RADIO TEST REPORT

Test Report No. : 13850591M-A-R1

Applicant	:	**SMK Corporation**
Type of EUT	:	**Bluetooth Low Energy Module**
Model Number of EUT	:	**VRB1129-0401F**
FCC ID	:	**GT3FSCI02**
Test regulation	:	**FCC Part 15 Subpart C: 2021**
Test Result	:	**Complied (Refer to SECTION 3)**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements.
   It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Kashima 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 13850591M-A. 13850591M-A is replaced with this report.

Date of test: June 18 to July 27, 2021

Representative test engineer: K. Ando
Kazuhiro Ando
Engineer

Approved by:
Kenichi Suda
Manager

CERTIFICATE 1266.01

☐ 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.: 13850591M-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13850591M-A	July 13, 2021	-	-
1	13850591M-A-R1	July 28, 2021	P.25	Replace to the data chart showing the interval of two waves.

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer information

Company Name	:	SMK Corporation
Address	:	5-5, Togoshi 6-chome, Shinagawa-ku, Tokyo 142-8511 Japan
Telephone Number	:	+81-3-3785-1111
Facsimile Number	:	+81-3-3785-1068
Contact Person	:	Tomonari Hasegawa

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	:	Bluetooth Low Energy Module
Model Number	:	VRB1129-0401F
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 1.1 V to 3.3 V, 0.1 A
Receipt Date	:	June 15, 2021
Country of Mass-production	:	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: VRB1129-0401F (referred to as the EUT in this report) is a Bluetooth Low Energy Module.

Radio Specification

Bluetooth (Low Energy)

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz to 2480 MHz
Modulation	:	GFSK
Antenna type	:	Monopole Antenna
Antenna Gain	:	-1.39 dBi (Max)
Clock frequency (Maximum)	:	16 MHz
Operating Temperature	:	-40 deg. C to +85 deg. C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	**QP** 16.5 dB, 0.15329 MHz, N **AV** 20.7 dB, 1.24200 MHz, L	Complied a)	-
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
6dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(a)(2)	See data.	Complied b)	Conducted
	ISED: -	**ISED:** RSS-247 5.2(a)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(b)(3)		Complied c)	Conducted
	ISED: RSS-Gen 6.12	**ISED:** RSS-247 5.4(d)			
Power Density	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(e)		Complied d)	Conducted
	ISED: -	**ISED:** RSS-247 5.2(b)			
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	5.2 dB 2483.500 MHz, PK, Hori.	Complied e), f)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
	ISED: RSS-Gen 6.13	**ISED:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*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.

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)

Symbols:
Complied The data of this test item has enough margin, more than the measurement uncertainty.
Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

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

FCC Part 15.31 (e)
This EUT provides the stable voltage constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 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 15.203/212.

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.

Conducted emission

Frequency range	Required Uncertainty (+/-)	Uncertainty (+/-)
0.15 MHz to 30 MHz	3.4 dB	3.3 dB

Radiated emission

Measurement distance	Frequency range	Required Uncertainty (+/-)	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	Not Defined	2.9 dB
	30 MHz to 200 MHz	6.3 dB	6.1 dB
	200 MHz to 1000 MHz		6.2 dB
	1 GHz to 6 GHz	5.2 dB	5.0 dB
	6 GHz to 18 GHz	5.5 dB	5.4 dB
	18 GHz to 40 GHz	Not Defined	5.5 dB
1 m	1 GHz to 18 GHz	Not Defined	5.4 dB
	18 GHz to 40 GHz		5.6 dB
0.5 m	26.5 GHz to 40 GHz	Not Defined	5.9 dB

Antenna Terminal test

Test Item	Required Uncertainty (+/-)	Uncertainty (+/-)
6 dB Bandwidth / 99 % Occupied Bandwidth	Not Defined	1.6 %
Maximum Output Power	0.75 dB	0.73 dB
Burst Rate	Not Defined	0.256 %
Power Density	4 dB	2.2 dB
Conducted Spurious Emission (9 kHz to 30 MHz)	4 dB	2.2 dB

3.5 Test Location

UL Japan, Inc. Kashima EMC Lab.
1614 Mushihata, Katori-shi, Chiba-ken, 289-0341 JAPAN
Telephone: +81 478 88 6500, Facsimile: +81 478 82 3373
A2LA Certificate Number: 1266.01 / FCC Test Firm Registration Number: 910230
ISED Lab Company Number: 4659A / CAB identifier: JP0006

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Open site	6.0 x 5.5 x 2.5	20 x 40	10 m
No.5 Open site	8.6 x 7.1 x 2.4	18 x 23	10 m
No.1 Shielded room	5.4 x 4.5 x 2.3	-	-
No.5 Shielded Room	4.2 x 3.1 x 2.5	-	-
No.9 Shielded Room	6.1 x 3.6 x 2.8	-	-
No.6 Semi-anechoic Chamber	8.5 x 5.5 x 5.2	-	3 m
No.10 Semi-anechoic Chamber	18.4 x 9.9 x 7.7	-	10 m
No.11 Semi-anechoic Chamber	9.0 x 6.5 x 5.2	-	3 m
No.1 Measurement room	5.0 x 3.7 x 2.6	-	-
No.2 Measurement room	4.3 x 4.4 x 2.7	-	-
No.3 Measurement room	4.5 x 5.3 x 2.7	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

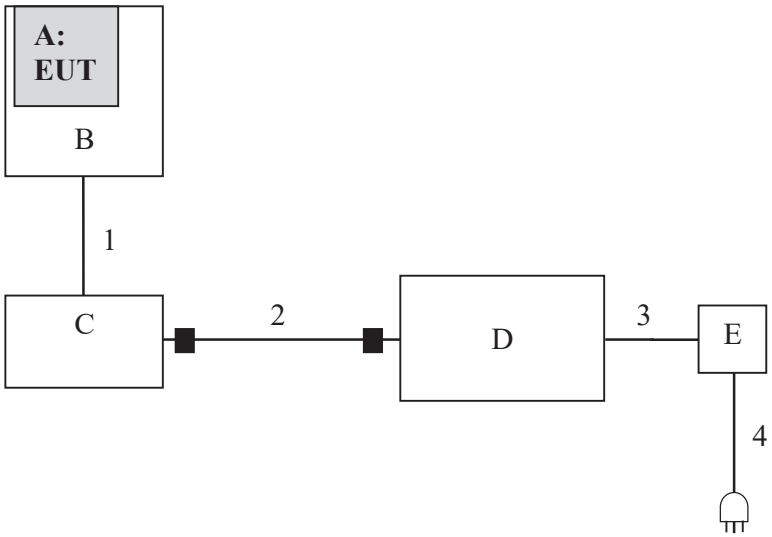
4.1 Operating Mode(s)

Mode	Remarks*
Bluetooth Low Energy (BT LE) 125 kbps	Maximum Packet Size, PRBS9
Bluetooth Low Energy (BT LE) 500 kbps	Maximum Packet Size, PRBS9
Bluetooth Low Energy (BT LE) 1M-PHY	Maximum Packet Size, PRBS9
Bluetooth Low Energy (BT LE) 2M-PHY	Maximum Packet Size, PRBS9
*Power of the EUT was set by the software as follows; Power settings: 4 dBm Software: Atmosic RF Tool v1.5.1 (Date: 2020.10.10, Storage location: EUT memory) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Maximum Peak Output Power	BT LE, 125 kbps BT LE, 500 kbps BT LE, 1M-PHY BT LE, 2M-PHY	2402 MHz 2440 MHz 2480 MHz
Conducted Emission, Radiated Spurious Emission, Power Density, 6dB Bandwidth, 99% Occupied Bandwidth, Conducted Spurious Emission	BT LE, 1M-PHY *1) BT LE, 2M-PHY	2402 MHz 2440 MHz 2480 MHz
*1) This EUT has three kinds of data rate and the test was performed only with 1M-PHY which is the worst case in Maximum Peak Output power.		

