	46.00	23.3	20.6	L1	

Calculation: Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN)=SLS-02

Conducted Emission

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.3 Shielded Room
Date May 4, 2020
Temperature / Humidity 22 deg. C / 54 % RH
Engineer Takahiro Suzuki
Mode Tx BT LE 1 M-PHY



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

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Conducted Emission

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2020/05/04

Mode : Tx BT LE 2 M-PHY 2440 MHz

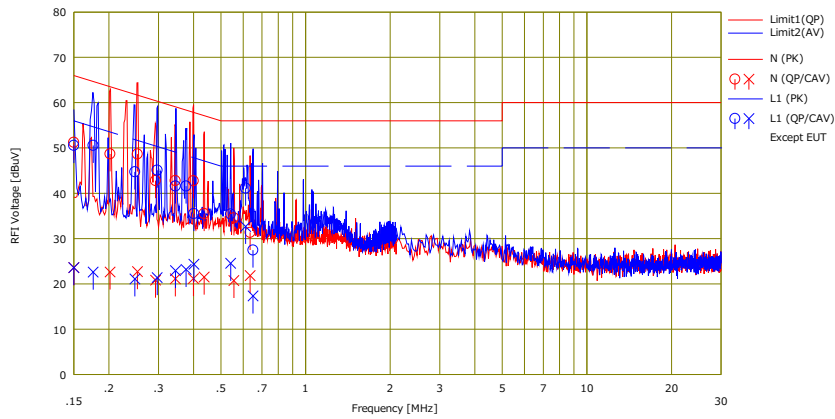
Power : AC 240 V / 60 Hz

Temp./Humi. : 22 deg.C / 54 %RH

Remarks : -

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Takahiro Suzuki

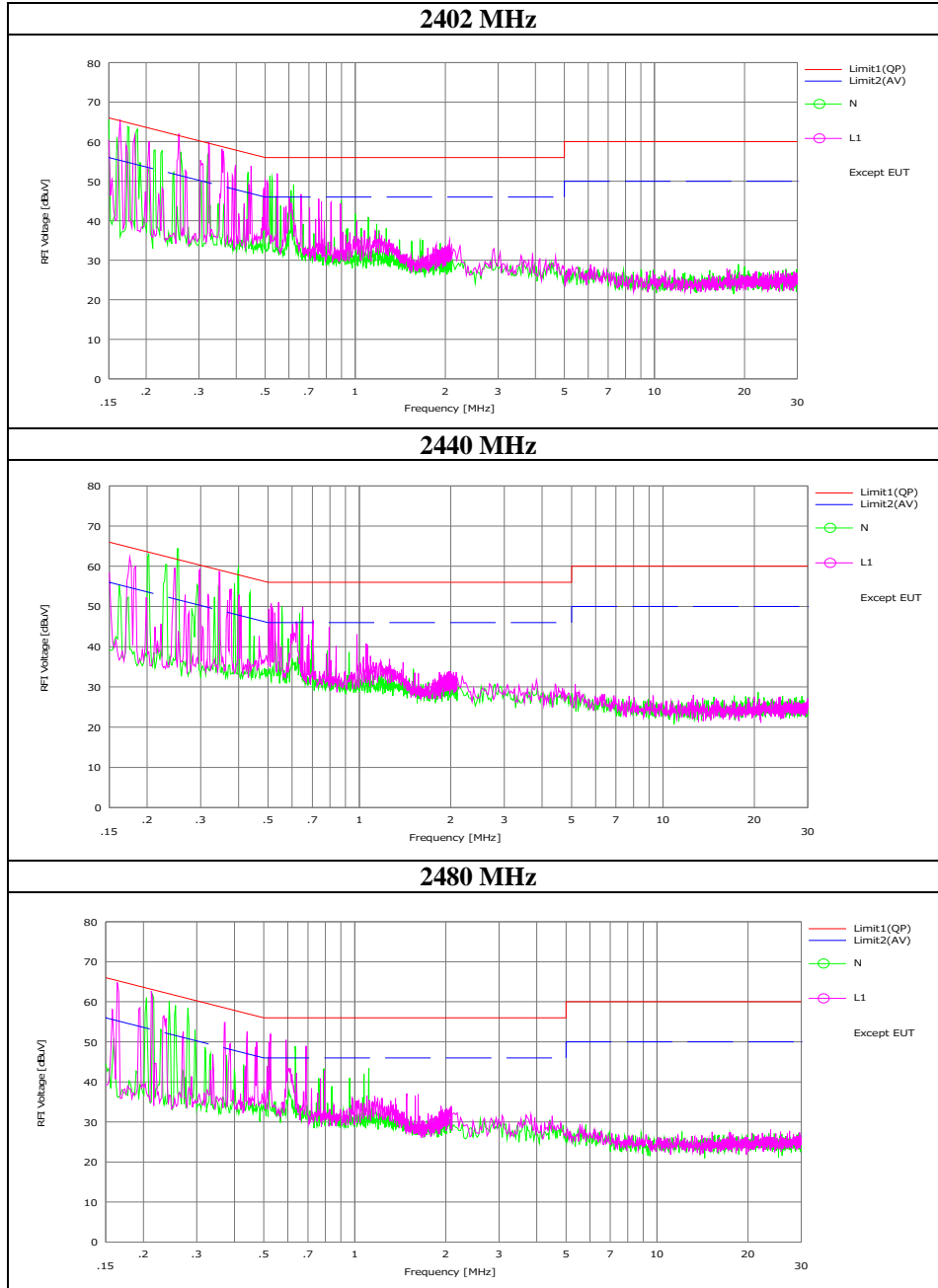


No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		(QP) [dBuV]	(CAV) [dBuV]		(QP) [dBuV]	(CAV) [dBuV]	(QP) [dBuV]	(AV) [dBuV]	(QP) [dB]	(AV) [dB]		
1	0.15000	38.68	11.02	12.57	51.25	23.59	66.00	56.00	14.7	32.4	N	
2	0.20185	36.13	10.07	12.55	48.68	22.62	63.53	53.53	14.8	30.9	N	
3	0.25250	36.09	10.15	12.56	48.65	22.71	61.67	51.67	13.0	28.9	N	
4	0.29293	30.23	8.27	12.56	42.79	20.83	60.44	50.44	17.6	29.6	N	
5	0.34432	30.19	8.55	12.57	42.76	21.12	59.10	49.10	16.3	27.9	N	
6	0.39945	30.18	8.61	12.56	42.74	21.17	57.86	47.86	15.1	26.6	N	
7	0.43592	22.95	8.94	12.56	35.51	21.50	57.14	47.14	21.6	25.6	N	
8	0.55613	22.00	8.18	12.57	34.57	20.75	56.00	46.00	21.4	25.2	N	
9	0.63540	18.79	9.27	12.57	31.36	21.84	56.00	46.00	24.6	24.1	N	
10	0.15000	38.00	11.04	12.55	50.55	23.59	66.00	56.00	15.4	32.4	L1	
11	0.17879	38.02	10.05	12.55	50.57	22.60	64.68	54.68	14.1	32.0	L1	
12	0.24745	32.18	8.54	12.55	44.73	21.09	61.84	51.84	17.1	30.7	L1	
13	0.29681	32.52	8.81	12.57	45.09	21.38	60.33	50.33	15.2	28.9	L1	
14	0.34499	28.99	10.35	12.59	41.58	22.94	59.08	49.08	17.5	26.1	L1	
15	0.37603	29.00	10.61	12.58	41.58	23.19	58.37	48.37	16.7	25.1	L1	
16	0.40100	22.93	11.75	12.58	35.51	24.33	57.83	47.83	22.3	23.5	L1	
17	0.54176	22.83	11.95	12.59	35.42	24.54	56.00	46.00	20.5	21.4	L1	
18	0.61227	28.52	20.09	12.60	41.12	32.69	56.00	46.00	14.8	13.3	L1	
19	0.65072	14.87	4.74	12.60	27.47	17.34	56.00	46.00	28.5	28.6	L1	

Calculation: Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN)=SLS-02

Conducted Emission

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.3 Shielded Room
Date May 4, 2020
Temperature / Humidity 22 deg. C / 54 % RH
Engineer Takahiro Suzuki
Mode Tx BT LE 2 M-PHY



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

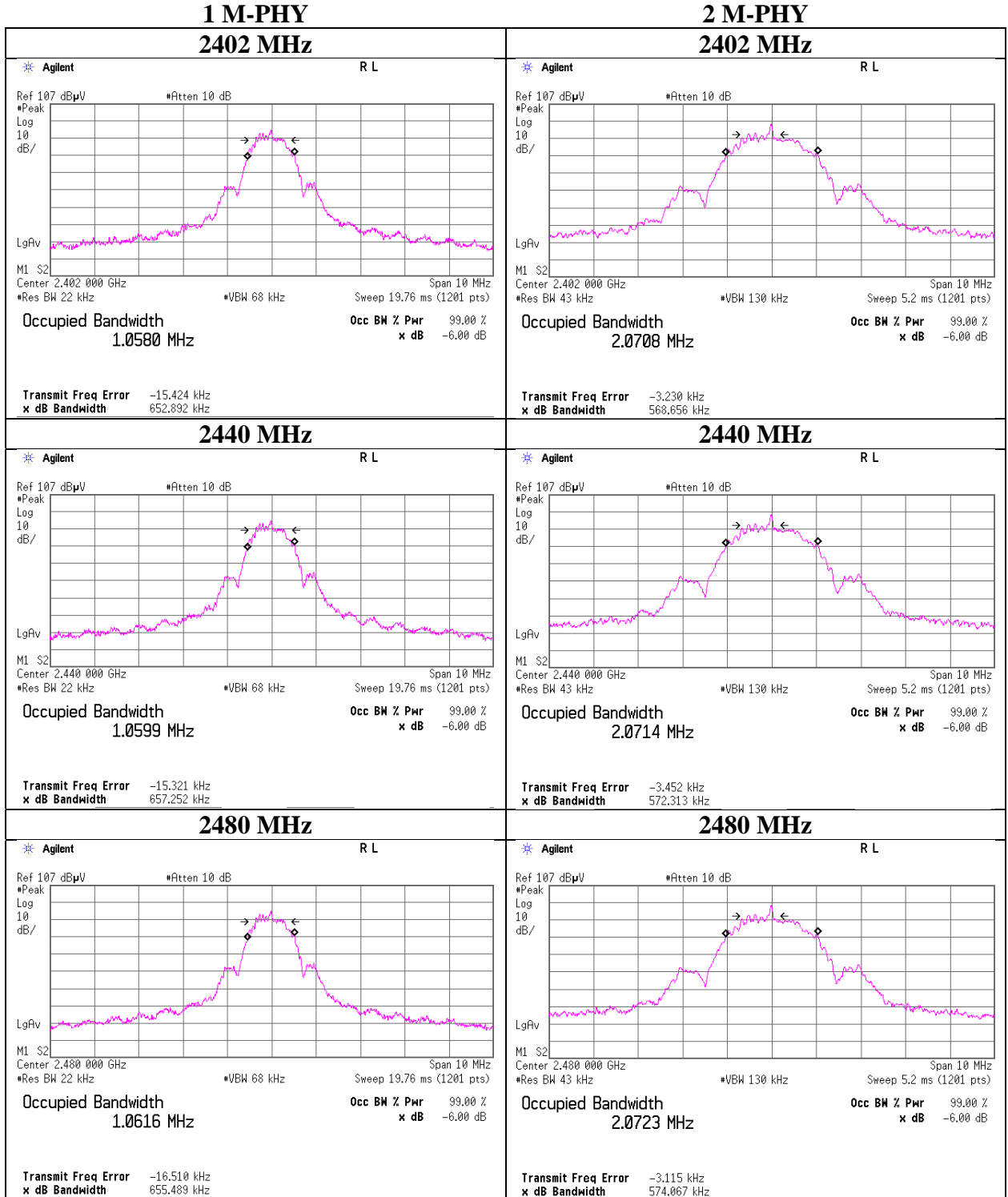
Facsimile : +81 463 50 6401

6 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.1 Measurement Room
Date March 25, 2020
Temperature / Humidity 23 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx BT LE

Mode	Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
1 M-PHY	2402	1058.0	0.742	> 0.5000
	2440	1059.9	0.721	> 0.5000
	2480	1061.6	0.721	> 0.5000
2 M-PHY	2402	2070.8	1.158	> 0.5000
	2440	2071.4	1.171	> 0.5000
	2480	2072.3	1.191	> 0.5000

99 % Occupied Bandwidth



UL Japan, Inc.