4.2 Configuration and peripherals



AC 120 V/ 60 Hz with PE

■ : Standrad Ferrite Core

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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	**Bluetooth Low Energy Module**	**VRB1129-0401F**	**001 *1) 002 *2)**	**SMK Corporation**	**EUT**
B	Receive board	HARVEST SHEET V0.3	001	SMK Corporation	-
C	Relay board	INTERFACE BORD V3.1	1154	ATMOSIC TECHNOLOGIES	-
D	Note PC	Vostro 3590	42145640175	DELL	-
E	AC adapter	HA45NM140	CN-00285K-CH200-03H-0MPY-A07	DELL	-

*1) Used for Antenna Terminal conducted test
*2) Used for Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Ribbon cable	0.3	Unshielded	Unshielded	-
2	USB2.0 cable	2.0	Shielded	Shielded	-
3	DC cable	1.7	Unshielded	Unshielded	-
4	AC cable	0.9	Unshielded	Unshielded	3 wires

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a wooden table 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) and excess AC cable was bundled in center.

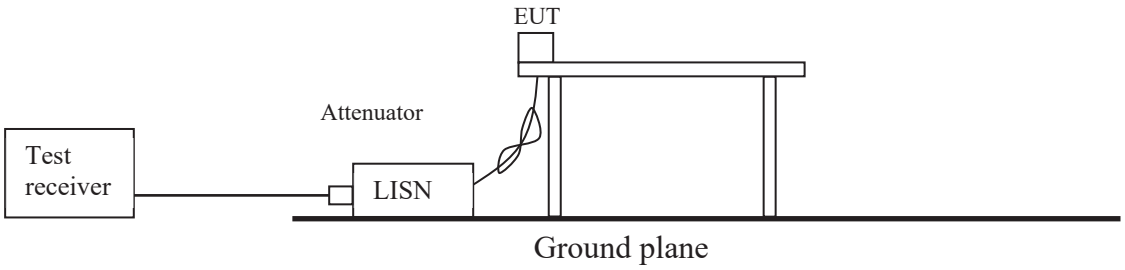
For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50ohm connectors of the LISN (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 Sealed 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, 0.5 m by 0.5 m, raised 0.8 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	Below 1 GHz	Above 1 GHz
Antenna Type	Hybrid	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.

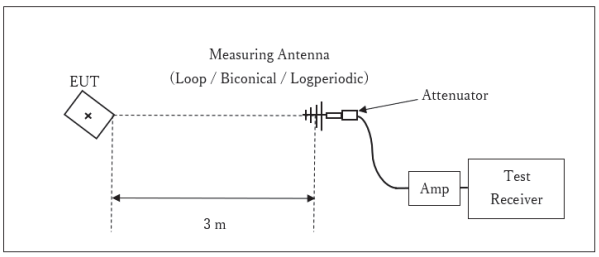
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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).

Figure 2: Test Setup

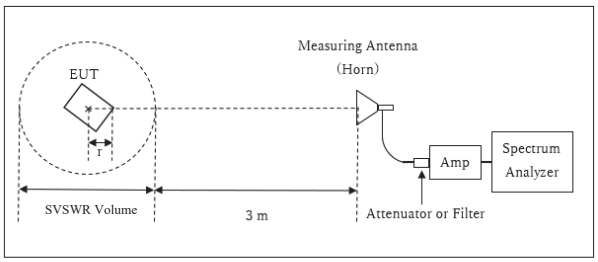
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz

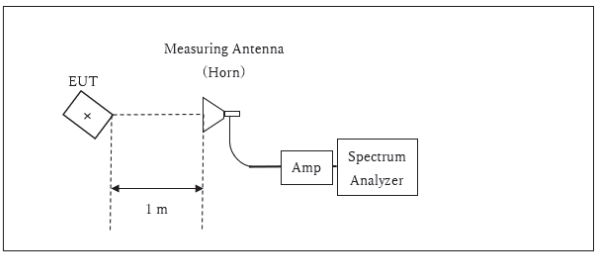


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.99 m / 3.0 m) = 2.48 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.99 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.01 m

10 GHz – 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.54 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

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: 160 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4) *5)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	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 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 = 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 Ohmes. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to 45.5 – 51.5 = -6.0 dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

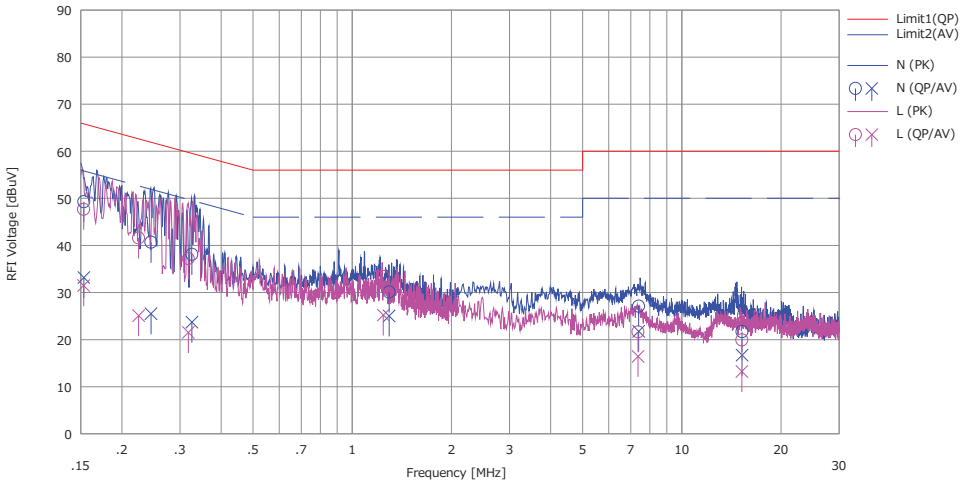
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Kashima EMC Lab. No.5 Shielded Room
Date : 2021/06/25

Mode : Tx BT LE, 1M-PHY 2402MHz
Order No. : 13850591M
Power : DC 2.5V(AC 120V / 60Hz)
Temp./Humi. : 22deg.C / 48%RH

Limit : FCC_Part 15 Subpart C(15.207)

Tested by : Kazuhiro Ando



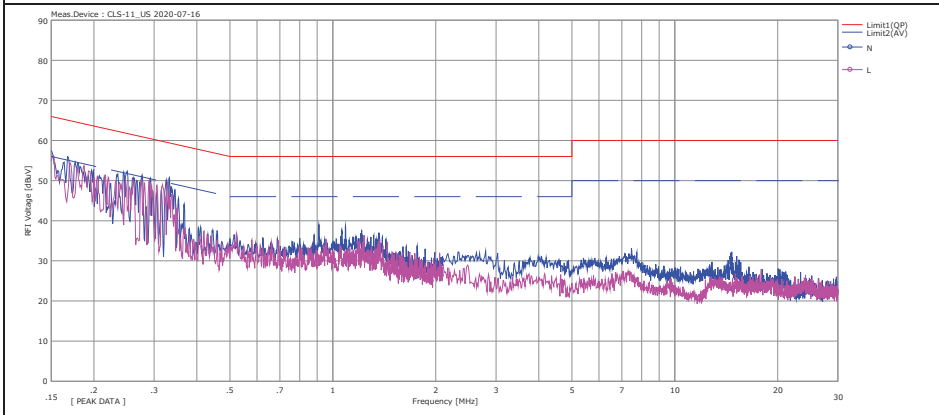
No.	Freq.	Reading ⟨QP⟩	Reading ⟨AV⟩	C.Fac	Results ⟨QP⟩	Results ⟨AV⟩	Limit ⟨QP⟩	Limit ⟨AV⟩	Margin ⟨QP⟩	Margin ⟨AV⟩	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15329	39.20	23.10	10.08	49.28	33.18	65.82	55.82	16.5	22.6	N	
2	0.24510	30.60	15.40	10.09	40.69	25.49	61.92	51.92	21.2	26.4	N	
3	0.32621	28.00	13.60	10.11	38.11	23.71	59.55	49.55	21.4	25.8	N	
4	1.29400	19.90	14.80	10.22	30.12	25.02	56.00	46.00	25.8	20.9	N	
5	7.39750	16.40	11.10	10.68	27.08	21.78	60.00	50.00	32.9	28.2	N	
6	15.23450	10.50	5.50	11.20	21.70	16.70	60.00	50.00	38.3	33.3	N	
7	0.15303	37.60	21.40	10.08	47.68	31.48	65.83	55.83	18.1	24.3	L	
8	0.22480	31.50	15.00	10.08	41.58	25.08	62.64	52.64	21.0	27.5	L	
9	0.31825	27.10	11.40	10.11	37.21	21.51	59.75	49.75	22.5	28.2	L	
10	1.24200	23.20	15.00	10.21	33.41	25.21	56.00	46.00	22.5	20.7	L	
11	7.36750	10.90	5.70	10.74	21.64	16.44	60.00	50.00	38.3	33.5	L	
12	15.21000	8.50	1.80	11.43	19.93	13.23	60.00	50.00	40.0	36.7	L	

Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(AMN+Cable+ATT)[dB]
AMN:CLS-11

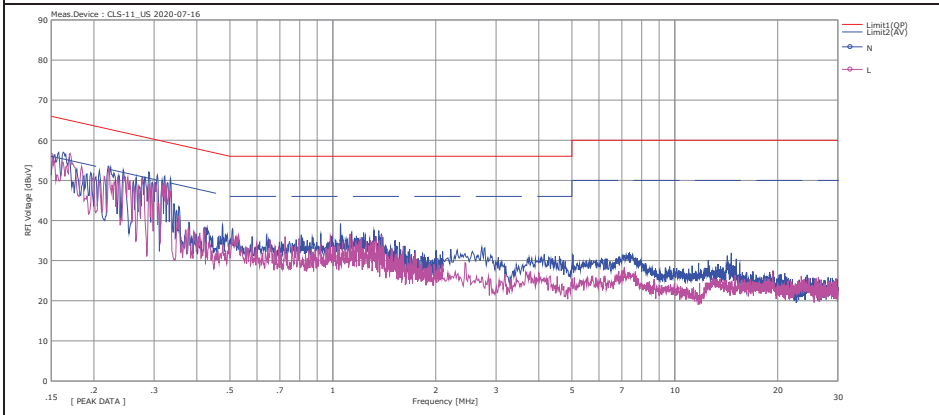
Conducted Emission

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.5 Shielded Room
Date	June 25, 2021
Temperature / Humidity	22 deg. C / 48 % RH
Engineer	Kazuhiro Ando
Mode	Tx BT LE, 1M-PHY

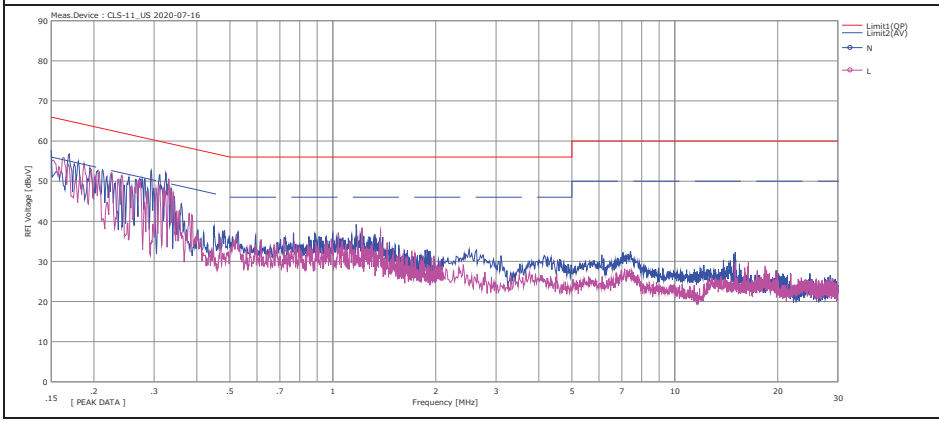
2402 MHz



2440 MHz



2480 MHz



Conducted Emission

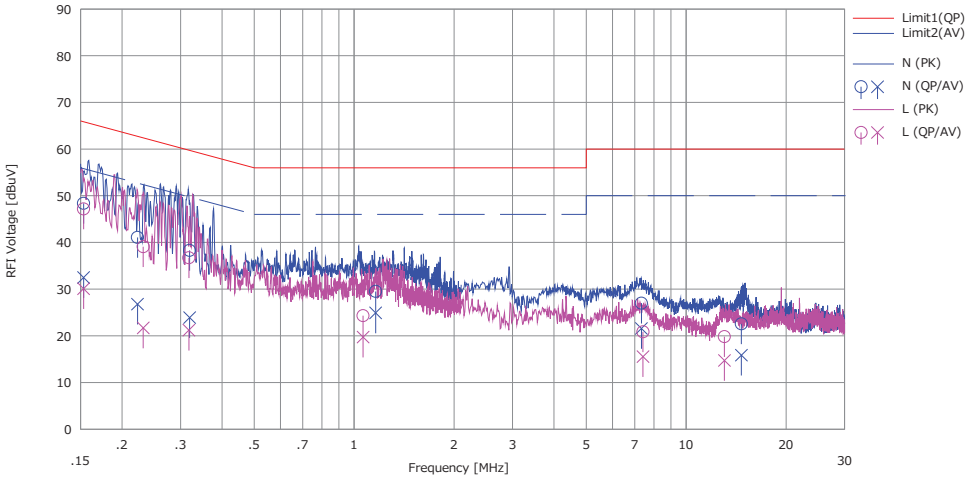
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Kashima EMC Lab. No.5 Shielded Room
Date : 2021/06/25

Mode : Tx BT LE, 2M-PHY 2402MHz
Order No. : 13850591M
Power : DC 2.5V(AC 120V / 60Hz)
Temp./Humi. : 22deg.C / 48%RH

Limit : FCC_Part 15 Subpart C(15.207)