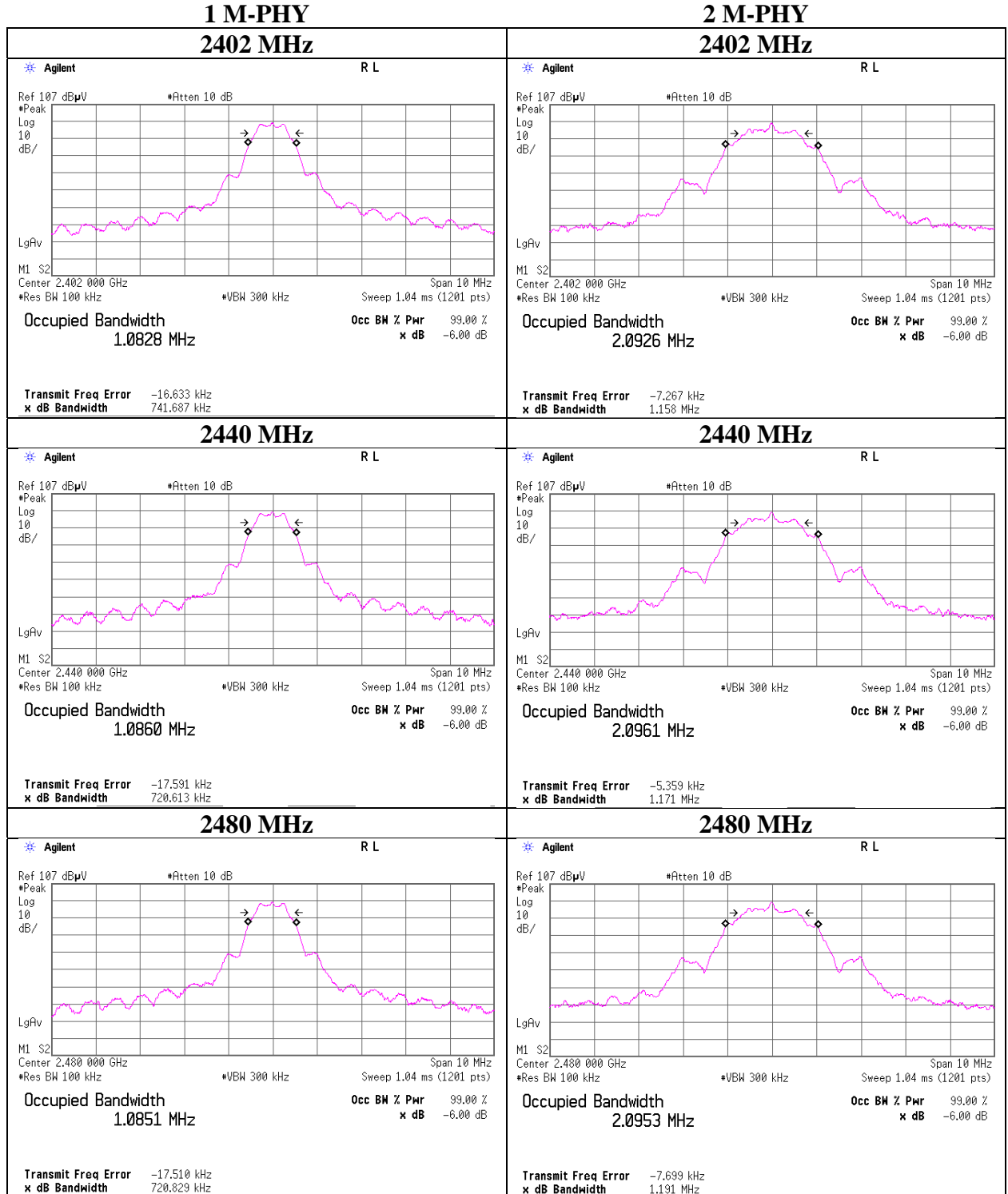
Shonan EMC Lab.

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Telephone : +81 463 50 6400

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6 dB Bandwidth



UL Japan, Inc.

Shonan EMC Lab.

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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Maximum Peak Output Power

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.1 Measurement Room
Date March 25, 2020
Temperature / Humidity 23 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx BT LE

1 M-PHY				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	-10.56	2.47	9.82	1.73	1.49	30.00	1000	28.27	1.33	3.06	2.02	36.02	4000	32.96
2440	-10.46	2.49	9.82	1.85	1.53	30.00	1000	28.15	1.33	3.18	2.08	36.02	4000	32.84
2480	-10.54	2.50	9.82	1.78	1.51	30.00	1000	28.22	1.33	3.11	2.04	36.02	4000	32.91

Sample Calculation:

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

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

2 M-PHY				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	-10.61	2.47	9.82	1.68	1.47	30.00	1000	28.32	1.33	3.01	2.00	36.02	4000	33.01
2440	-10.47	2.49	9.82	1.84	1.53	30.00	1000	28.16	1.33	3.17	2.07	36.02	4000	32.85
2480	-10.51	2.50	9.82	1.81	1.52	30.00	1000	28.19	1.33	3.14	2.06	36.02	4000	32.88

Sample Calculation:

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

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

Average Output Power
(Reference data for RF Exposure)

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.1 Measurement Room
Date March 25, 2020
Temperature / Humidity 23 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx BT LE

1 M-PHY

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-13.08	2.47	9.82	-0.79	0.83	1.99	1.20	1.32
2440	-12.94	2.49	9.82	-0.63	0.86	1.99	1.36	1.37
2480	-12.97	2.50	9.82	-0.65	0.86	1.99	1.34	1.36

2 M-PHY

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-15.87	2.47	9.82	-3.58	0.44	4.75	1.17	1.31
2440	-15.74	2.49	9.82	-3.43	0.45	4.75	1.32	1.36
2480	-15.76	2.50	9.82	-3.44	0.45	4.75	1.31	1.35

Sample Calculation:

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

Result (Burst power average) = Time average + Duty factor

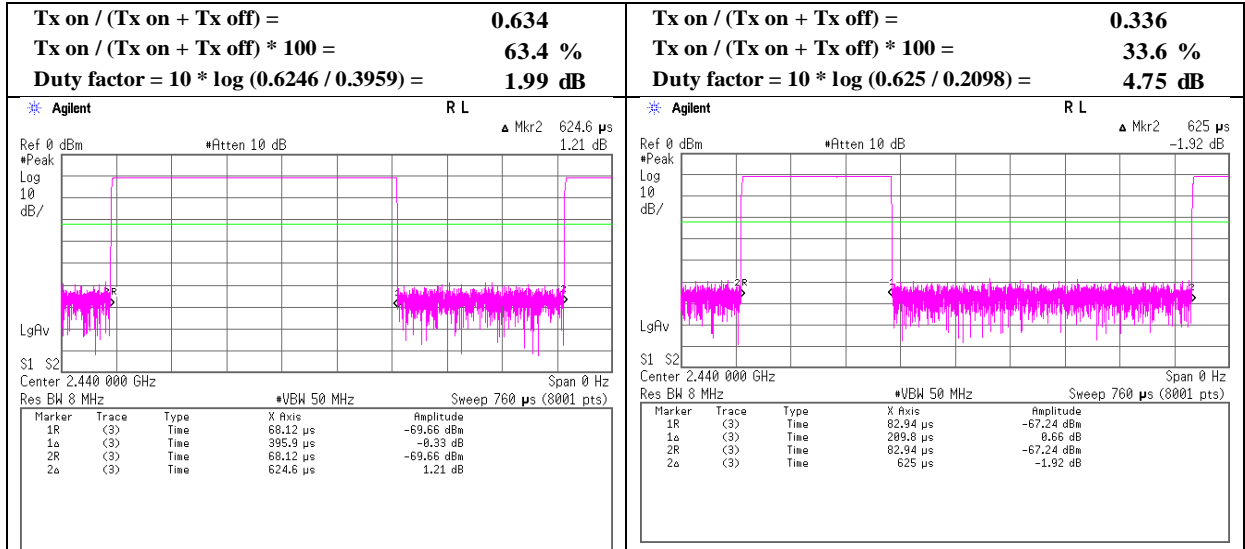
Burst rate confirmation

Report No. 13175092S-A-R3
 Test place Shonan EMC Lab. No.1 Measurement Room
 Date March 25, 2020
 Temperature / Humidity 23 deg. C / 47 % RH
 Engineer Shiro Kobayashi
 Mode Tx BT LE