Tested by : Kazuhiro Ando



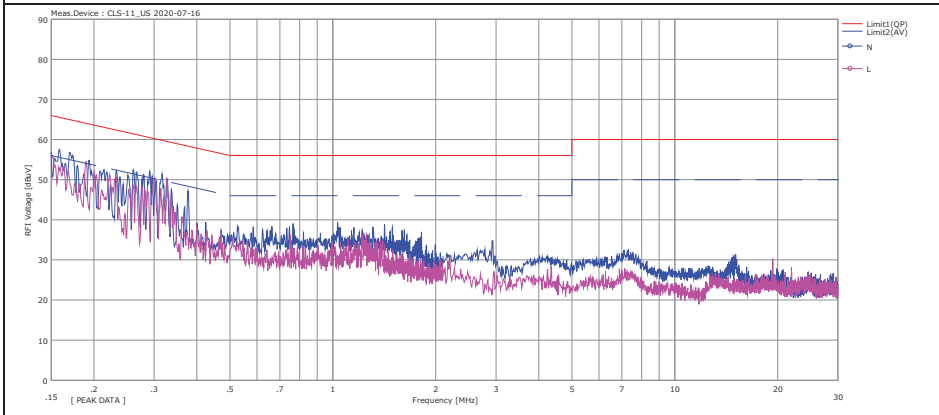
No.	Freq.	Reading ⟨QP⟩	Reading ⟨AV⟩	C.Fac	Results ⟨QP⟩	Results ⟨AV⟩	Limit ⟨QP⟩	Limit ⟨AV⟩	Margin ⟨QP⟩	Margin ⟨AV⟩	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15315	38.30	22.40	10.08	48.38	32.48	65.83	55.83	17.4	23.3	N	
2	0.22272	31.00	16.70	10.08	41.08	26.78	62.72	52.72	21.6	25.9	N	
3	0.31960	28.20	13.80	10.10	38.30	23.90	59.72	49.72	21.4	25.8	N	
4	1.16100	19.30	14.70	10.20	29.50	24.90	56.00	46.00	26.5	21.1	N	
5	7.33250	16.30	10.90	10.68	26.98	21.58	60.00	50.00	33.0	28.4	N	
6	14.66500	11.40	4.70	11.16	22.56	15.86	60.00	50.00	37.4	34.1	N	
7	0.15315	37.10	20.00	10.08	47.18	30.08	65.83	55.83	18.6	25.7	L	
8	0.23170	29.00	11.60	10.09	39.09	21.69	62.39	52.39	23.3	30.7	L	
9	0.31790	26.60	11.10	10.11	36.71	21.21	59.76	49.76	23.0	28.5	L	
10	1.06400	14.10	9.50	10.20	24.30	19.70	56.00	46.00	31.7	26.3	L	
11	7.41250	10.10	4.80	10.74	20.84	15.54	60.00	50.00	39.1	34.4	L	
12	13.03500	8.60	3.50	11.22	19.82	14.72	60.00	50.00	40.1	35.2	L	

Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(AMN+Cable+ATT)[dB]
AMN:CLS-11

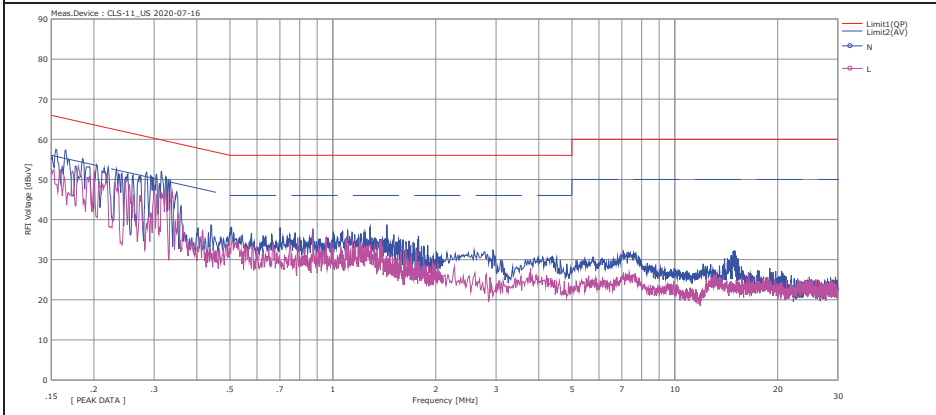
Conducted Emission

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.5 Shielded Room
Date	June 25, 2021
Temperature / Humidity	22 deg. C / 48 % RH
Engineer	Kazuhiro Ando
Mode	Tx BT LE, 2M-PHY

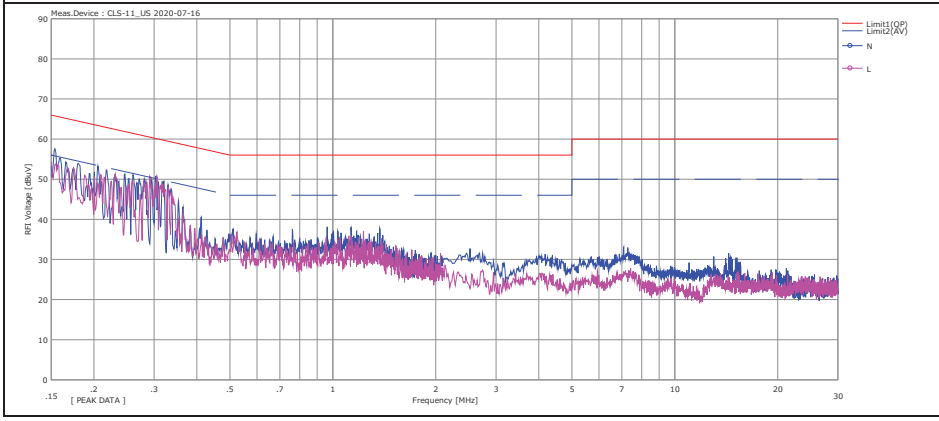
2402 MHz



2440 MHz



2480 MHz



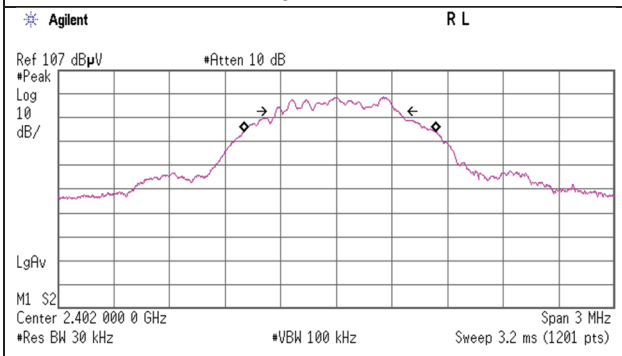
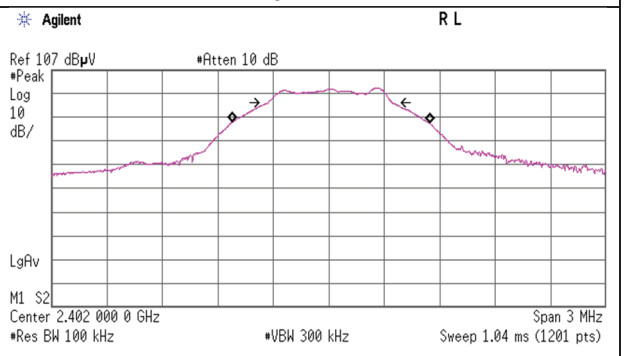
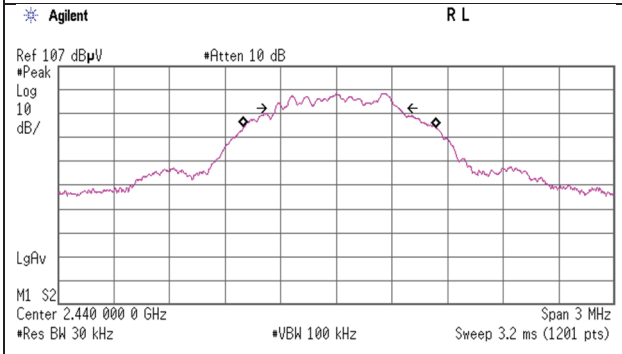
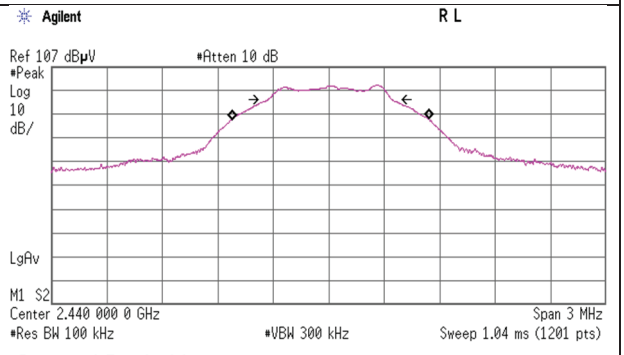
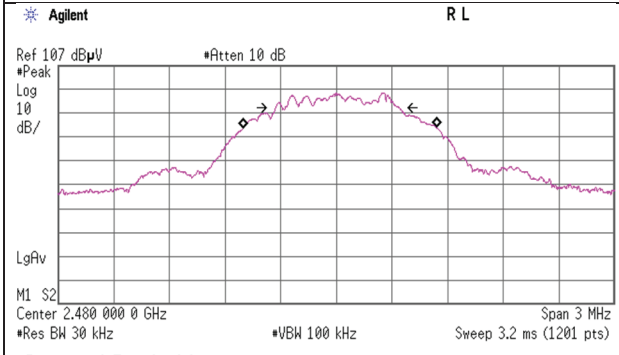
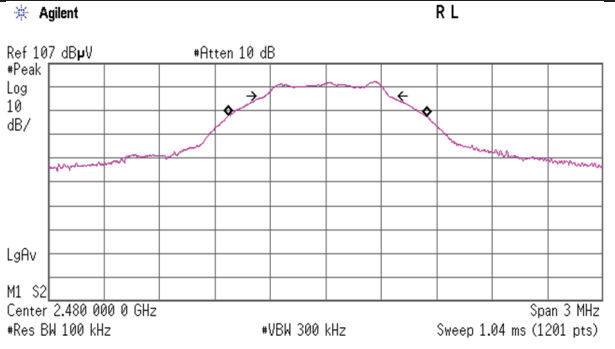
99 % Occupied Bandwidth and 6 dB Bandwidth

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 18, 2021
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx BT LE

Mode	Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
1M-PHY	2402	1032.2	0.670	> 0.5000
	2440	1036.3	0.675	> 0.5000
	2480	1042.2	0.670	> 0.5000
2M-PHY	2402	2057.8	1.176	> 0.5000
	2440	2058.3	1.155	> 0.5000
	2480	2070.1	1.164	> 0.5000

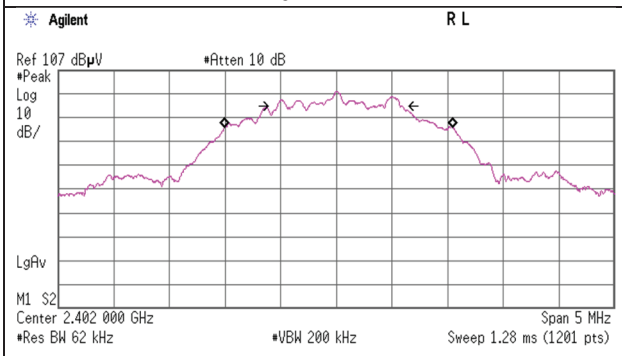
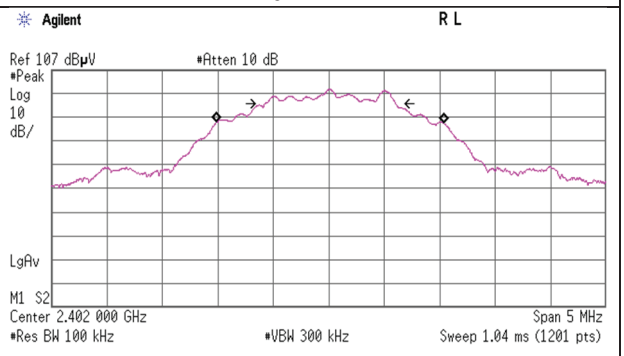
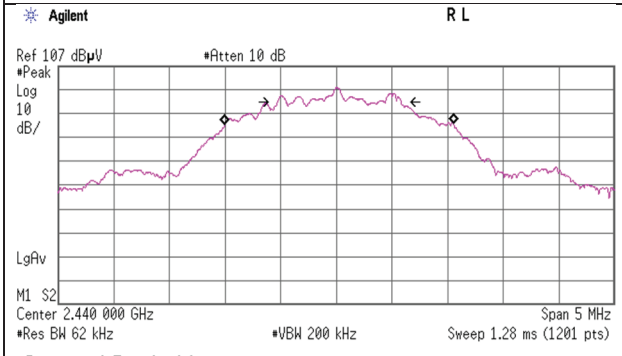
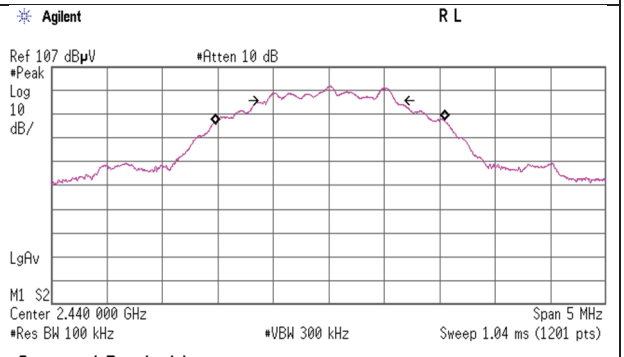
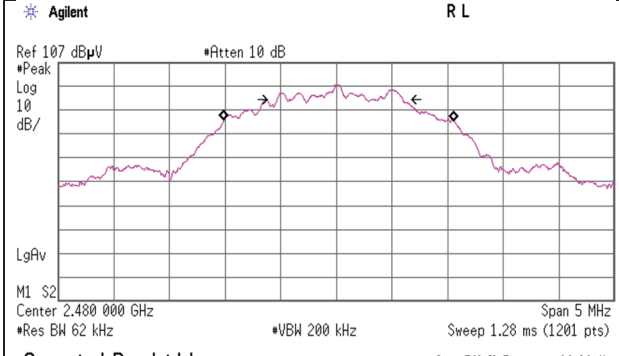
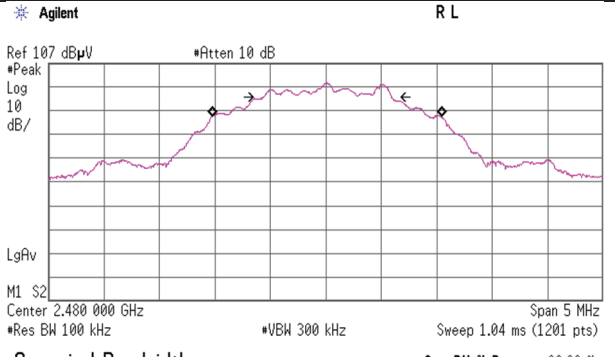
99 % Occupied Bandwidth and 6 dB Bandwidth

BT LE 1M-PHY

99 % Occupied Bandwidth	6 dB Bandwidth
2402 MHz	2402 MHz
	
2440 MHz	2440 MHz
	
2480 MHz	2480 MHz
	

99 % Occupied Bandwidth and 6 dB Bandwidth

BT LE 2M-PHY

99 % Occupied Bandwidth	6 dB Bandwidth
2402 MHz	2402 MHz
	
2440 MHz	2440 MHz
	
2480 MHz	2480 MHz
	

Maximum Peak Output Power

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 18, 2021
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx BT LE