For Average Output Power
 Maximum Duty that can be achieved in test mode of EUT

1 M-PHY

2 M-PHY

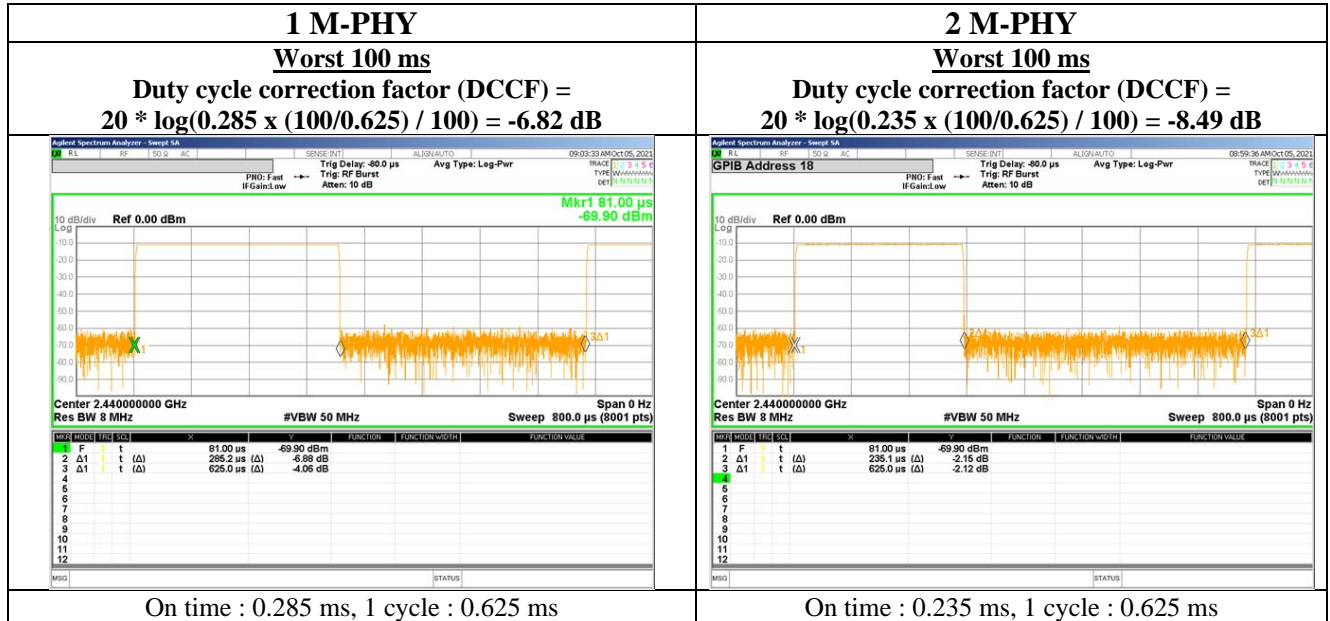


* Since the burst rate is not different between the channels, the data has been obtained on the representative channel

Duty cycle correction factor

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.5 Measurement Room
Date October 5, 2021
Temperature / Humidity 25 deg. C / 46 % RH
Engineer Shunsaku Yumi
Mode Tx BT LE

(for Duty cycle correction factor for Radiated Spurious Emission)
Worst 100 ms case



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

*Worst TX Duty cycle BLE is Advertising mode.

The actual measurement value was applied as Duty Cycle Correction factor.

Radiated Spurious Emission

Report No.	13175092S-A-R3	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	March 28, 2020	March 27, 2020
Temperature / Humidity	24 deg. C / 52 % RH	23 deg. C / 40 % RH
Engineer	Kazuya Noda	Toshinori Yamada
	(30 MHz - 1 GHz, 18 GHz - 26.5 GHz)	(1 GHz - 18 GHz)
Mode	Tx BT LE 1 M-PHY 2402 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	184.453	QP	28.64	16.05	7.86	32.05	0.00	20.50	43.5	23.0	100	201	
Hori.	202.049	QP	25.68	11.22	8.08	32.04	0.00	12.94	43.5	30.6	165	47	
Hori.	208.363	QP	26.68	10.98	8.13	32.03	0.00	13.76	43.5	29.7	147	42	
Hori.	213.106	QP	27.02	10.92	8.16	32.03	0.00	14.07	43.5	29.4	157	225	
Hori.	2390.000	PK	47.47	28.33	14.07	41.66	2.43	50.64	73.9	23.3	137	227	
Hori.	4804.000	PK	59.50	31.62	6.58	42.92	2.43	57.21	73.9	16.7	100	305	
Hori.	7206.000	PK	48.47	37.23	8.08	43.39	2.43	52.82	73.9	21.1	150	0	
Hori.	9608.000	PK	48.11	38.84	9.21	43.14	2.43	55.45	73.9	18.5	150	0	
Vert.	49.114	QP	24.90	11.40	6.80	32.16	0.00	10.94	40.0	29.1	100	155	
Vert.	54.658	QP	25.79	9.50	6.76	32.16	0.00	9.89	40.0	30.1	100	269	
Vert.	155.052	QP	29.88	14.85	7.88	32.08	0.00	20.53	43.5	23.0	130	112	
Vert.	163.089	QP	33.09	15.17	7.92	32.07	0.00	24.11	43.5	19.4	100	102	
Vert.	182.109	QP	29.82	15.95	7.87	32.06	0.00	21.58	43.5	21.9	100	108	
Vert.	2390.000	PK	47.81	28.33	14.07	41.66	2.43	50.98	73.9	22.9	121	155	
Vert.	4804.000	PK	59.65	31.62	6.58	42.92	2.43	57.36	73.9	16.5	179	196	
Vert.	7206.000	PK	47.94	37.23	8.08	43.39	2.43	52.29	73.9	21.6	150	0	
Vert.	9608.000	PK	48.73	38.84	9.21	43.14	2.43	56.07	73.9	17.8	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Peak with DCCF (Duty cycle correction factor)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	PK	47.47	28.33	14.07	41.66	-6.82	2.43	43.82	53.9	10.1	*1)
Hori.	4804.000	PK	59.50	31.62	6.58	42.92	-6.82	2.43	50.39	53.9	3.5	
Hori.	7206.000	PK	48.47	37.23	8.08	43.39	-6.82	2.43	46.00	53.9	7.9	
Hori.	9608.000	PK	48.11	38.84	9.21	43.14	-6.82	2.43	48.63	53.9	5.3	
Vert.	2390.000	PK	47.81	28.33	14.07	41.66	-6.82	2.43	44.16	53.9	9.7	*1)
Vert.	4804.000	PK	59.65	31.62	6.58	42.92	-6.82	2.43	50.54	53.9	3.4	
Vert.	7206.000	PK	47.94	37.23	8.08	43.39	-6.82	2.43	45.47	53.9	8.4	
Vert.	9608.000	PK	48.73	38.84	9.21	43.14	-6.82	2.43	49.25	53.9	4.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

DCCF refer to "Burst rate confirmation" sheet.

*1) Not out of band emission (Leakage Power)

20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	92.45	28.31	14.08	41.67	2.43	95.60	-	-	Carrier
Hori.	2400.000	PK	41.90	28.31	14.07	41.67	2.43	45.04	75.6	30.6	
Vert.	2402.000	PK	93.63	28.31	14.08	41.67	2.43	96.78	-	-	Carrier
Vert.	2400.000	PK	42.98	28.31	14.07	41.67	2.43	46.12	76.8	30.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

UL Japan, Inc.

Shonan EMC Lab.

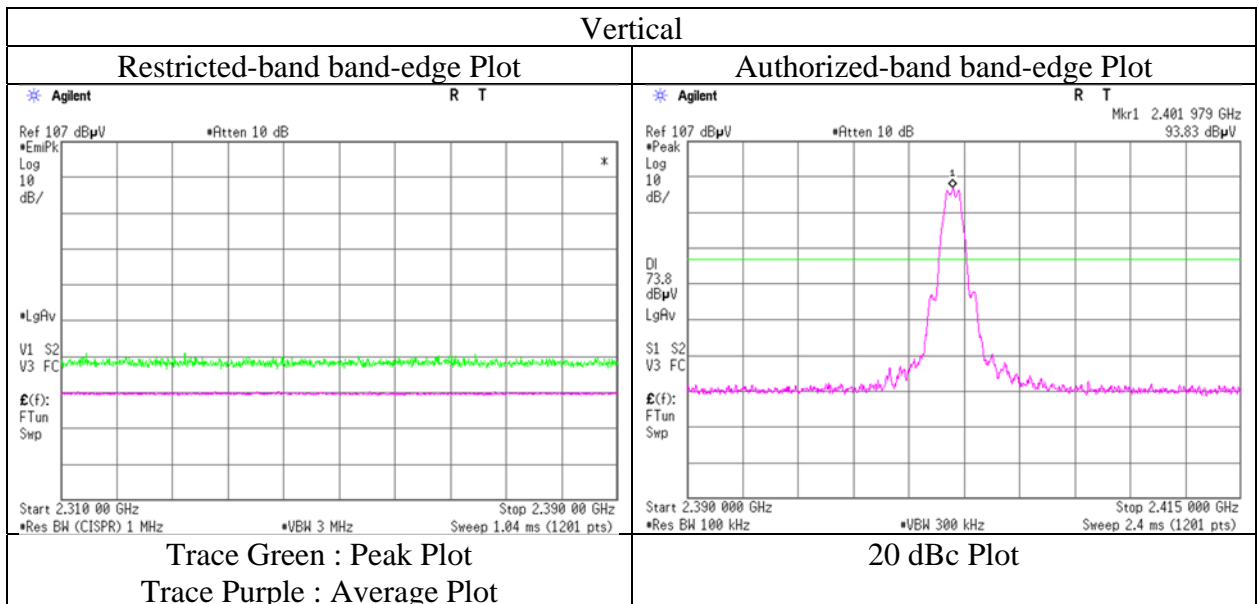
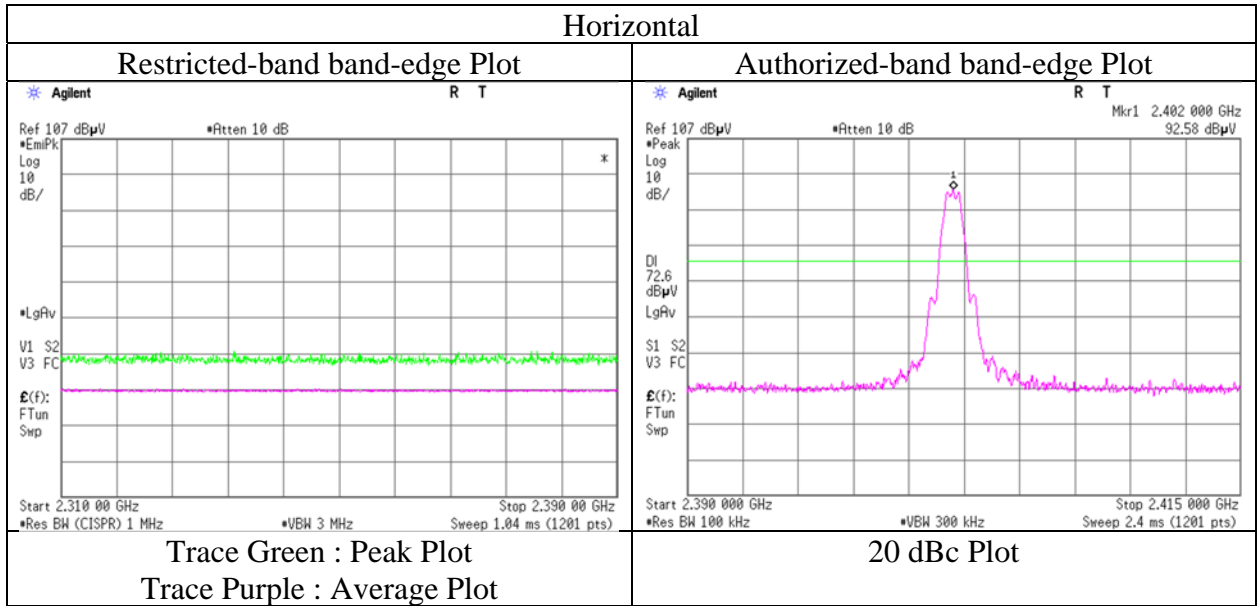
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 13175092S-A-R3
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3
Date March 27, 2020
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Toshinori Yamada
Mode Tx BT LE 1 M-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.

Radiated Spurious Emission

Report No.	13175092S-A-R3	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	March 28, 2020	March 27, 2020
Temperature / Humidity	24 deg. C / 52 % RH	23 deg. C / 40 % RH
Engineer	Kazuya Noda	Toshinori Yamada
	(30 MHz - 1 GHz, 18 GHz - 26.5 GHz)	(1 GHz - 18 GHz)
Mode	Tx BT LE 1 M-PHY 2440 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	180.114	QP	27.61	15.92	7.87	32.06	0.00	19.34	43.5	24.2	100	211	
Hori.	202.184	QP	25.79	11.21	8.09	32.04	0.00	13.05	43.5	30.5	161	49	
Hori.	208.185	QP	27.03	10.99	8.13	32.03	0.00	14.12	43.5	29.4	144	52	
Hori.	213.117	QP	27.41	10.92	8.16	32.03	0.00	14.46	43.5	29.0	155	221	
Hori.	4880.000	PK	50.83	31.71	6.62	42.93	2.43	48.66	73.9	25.2	100	295	
Hori.	7320.000	PK	48.02	37.38	8.14	43.49	2.43	52.48	73.9	21.4	150	0	
Hori.	9760.000	PK	48.31	39.33	9.31	42.97	2.43	56.41	73.9	17.5	150	0	
Vert.	48.974	QP	24.79	11.46	6.80	32.16	0.00	10.89	40.0	29.1	100	152	
Vert.	54.716	QP	25.73	9.48	6.77	32.16	0.00	9.82	40.0	30.2	100	272	
Vert.	157.647	QP	29.41	14.96	7.89	32.07	0.00	20.19	43.5	23.3	111	117	
Vert.	162.808	QP	33.98	15.16	7.92	32.07	0.00	24.99	43.5	18.5	100	111	
Vert.	185.172	QP	30.25	16.04	7.87	32.05	0.00	22.11	43.5	21.4	100	109	
Vert.	4880.000	PK	58.95	31.71	6.62	42.93	2.43	56.78	73.9	17.1	141	154	
Vert.	7320.000	PK	48.25	37.38	8.14	43.49	2.43	52.71	73.9	21.2	150	0	
Vert.	9760.000	PK	48.30	39.33	9.31	42.97	2.43	56.40	73.9	17.5	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log (3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak with DCCF (Duty cycle correction factor)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	PK	50.83	31.71	6.62	42.93	-6.82	2.43	41.84	53.9	12.1	
Hori.	7320.000	PK	48.02	37.38	8.14	43.49	-6.82	2.43	45.66	53.9	8.2	
Hori.	9760.000	PK	48.31	39.33	9.31	42.97	-6.82	2.43	49.59	53.9	4.3	
Vert.	4880.000	PK	58.95	31.71	6.62	42.93	-6.82	2.43	49.96	53.9	3.9	
Vert.	7320.000	PK	48.25	37.38	8.14	43.49	-6.82	2.43	45.89	53.9	8.0	
Vert.	9760.000	PK	48.30	39.33	9.31	42.97	-6.82	2.43	49.58	53.9	4.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log (3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

DCCF refer to "Burst rate confirmation" sheet.

*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission

Report No.	13175092S-A-R3	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	March 28, 2020	March 27, 2020
Temperature / Humidity	24 deg. C / 52 % RH	23 deg. C / 40 % RH
Engineer	Kazuya Noda	Toshinori Yamada
	(30 MHz - 1 GHz, 18 GHz - 26.5 GHz)	(1 GHz - 18 GHz)
Mode	Tx BT LE 1 M-PHY 2480 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	202.190	QP	25.89	11.21	8.09	32.04	0.00	13.15	43.5	30.4	168	54	
Hori.	208.276	QP	26.96	10.98	8.13	32.03	0.00	14.04	43.5	29.5	144	62	
Hori.	213.045	QP	27.18	10.92	8.16	32.03	0.00	14.23	43.5	29.3	156	213	
Hori.	2483.500	PK	52.58	28.24	14.16	41.69	2.43	55.72	73.9	18.2	197	237	
Hori.	4960.000	PK	55.88	31.96	6.67	42.94	2.43	54.00	73.9	19.9	100	311	
Hori.	7440.000	PK	48.68	37.56	8.21	43.60	2.43	53.28	73.9	20.6	150	0	
Hori.	9920.000	PK	48.72	39.18	9.42	42.78	2.43	56.97	73.9	16.9	150	0	
Vert.	49.169	QP	24.64	11.38	6.80	32.16	0.00	10.66	40.0	29.3	100	151	
Vert.	54.739	QP	25.69	9.47	6.77	32.16	0.00	9.77	40.0	30.2	100	257	
Vert.	157.766	QP	29.16	14.96	7.89	32.07	0.00	19.94	43.5	23.6	115	116	
Vert.	162.878	QP	33.70	15.16	7.92	32.07	0.00	24.71	43.5	18.8	100	117	
Vert.	185.119	QP	29.91	16.04	7.87	32.05	0.00	21.77	43.5	21.7	100	121	
Vert.	2483.500	PK	54.10	28.24	14.16	41.69	2.43	57.24	73.9	16.7	114	324	
Vert.	4960.000	PK	56.14	31.96	6.67	42.94	2.43	54.26	73.9	19.6	171	141	
Vert.	7440.000	PK	48.16	37.56	8.21	43.60	2.43	52.76	73.9	21.1	150	0	
Vert.	9920.000	PK	48.55	39.18	9.42	42.78	2.43	56.80	73.9	17.1	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log (3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak with DCCF (Duty cycle correction factor)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	52.58	28.24	14.16	41.69	-6.82	2.43	48.90	53.9	5.0	*1)
Hori.	4960.000	PK	55.88	31.96	6.67	42.94	-6.82	2.43	47.18	53.9	6.7	
Hori.	7440.000	PK	48.68	37.56	8.21	43.60	-6.82	2.43	46.46	53.9	7.4	
Hori.	9920.000	PK	48.72	39.18	9.42	42.78	-6.82	2.43	50.15	53.9	3.7	
Vert.	2483.500	PK	54.10	28.24	14.16	41.69	-6.82	2.43	50.42	53.9	3.5	*1)
Vert.	4960.000	PK	56.14	31.96	6.67	42.94	-6.82	2.43	47.44	53.9	6.5	
Vert.	7440.000	PK	48.16	37.56	8.21	43.60	-6.82	2.43	45.94	53.9	8.0	
Vert.	9920.000	PK	48.55	39.18	9.42	42.78	-6.82	2.43	49.98	53.9	3.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log (3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

DCCF refer to "Burst rate confirmation" sheet.

*1) Not out of band emission (Leakage Power)

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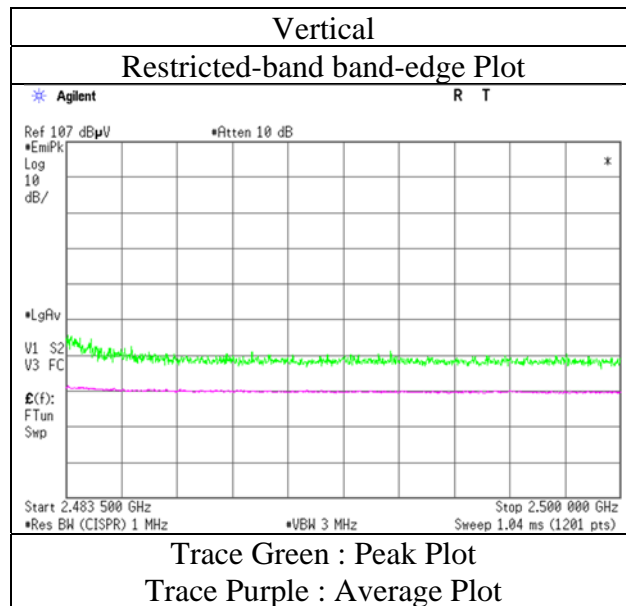
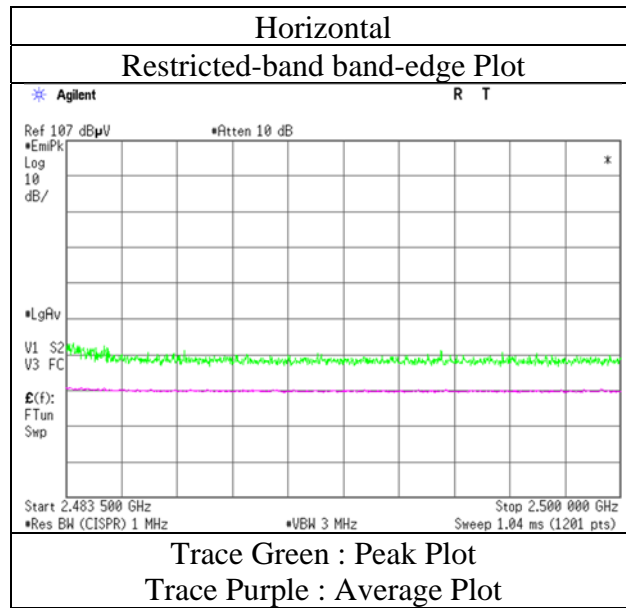
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Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 13175092S-A-R3
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3
Date March 27, 2020
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Toshinori Yamada
Mode Tx BT LE 1 M-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.