125 kbps				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-7.50	1.71	10.05	4.26	2.67	30.00	1000	25.74	-1.39	2.87	1.94	36.02	4000	33.15
2440	-7.57	1.72	10.05	4.20	2.63	30.00	1000	25.80	-1.42	2.78	1.90	36.02	4000	33.24
2480	-7.63	1.73	10.05	4.15	2.60	30.00	1000	25.85	-2.00	2.15	1.64	36.02	4000	33.87

500 kbps				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-7.47	1.71	10.05	4.29	2.69	30.00	1000	25.71	-1.39	2.90	1.95	36.02	4000	33.12
2440	-7.57	1.72	10.05	4.20	2.63	30.00	1000	25.80	-1.42	2.78	1.90	36.02	4000	33.24
2480	-7.64	1.73	10.05	4.14	2.59	30.00	1000	25.86	-2.00	2.14	1.64	36.02	4000	33.88

1M-PHY				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-7.46	1.71	10.05	4.30	2.69	30.00	1000	25.70	-1.39	2.91	1.95	36.02	4000	33.11
2440	-7.53	1.72	10.05	4.24	2.65	30.00	1000	25.76	-1.42	2.82	1.91	36.02	4000	33.20
2480	-7.59	1.73	10.05	4.19	2.62	30.00	1000	25.81	-2.00	2.19	1.66	36.02	4000	33.83

2M-PHY				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-7.43	1.71	10.05	4.33	2.71	30.00	1000	25.67	-1.39	2.94	1.97	36.02	4000	33.08
2440	-7.53	1.72	10.05	4.24	2.65	30.00	1000	25.76	-1.42	2.82	1.91	36.02	4000	33.20
2480	-7.59	1.73	10.05	4.19	2.62	30.00	1000	25.81	-2.00	2.19	1.66	36.02	4000	33.83

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.

Average Output Power
(Reference data for RF Exposure)

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 18, 2021
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx BT LE

125 kbps

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-7.90	1.71	10.05	3.86	2.43	0.11	3.97	2.49
2440	-7.97	1.72	10.05	3.80	2.40	0.11	3.91	2.46
2480	-8.03	1.73	10.05	3.75	2.37	0.11	3.86	2.43

500 kbps

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-8.20	1.71	10.05	3.56	2.27	0.41	3.97	2.49
2440	-8.27	1.72	10.05	3.50	2.24	0.41	3.91	2.46
2480	-8.33	1.73	10.05	3.45	2.21	0.41	3.86	2.43

1M-PHY

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-8.49	1.71	10.05	3.27	2.12	0.69	3.96	2.49
2440	-8.56	1.72	10.05	3.21	2.09	0.69	3.90	2.45
2480	-8.62	1.73	10.05	3.16	2.07	0.69	3.85	2.43

2M-PHY

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-10.22	1.71	10.05	1.54	1.43	2.42	3.96	2.49
2440	-10.28	1.72	10.05	1.49	1.41	2.42	3.91	2.46
2480	-10.34	1.73	10.05	1.44	1.39	2.42	3.86	2.43

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

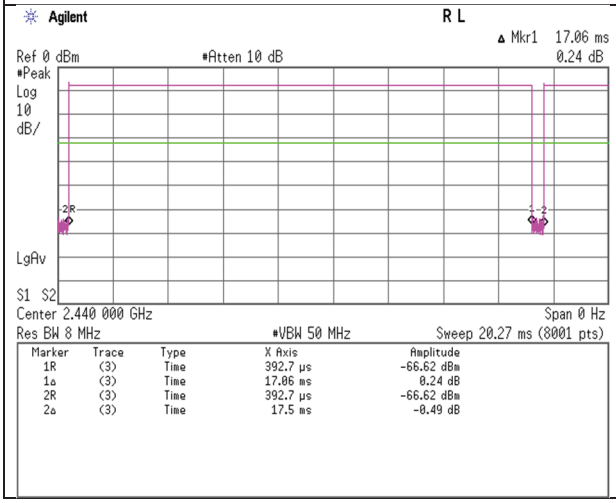
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst rate confirmation

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 18, 2021
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx BT LE

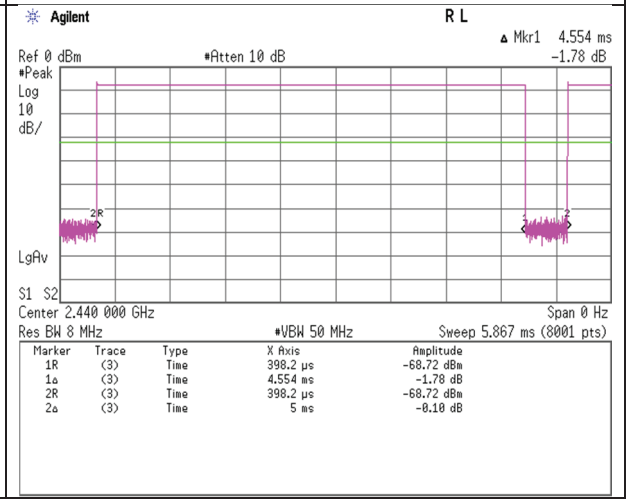
125 kbps

Tx on / (Tx on + Tx off) = 0.975
Tx on / (Tx on + Tx off) * 100 = 97.5 %
Duty factor = 10 * log (17.5 / 17.06) = 0.11 dB



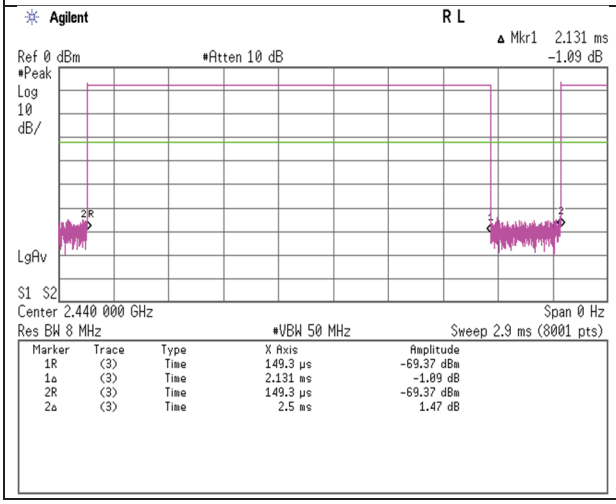
500 kbps

Tx on / (Tx on + Tx off) = 0.911
Tx on / (Tx on + Tx off) * 100 = 91.1 %
Duty factor = 10 * log (5 / 4.554) = 0.41 dB



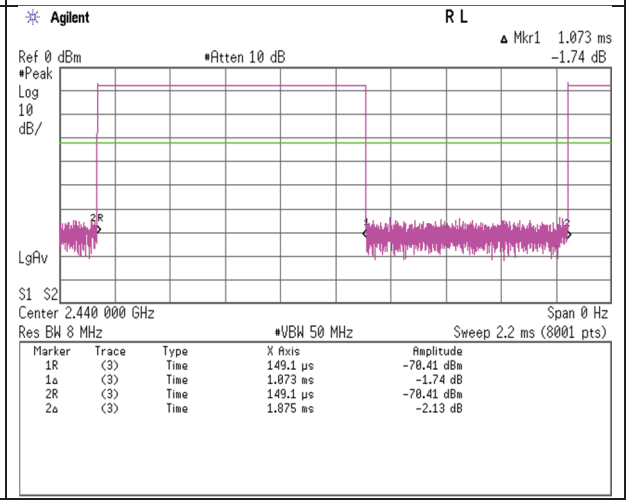
1M-PHY

Tx on / (Tx on + Tx off) = 0.852
Tx on / (Tx on + Tx off) * 100 = 85.2 %
Duty factor = 10 * log (2.5 / 2.131) = 0.69 dB