Radiated Spurious Emission

Report No.	13175092S-A-R3	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	March 28, 2020	March 27, 2020
Temperature / Humidity	24 deg. C / 52 % RH	23 deg. C / 40 % RH
Engineer	Kazuya Noda	Toshinori Yamada
	(30 MHz - 1 GHz, 18 GHz - 26.5 GHz)	(1 GHz - 18 GHz)
Mode	Tx BT LE 2 M-PHY 2402 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	179.717	QP	28.66	15.91	7.87	32.06	0.00	20.38	43.5	23.1	100	204	
Hori.	200.992	QP	25.73	11.26	8.08	32.04	0.00	13.03	43.5	30.5	165	49	
Hori.	206.191	QP	25.89	11.05	8.11	32.04	0.00	13.01	43.5	30.5	148	54	
Hori.	212.235	QP	27.31	10.91	8.16	32.03	0.00	14.35	43.5	29.2	158	219	
Hori.	2390.000	PK	48.21	28.33	14.07	41.66	2.43	51.38	73.9	22.5	104	2	
Hori.	4804.000	PK	58.58	31.62	6.58	42.92	2.43	56.29	73.9	17.6	133	250	
Hori.	7206.000	PK	48.54	37.23	8.08	43.39	2.43	52.89	73.9	21.0	150	0	
Hori.	9608.000	PK	48.74	38.84	9.21	43.14	2.43	56.08	73.9	17.8	150	0	
Vert.	49.102	QP	24.79	11.41	6.80	32.16	0.00	10.84	40.0	29.2	100	114	
Vert.	54.471	QP	25.61	9.57	6.76	32.16	0.00	9.78	40.0	30.2	100	235	
Vert.	155.745	QP	29.31	14.86	7.89	32.08	0.00	19.98	43.5	23.5	133	109	
Vert.	164.649	QP	31.92	15.28	7.92	32.07	0.00	23.05	43.5	20.5	100	106	
Vert.	182.559	QP	30.31	15.98	7.87	32.06	0.00	22.10	43.5	21.4	100	113	
Vert.	2390.000	PK	47.48	28.33	14.07	41.66	2.43	50.65	73.9	23.3	153	81	
Vert.	4804.000	PK	58.52	31.62	6.58	42.92	2.43	56.23	73.9	17.7	212	185	
Vert.	7206.000	PK	47.85	37.23	8.08	43.39	2.43	52.20	73.9	21.7	150	0	
Vert.	9608.000	PK	48.31	38.84	9.21	43.14	2.43	55.65	73.9	18.3	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Peak with DCCF (Duty cycle correction factor)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	PK	48.21	28.33	14.07	41.66	-8.49	2.43	42.89	53.9	11.0	*1)
Hori.	4804.000	PK	58.58	31.62	6.58	42.92	-8.49	2.43	47.80	53.9	6.1	
Hori.	7206.000	PK	48.54	37.23	8.08	43.39	-8.49	2.43	44.40	53.9	9.5	
Hori.	9608.000	PK	48.74	38.84	9.21	43.14	-8.49	2.43	47.59	53.9	6.3	
Vert.	2390.000	PK	47.48	28.33	14.07	41.66	-8.49	2.43	42.16	53.9	11.7	*1)
Vert.	4804.000	PK	58.52	31.62	6.58	42.92	-8.49	2.43	47.74	53.9	6.2	
Vert.	7206.000	PK	47.85	37.23	8.08	43.39	-8.49	2.43	43.71	53.9	10.2	
Vert.	9608.000	PK	48.31	38.84	9.21	43.14	-8.49	2.43	47.16	53.9	6.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

DCCF refer to "Burst rate confirmation" sheet.

*1) Not out of band emission (Leakage Power)

20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	93.82	28.31	14.08	41.67	2.43	96.97	-	-	
Hori.	2400.000	PK	62.06	28.31	14.07	41.67	2.43	65.20	77.0	11.8	
Vert.	2402.000	PK	93.73	28.31	14.08	41.67	2.43	96.88	-	-	
Vert.	2400.000	PK	61.24	28.31	14.07	41.67	2.43	64.38	76.9	12.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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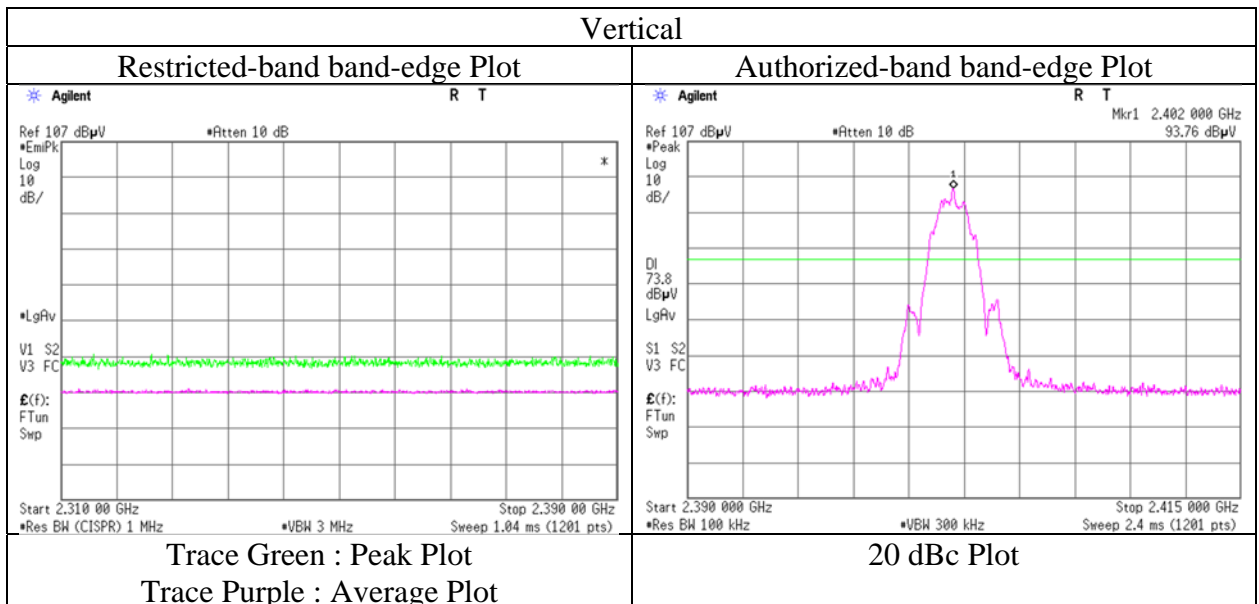
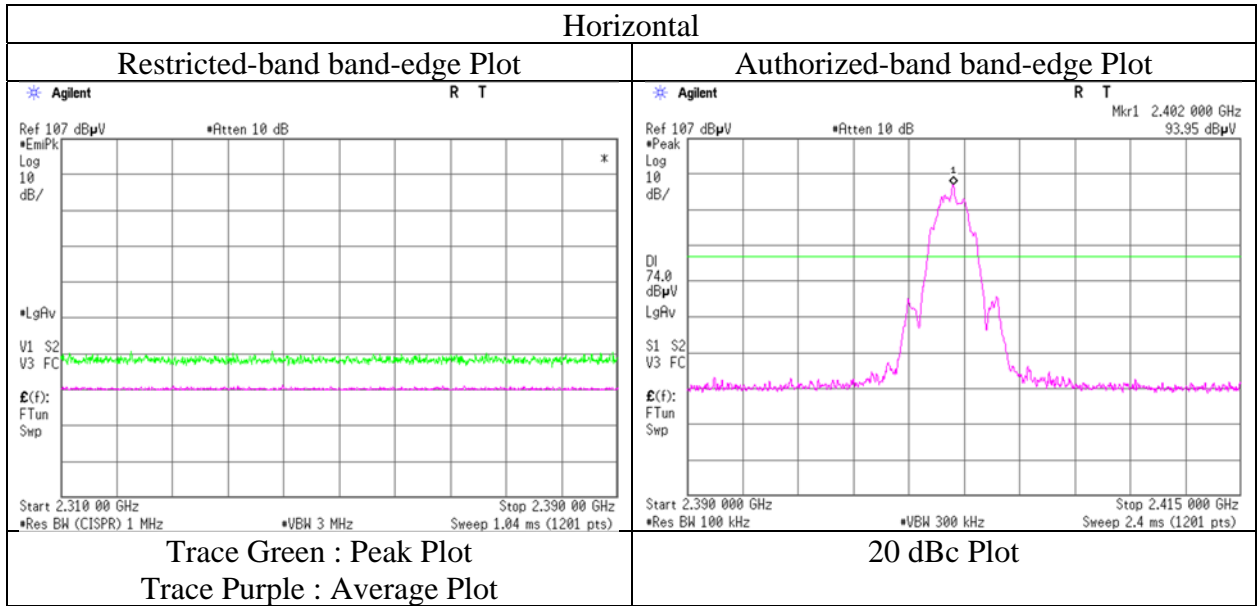
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Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 13175092S-A-R3
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3
Date March 27, 2020
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Toshinori Yamada
Mode Tx BT LE 2 M-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.

Radiated Spurious Emission

Report No.	13175092S-A-R3	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	March 28, 2020	March 27, 2020
Temperature / Humidity	24 deg. C / 52 % RH	23 deg. C / 40 % RH
Engineer	Kazuya Noda	Toshinori Yamada
	(30 MHz - 1 GHz, 18 GHz - 26.5 GHz)	(1 GHz - 18 GHz)
Mode	Tx BT LE 2 M-PHY 2440 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	182.118	QP	30.14	15.95	7.87	32.06	0.00	21.90	43.5	21.6	100	218	
Hori.	201.891	QP	25.82	11.22	8.08	32.04	0.00	13.08	43.5	30.4	168	63	
Hori.	207.314	QP	26.12	11.01	8.12	32.04	0.00	13.21	43.5	30.3	148	47	
Hori.	212.205	QP	27.22	10.91	8.16	32.03	0.00	14.26	43.5	29.2	155	215	
Hori.	4880.000	PK	59.98	31.71	6.62	42.93	2.43	57.81	73.9	16.1	114	311	
Hori.	7320.000	PK	47.55	37.38	8.14	43.49	2.43	52.01	73.9	21.9	150	0	
Hori.	9760.000	PK	47.75	39.33	9.31	42.97	2.43	55.85	73.9	18.1	150	0	
Vert.	49.122	QP	24.92	11.40	6.80	32.16	0.00	10.96	40.0	29.0	100	138	
Vert.	54.640	QP	26.28	9.51	6.76	32.16	0.00	10.39	40.0	29.6	100	233	
Vert.	156.325	QP	29.12	14.90	7.89	32.08	0.00	19.83	43.5	23.7	115	115	
Vert.	164.665	QP	33.48	15.28	7.92	32.07	0.00	24.61	43.5	18.9	100	115	
Vert.	184.066	QP	30.67	16.06	7.87	32.06	0.00	22.54	43.5	21.0	100	121	
Vert.	4880.000	PK	60.92	31.71	6.62	42.93	2.43	58.75	73.9	15.2	134	167	
Vert.	7320.000	PK	47.88	37.38	8.14	43.49	2.43	52.34	73.9	21.6	150	0	
Vert.	9760.000	PK	48.06	39.33	9.31	42.97	2.43	56.16	73.9	17.7	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log (3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak with DCCF (Duty cycle correction factor)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	PK	59.98	31.71	6.62	42.93	-8.49	2.43	49.32	53.9	4.6	
Hori.	7320.000	PK	47.55	37.38	8.14	43.49	-8.49	2.43	43.52	53.9	10.4	
Hori.	9760.000	PK	47.75	39.33	9.31	42.97	-8.49	2.43	47.36	53.9	6.5	
Vert.	4880.000	PK	60.92	31.71	6.62	42.93	-8.49	2.43	50.26	53.9	3.6	
Vert.	7320.000	PK	47.88	37.38	8.14	43.49	-8.49	2.43	43.85	53.9	10.1	
Vert.	9760.000	PK	48.06	39.33	9.31	42.97	-8.49	2.43	47.67	53.9	6.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCFr + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log (3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

DCCF refer to "Burst rate confirmation" sheet.

UL Japan, Inc.

Shonan EMC Lab.

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

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Radiated Spurious Emission

Report No.	13175092S-A-R3	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	March 28, 2020	March 27, 2020
Temperature / Humidity	24 deg. C / 52 % RH	23 deg. C / 40 % RH
Engineer	Kazuya Noda	Toshinori Yamada
	(30 MHz - 1 GHz, 18 GHz - 26.5 GHz)	(1 GHz - 18 GHz)
Mode	Tx BT LE 2 M-PHY 2480 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	185.935	QP	28.93	16.10	7.86	32.05	0.00	20.84	43.5	22.7	100	195	
Hori.	203.532	QP	26.20	11.17	8.09	32.04	0.00	13.42	43.5	30.1	164	44	
Hori.	208.281	QP	27.05	10.98	8.13	32.03	0.00	14.13	43.5	29.4	146	45	
Hori.	213.791	QP	26.58	10.92	8.17	32.03	0.00	13.64	43.5	29.9	156	219	
Hori.	2483.500	PK	52.90	28.24	14.16	41.69	2.43	56.04	73.9	17.9	222	247	
Hori.	4960.000	PK	54.86	31.96	6.67	42.94	2.43	52.98	73.9	20.9	160	317	
Hori.	7440.000	PK	48.51	37.56	8.21	43.60	2.43	53.11	73.9	20.8	150	0	
Hori.	9920.000	PK	48.06	39.18	9.42	42.78	2.43	56.31	73.9	17.6	150	0	
Vert.	48.964	QP	24.93	11.46	6.80	32.16	0.00	11.03	40.0	29.0	100	154	
Vert.	54.494	QP	27.59	9.56	6.76	32.16	0.00	11.75	40.0	28.3	100	249	
Vert.	157.460	QP	29.13	14.95	7.90	32.07	0.00	19.91	43.5	23.6	131	119	
Vert.	163.595	QP	33.87	15.20	7.92	32.07	0.00	24.92	43.5	18.6	100	119	
Vert.	181.307	QP	29.33	15.94	7.87	32.06	0.00	21.08	43.5	22.4	100	125	
Vert.	2483.500	PK	52.94	28.24	14.16	41.69	2.43	56.08	73.9	17.8	224	330	
Vert.	4960.000	PK	54.81	31.96	6.67	42.94	2.43	52.93	73.9	21.0	202	142	
Vert.	7440.000	PK	48.20	37.56	8.21	43.60	2.43	52.80	73.9	21.1	150	0	
Vert.	9920.000	PK	47.86	39.18	9.42	42.78	2.43	56.11	73.9	17.8	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Peak with DCCF (Duty cycle correction factor)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	52.90	28.24	14.16	41.69	-8.49	2.43	47.55	53.9	6.4	*1)
Hori.	4960.000	PK	54.86	31.96	6.67	42.94	-8.49	2.43	44.49	53.9	9.4	
Hori.	7440.000	PK	48.51	37.56	8.21	43.60	-8.49	2.43	44.62	53.9	9.3	
Hori.	9920.000	PK	48.06	39.18	9.42	42.78	-8.49	2.43	47.82	53.9	6.1	
Vert.	2483.500	PK	52.94	28.24	14.16	41.69	-8.49	2.43	47.59	53.9	6.3	*1)
Vert.	4960.000	PK	54.81	31.96	6.67	42.94	-8.49	2.43	44.44	53.9	9.5	
Vert.	7440.000	PK	48.20	37.56	8.21	43.60	-8.49	2.43	44.31	53.9	9.6	
Vert.	9920.000	PK	47.86	39.18	9.42	42.78	-8.49	2.43	47.62	53.9	6.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + DCCF + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.965 m / 3.0 m) = 2.43 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

DCCF refer to "Burst rate confirmation" sheet.

*1) Not out of band emission (Leakage Power)

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Shonan EMC Lab.

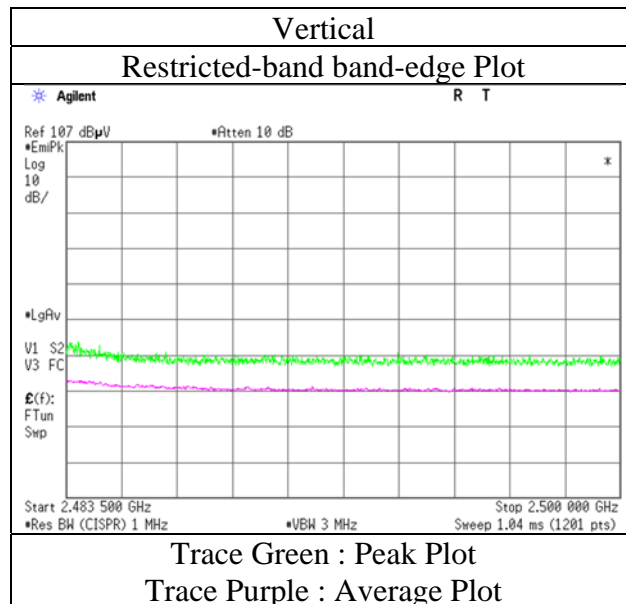
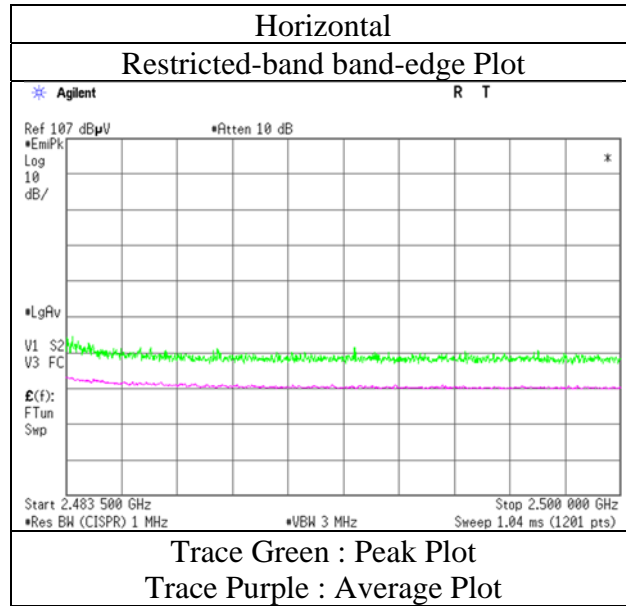
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Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 13175092S-A-R3
Test place Shonan EMC Lab.
Semi Anechoic Chamber 3
Date March 27, 2020
Temperature / Humidity 23 deg. C / 40 % RH
Engineer Toshinori Yamada
Mode Tx BT LE 2 M-PHY 2480 MHz

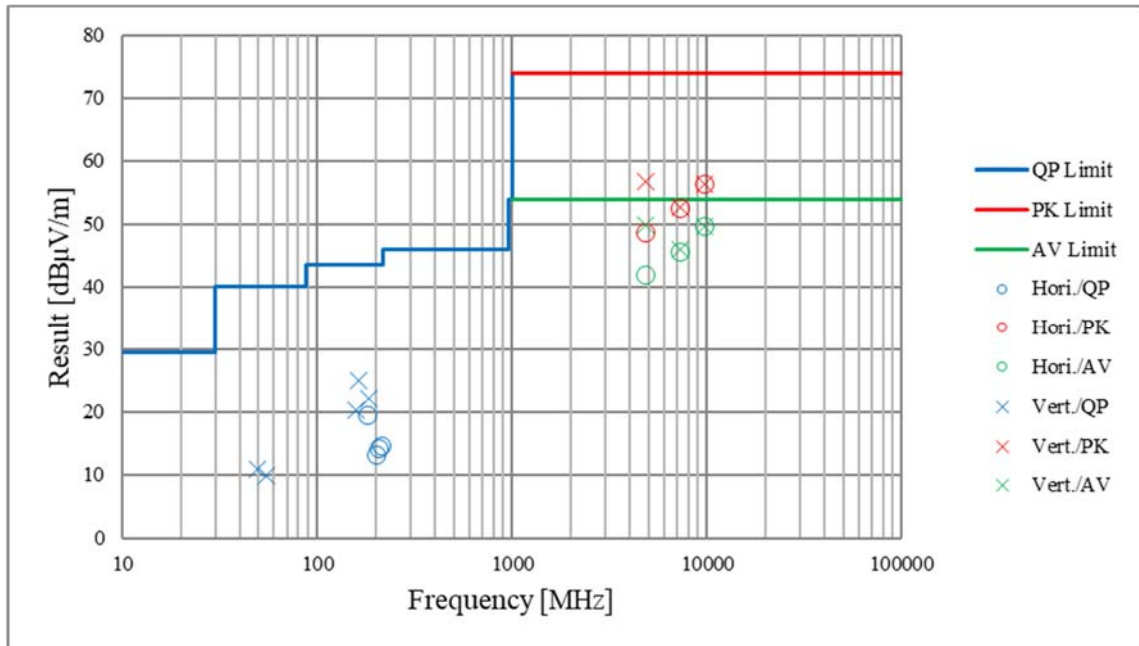


* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

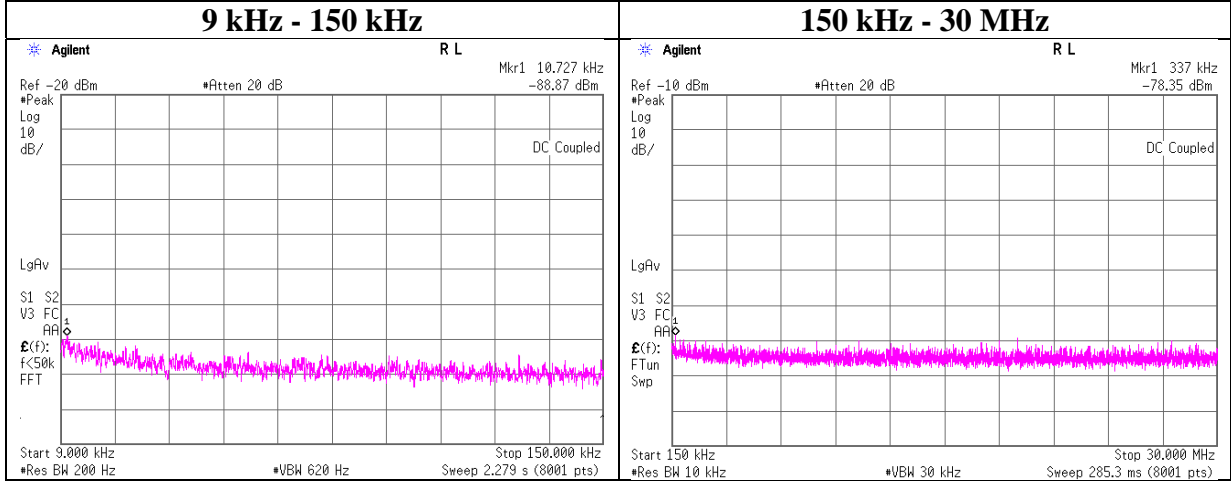
Report No.	13175092S-A-R3	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	March 28, 2020	March 27, 2020
Temperature / Humidity	24 deg. C / 52 % RH	23 deg. C / 40 % RH
Engineer	Kazuya Noda (30 MHz - 1 GHz, 18 GHz - 26.5 GHz)	Toshinori Yamada (1 GHz - 18 GHz)
Mode	Tx BT LE 1 M-PHY 2440 MHz	