2M-PHY

Tx on / (Tx on + Tx off) = 0.572
Tx on / (Tx on + Tx off) * 100 = 57.2 %
Duty factor = 10 * log (1.875 / 1.073) = 2.42 dB

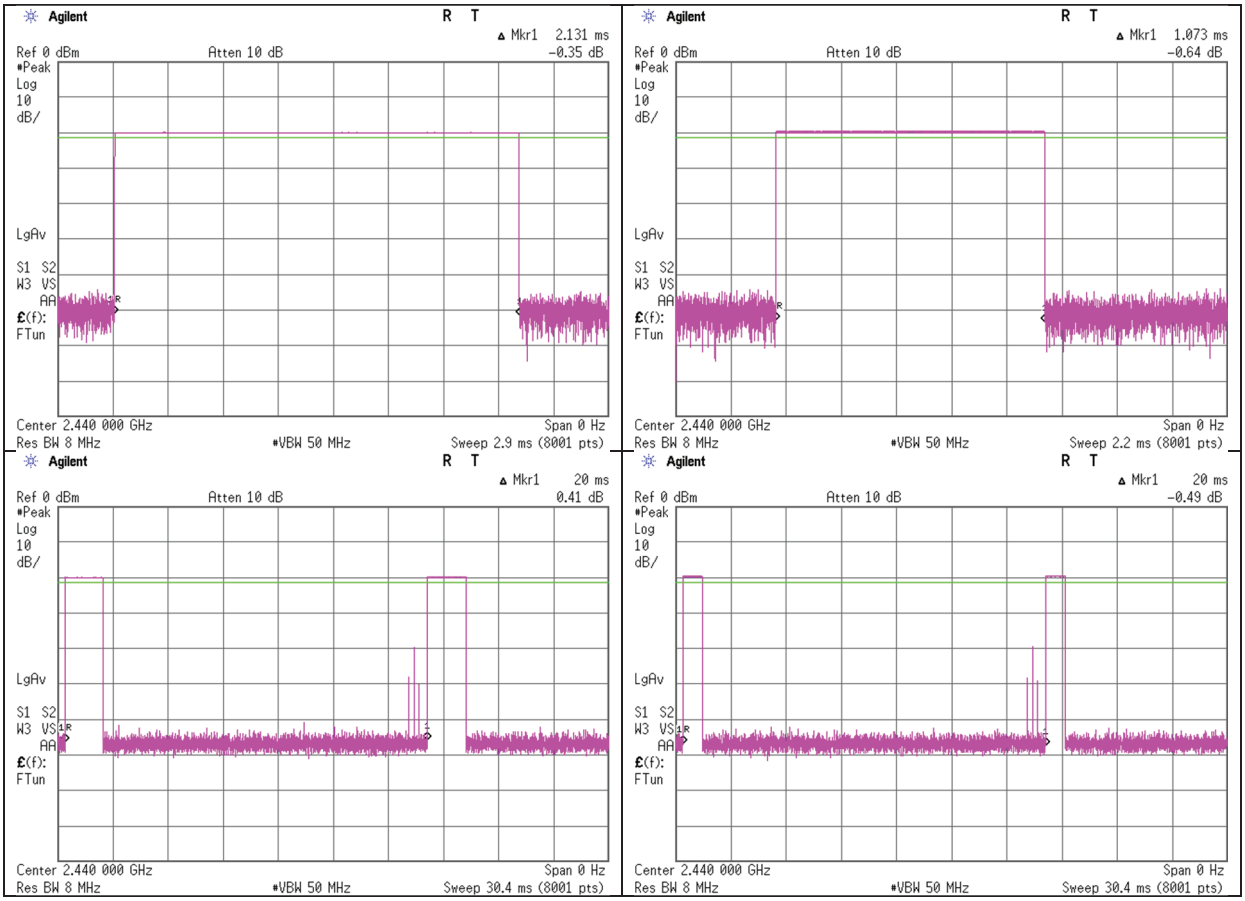


* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Duty cycle correction factor

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	July 27, 2021
Temperature / Humidity	22 deg. C / 60 % RH
Engineer	Kazuhiro Ando
Mode	Tx BT LE

1M-PHY **2M-PHY**



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

1 M-PHY	2 M-PHY
DCCF = 20 log(2.131 x 5 / 100) = -19.44 dB	DCCF = 20 log(1.073 x 5 / 100) = -25.40 dB

This device transmits to one of the data channels once 20 ms. Therefore, it may be transmitted up to 5 times in 100 ms.

Radiated Spurious Emission

Report No.	13850591M-A			
Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.6	No.6
Date	June 23, 2021	June 24, 2021	July 1, 2021	July 2, 2021
Temperature / Humidity	23 deg. C / 53 % RH	22 deg. C / 52 % RH	20 deg. C / 59 % RH	21 deg. C / 52 % RH
Engineer	Hiromitsu Tanabe	Kazuhiro Ando	Kazuhiro Ando	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 1M-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.	210.360	QP	33.80	9.85	7.07	32.07	0.00	18.65	43.5	24.8	150	162	
Hori.	2390.000	PK	57.90	27.61	13.33	43.84	2.48	57.48	73.9	16.4	205	0	
Hori.	4804.000	PK	54.30	32.69	5.35	45.17	2.48	49.65	73.9	24.2	121	21	
Hori.	7206.000	PK	57.80	37.26	6.64	44.07	2.48	60.11	73.9	13.7	180	46	
Hori.	9608.000	PK	46.50	38.09	7.44	41.90	2.48	52.61	73.9	21.2	296	0	
Hori.	12010.000	PK	64.27	38.66	8.39	43.38	-9.54	58.40	73.9	15.5	162	42	
Hori.	14412.000	PK	59.49	41.15	9.35	44.91	-9.54	55.54	73.9	18.3	144	44	
Vert.	34.950	QP	33.00	12.84	5.71	32.21	0.00	19.34	40.0	20.6	100	252	
Vert.	73.100	QP	32.90	10.92	6.11	32.19	0.00	17.74	40.0	22.2	100	123	
Vert.	182.611	QP	36.10	11.34	6.91	32.09	0.00	22.26	43.5	21.2	100	156	
Vert.	210.360	QP	44.90	9.85	7.07	32.07	0.00	29.75	43.5	13.7	100	154	
Vert.	490.848	QP	35.20	17.71	8.38	32.00	0.00	29.29	46.0	16.7	100	142	
Vert.	631.080	QP	34.60	20.67	8.94	32.04	0.00	32.17	46.0	13.8	100	29	
Vert.	2390.000	PK	57.60	27.61	13.33	43.84	2.48	57.18	73.9	16.7	356	59	
Vert.	4804.000	PK	54.50	32.69	5.35	45.17	2.48	49.85	73.9	24.0	123	126	
Vert.	7206.000	PK	58.40	37.26	6.64	44.07	2.48	60.71	73.9	13.1	185	87	
Vert.	9608.000	PK	46.70	38.09	7.44	41.90	2.48	52.81	73.9	21.0	100	228	
Vert.	12010.000	PK	62.46	38.66	8.39	43.38	-9.54	56.59	73.9	17.3	129	0	
Vert.	14412.000	PK	52.76	41.15	9.35	44.91	-9.54	48.81	73.9	25.0	189	66	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