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

Conducted Spurious Emission

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.1 Measurement Room
Date March 25, 2020
Temperature / Humidity 23 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx BT LE 1 M-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
10.73	-88.9	0.01	9.7	2.0	1	-77.1	300	6.0	-15.9	46.9	62.8	-
337.00	-78.4	0.02	9.7	2.0	1	-66.6	300	6.0	-5.3	17.0	22.3	-

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

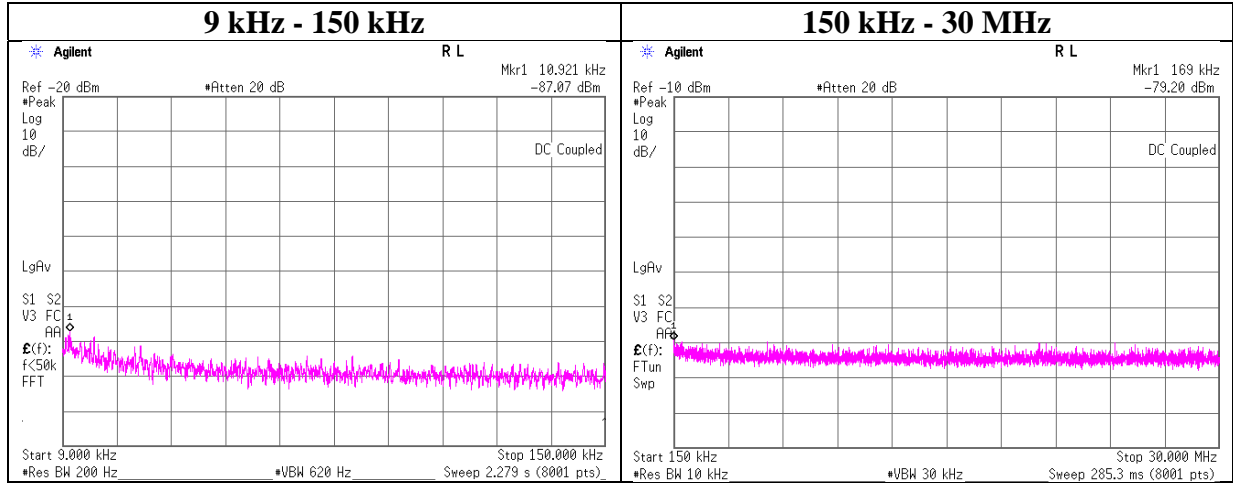
$\text{EIRP[dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log(N)$

N: Number of output

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

Conducted Spurious Emission

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.1 Measurement Room
Date March 25, 2020
Temperature / Humidity 23 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx BT LE 1 M-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
10.92	-87.1	0.01	9.7	2.0	1	-75.3	300	6.0	-14.1	46.8	60.9	-
169.00	-79.2	0.01	9.7	2.0	1	-67.5	300	6.0	-6.2	23.0	29.2	-

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

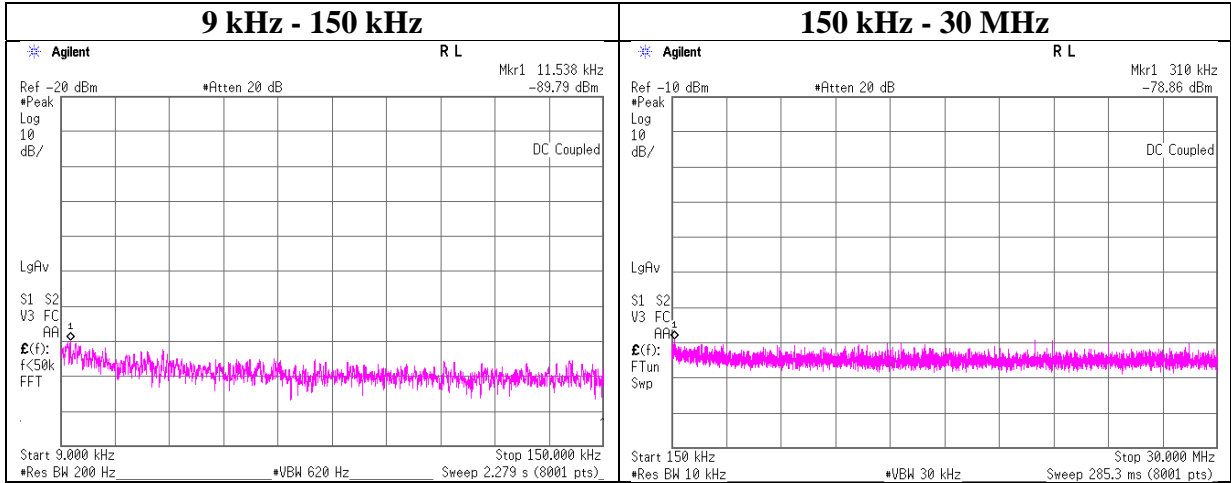
$\text{EIRP[dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log(N)$

N: Number of output

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

Conducted Spurious Emission

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.1 Measurement Room
Date March 25, 2020
Temperature / Humidity 23 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx BT LE 1 M-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
11.54	-89.8	0.01	9.7	2.0	1	-78.0	300	6.0	-16.8	46.3	63.1	-
310.00	-78.9	0.02	9.7	2.0	1	-67.1	300	6.0	-5.9	17.7	23.6	-

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

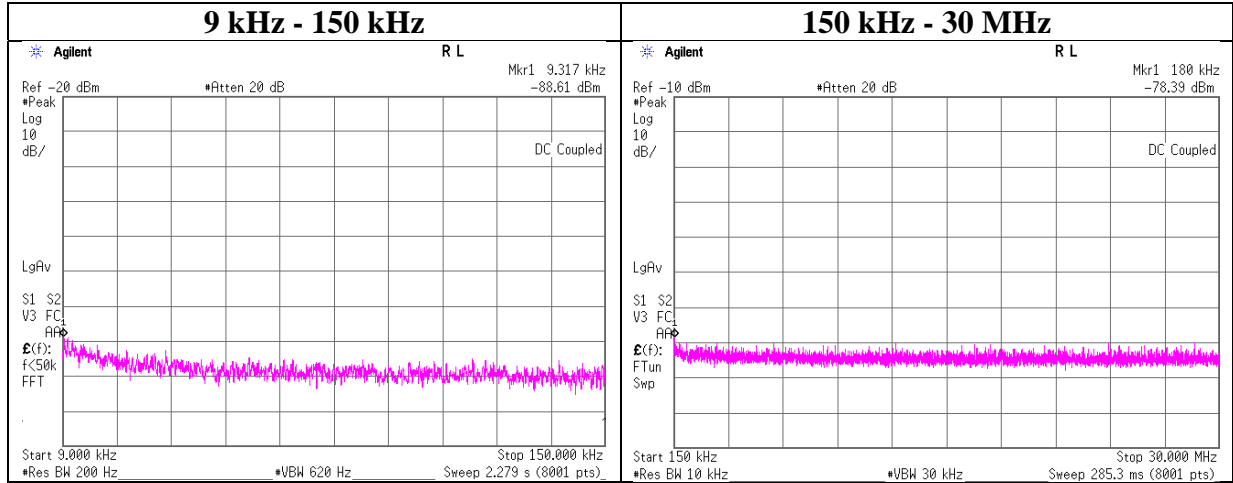
$EIRP[dBm] = Reading [dBm] + Cable\ loss [dB] + Attenuator\ Loss [dB] + Antenna\ gain [dBi] + 10 * \log (N)$

N: Number of output

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

Conducted Spurious Emission

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.1 Measurement Room
Date March 25, 2020
Temperature / Humidity 23 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx BT LE 2 M-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
9.32	-88.6	0.01	9.7	2.0	1	-76.9	300	6.0	-15.6	48.2	63.8	-
180.00	-78.4	0.01	9.7	2.0	1	-66.6	300	6.0	-5.4	22.4	27.8	-

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

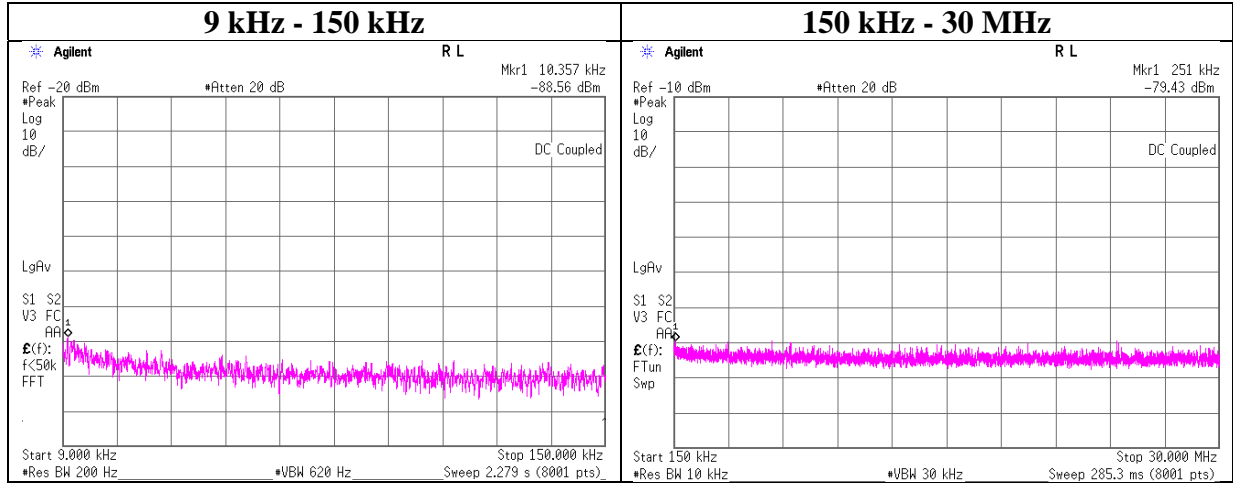
$\text{EIRP[dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log(N)$

N: Number of output

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

Conducted Spurious Emission

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.1 Measurement Room
Date March 25, 2020
Temperature / Humidity 23 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx BT LE 2 M-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
10.36	-88.6	0.01	9.7	2.0	1	-76.8	300	6.0	-15.6	47.2	62.8	-
251.00	-79.4	0.01	9.7	2.0	1	-67.7	300	6.0	-6.4	19.6	26.0	-

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

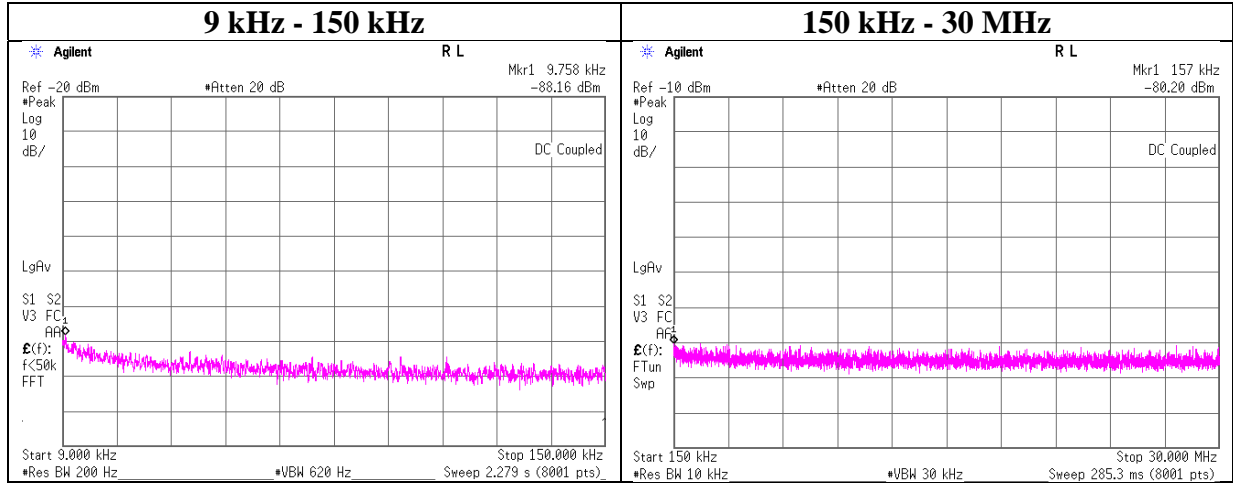
$$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$$

N: Number of output

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

Conducted Spurious Emission

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.1 Measurement Room
Date March 25, 2020
Temperature / Humidity 23 deg. C / 47 % RH
Engineer Shiro Kobayashi
Mode Tx BT LE 2 M-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
9.76	-88.2	0.01	9.7	2.0	1	-76.4	300	6.0	-15.2	47.8	63.0	-
157.00	-80.2	0.01	9.7	2.0	1	-68.5	300	6.0	-7.2	23.6	30.8	-

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

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

N: Number of output

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

Power Density

Report No. 13175092S-A-R3
Test place Shonan EMC Lab. No.1 Measurement Room
Date March 25, 2020
Temperature / Humidity 23 deg. C / 47 %RH
Engineer Shiro Kobayashi
Mode Tx BT LE

1 M-PHY

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2402	-26.36	2.47	9.82	-14.07	8.00	22.07
2440	-26.18	2.49	9.82	-13.87	8.00	21.87
2480	-26.34	2.50	9.82	-14.02	8.00	22.02

2 M-PHY

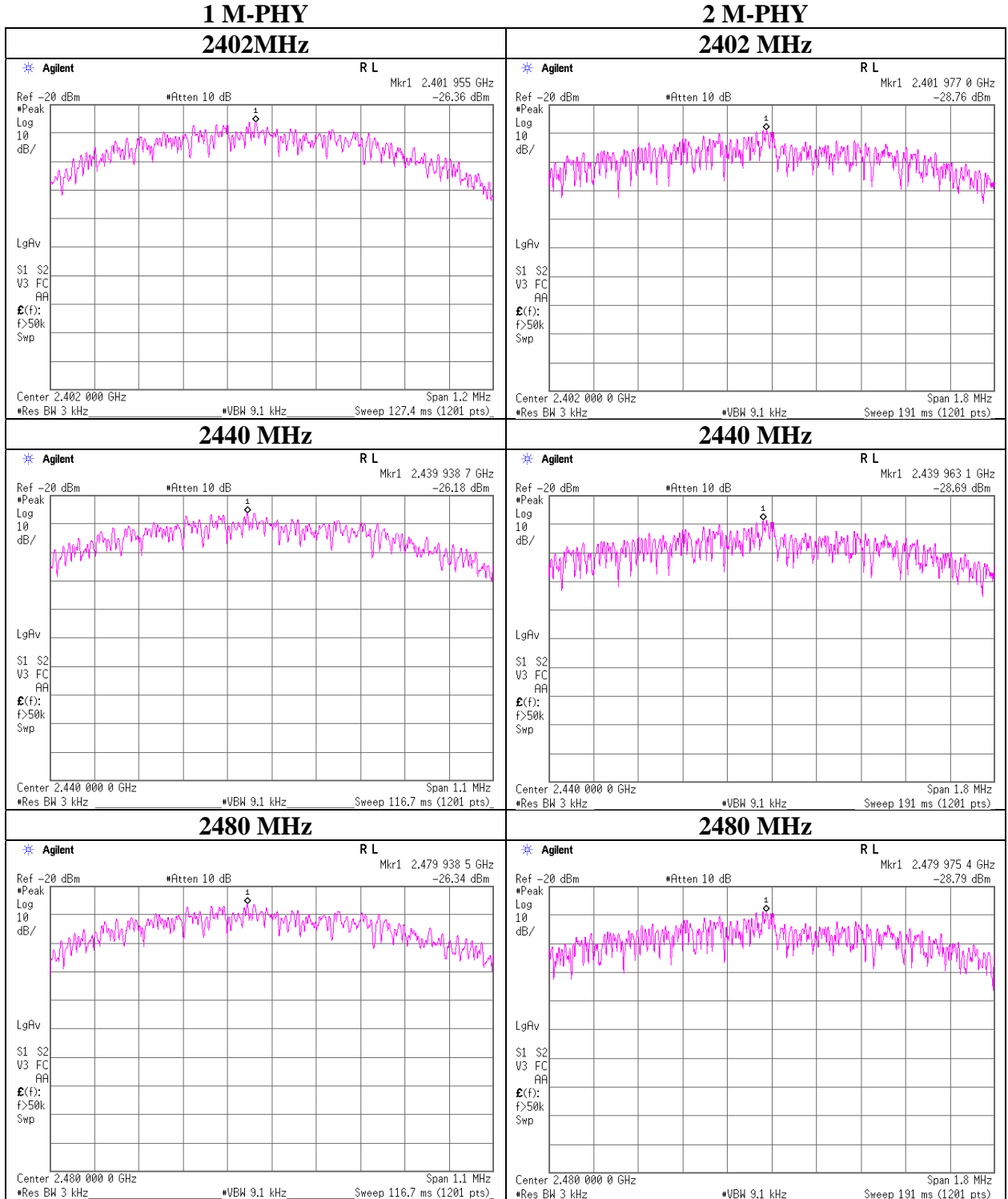
Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2402	-28.76	2.47	9.82	-16.47	8.00	24.47
2440	-28.69	2.49	9.82	-16.38	8.00	24.38
2480	-28.79	2.50	9.82	-16.47	8.00	24.47

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.

Power Density



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APPENDIX 2: Test instruments

Test equipment(1/2)

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
AT	SRENT-09	150461	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186392	2020/02/10	12
AT	SPM-13	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2020/01/28	12
AT	SPSS-06	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2020/01/28	12
AT	SCC-G14	145175	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	2019/12/12	12
AT	SAT10-14	154591	Attenuator	Weinschel Corp.	54A-10	81595	2019/04/16	12
AT	KTS-08	145095	Digital Tester	SANWA	PC500	7019224	2019/04/02	12
AT	SOS-13	146321	Humidity Indicator	CUSTOM	CTH-202	Q.C.17	2019/12/19	12
CE	SAT3-13	150923	Attenuator	JFW	50HF-003N	-	2020/01/30	12
CE	SCC-C9	145035	Coaxial Cable	Suhner	RG223U	-	2020/04/12	12
CE	SLS-02	145539	LISN	Rohde & Schwarz	ENV216	100512	2020/02/18	12
CE	SOS-24	191841	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
CE	STR-01	145790	Test Receiver	Rohde & Schwarz	ESU40	100093	2020/04/24	12
CE,RE	COTS-SEMI-5	170932	EMI Software	TSJ	TEPTO-DV3(RE,CE,M E,PE)	-	-	-
CE,RE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
RE	KSA-08	145089	Spectrum Analyzer	Keysight Technologies Inc	E4446A	MY46180525	2019/11/05	12
RE	SAEC-03(NSA)	145565	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	2020/04/12	12
RE	SAEC-03(SVSWR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2019/05/03	12
RE	SAF-03	145126	Pre Amplifier	SONOMA	310N	290213	2020/02/19	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2020/02/20	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2020/03/03	12
RE	SAT10-05	145136	Attenuator(above 1GHz)	Keysight Technologies Inc	8493C-010	74864	2019/11/06	12
RE	SAT6-13	167094	Attenuator	JFW	50HF-006N	-	2020/02/21	12

Test equipment(2/2)

Test Name	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
RE	SBA-03	145023	Biconical Antenna	Schwarzbeck Mess - Elektronik	BBA9106	91032666	2019/05/07	12
RE	SCC-C1/C2/C3/C4/C5/C10/SRSE-03	145171	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	~/0901-271(RF Selector)	2020/04/12	12
RE	SCC-G19	145178	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	2020/03/04	12
RE	SCC-G42	151618	Coaxial Cable	Junkosha	J12J103275-00	FEB-28-17-017	2020/03/04	12
RE	SCC-G43	156380	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104_E	SN MY 13406/4E	2019/07/03	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2019/05/16	12
RE	SCC-G58	183047	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800287/4A	2019/07/23	12
RE	SFL-02	145301	Highpass Filter	MICRO-TRONICS	HPM50111	51	2019/11/06	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck Mess - Elektronik	BBHA9120D	9120D-739	2019/06/26	12
RE	SHA-04	145512	Horn Antenna	ETS LINDGREN	3160-09	00094868	2019/06/26	12
RE	SLA-07	145529	Logperiodic Antenna	Schwarzbeck Mess - Elektronik	VUSLP9111B	196	2019/05/07	12
RE	SOS-23	191840	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
RE	STR-08	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2019/11/22	12
RE	STS-03	146210	Digital Hitester	Hioki	3805-50	80997823	2019/10/01	12
AT	SAT10-22	204926	Attenuator	Weinschel Corp.	54A-10	-	2021/02/09	12
AT	SCC-G63	196946	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803411/2	2021/03/01	12
AT	SJM-17	145339	Measure	ASKUL	-	-	-	-
AT	SOS-27	191845	Humidity Indicator	CUSTOM. Inc	CTH-201	-	2021/08/02	12
AT	SSA-01	146223	Spectrum Analyzer	Keysight Technologies Inc	N9010A-526	MY48031482	2021/09/09	12
AT	STS-05	146212	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997828	2021/09/14	12

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

The expiration date of the calibration is the end of the expired month.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

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

Test item: CE: Conducted Emission test
RE: Radiated Emission test
AT: Antenna Terminal Conducted test

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