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	AV	57.90	27.61	13.33	43.84	-19.44	2.48	38.04	53.9	15.8	*1)
Hori.	4804.000	AV	54.30	32.69	5.35	45.17	-19.44	2.48	30.21	53.9	23.6	
Hori.	7206.000	AV	57.80	37.26	6.64	44.07	-19.44	2.48	40.67	53.9	13.2	
Hori.	9608.000	AV	46.50	38.09	7.44	41.90	-19.44	2.48	33.17	53.9	20.7	
Hori.	12010.000	AV	64.27	38.66	8.39	43.38	-19.44	-9.54	38.96	53.9	14.9	
Hori.	14412.000	AV	59.49	41.15	9.35	44.91	-19.44	-9.54	36.10	53.9	17.8	
Vert.	2390.000	AV	57.60	27.61	13.33	43.84	-19.44	2.48	37.74	53.9	16.1	*1)
Vert.	4804.000	AV	54.50	32.69	5.35	45.17	-19.44	2.48	30.41	53.9	23.4	
Vert.	7206.000	AV	58.40	37.26	6.64	44.07	-19.44	2.48	41.27	53.9	**12.6**	
Vert.	9608.000	AV	46.70	38.09	7.44	41.90	-19.44	2.48	33.37	53.9	20.5	
Vert.	12010.000	AV	62.46	38.66	8.39	43.38	-19.44	-9.54	37.15	53.9	16.7	
Vert.	14412.000	AV	52.76	41.15	9.35	44.91	-19.44	-9.54	29.37	53.9	24.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" 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	94.40	27.61	13.34	43.83	2.48	94.00	-	-	Carrier
Hori.	2400.000	PK	56.60	27.60	13.34	43.83	2.48	56.19	74.00	17.8	
Vert.	2402.000	PK	93.20	27.61	13.34	43.83	2.48	92.80	-	-	Carrier
Vert.	2400.000	PK	55.70	27.60	13.34	43.83	2.48	55.29	72.80	17.5	

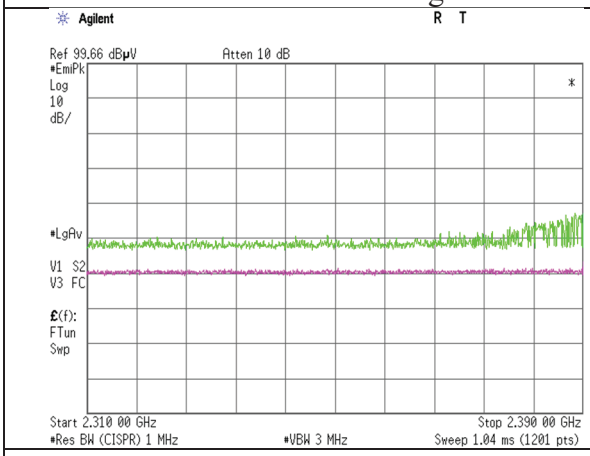
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13850591M-A
Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	June 24, 2021
Temperature / Humidity	22 deg. C / 52 % RH
Engineer	Kazuhiro Ando
	(1 GHz - 10 GHz)
Mode	Tx BT LE 1M-PHY, 2402 MHz

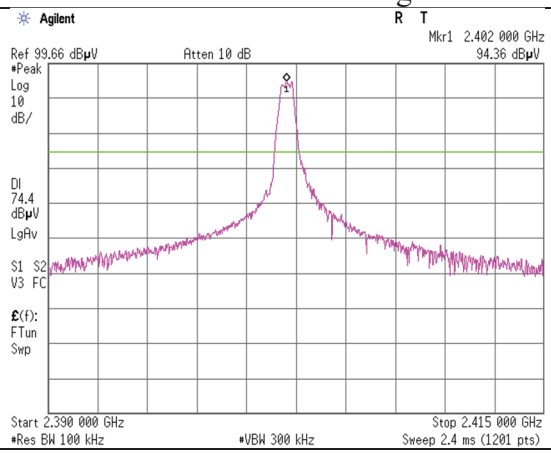
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

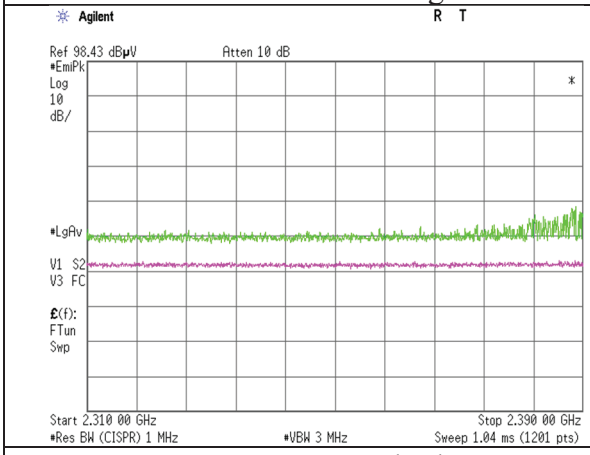
Authorized-band band-edge Plot



20dBc Plot

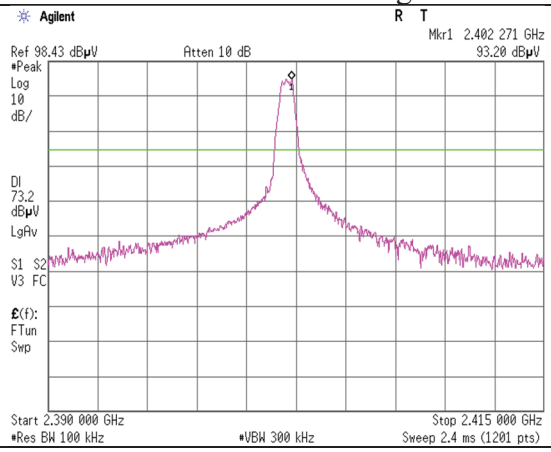
Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Authorized-band band-edge Plot



20dBc Plot

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

Radiated Spurious Emission

Report No.	13850591M-A			
Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.6	No.6
Date	June 23, 2021	June 24, 2021	July 1, 2021	July 2, 2021
Temperature / Humidity	23 deg. C / 53 % RH	22 deg. C / 52 % RH	20 deg. C / 59 % RH	21 deg. C / 52 % RH
Engineer	Hiromitsu Tanabe	Kazuhiro Ando	Kazuhiro Ando	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 1M-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.	210.360	QP	33.90	9.85	7.07	32.07	0.00	18.75	43.5	24.7	150	164	
Hori.	4880.000	PK	53.50	32.62	5.40	45.21	2.48	48.79	73.9	25.1	120	203	
Hori.	7320.000	PK	57.50	37.54	6.63	43.80	2.48	60.35	73.9	13.5	167	49	
Hori.	9760.000	PK	48.70	38.09	7.47	41.79	2.48	54.95	73.9	18.9	261	0	
Hori.	12200.000	PK	65.32	38.74	8.45	43.56	-9.54	59.41	73.9	14.4	142	36	
Hori.	14640.000	PK	60.21	41.77	9.36	45.36	-9.54	56.44	73.9	17.4	154	50	
Vert.	34.100	QP	33.00	12.79	5.70	32.21	0.00	19.28	40.0	20.7	100	295	
Vert.	73.100	QP	31.90	10.92	6.11	32.19	0.00	16.74	40.0	23.2	100	24	
Vert.	182.040	QP	34.90	11.38	6.91	32.09	0.00	21.10	43.5	22.4	100	162	
Vert.	210.364	QP	44.60	9.85	7.07	32.07	0.00	29.45	43.5	14.0	100	167	
Vert.	490.848	QP	34.60	17.71	8.38	32.00	0.00	28.69	46.0	17.3	100	146	
Vert.	631.080	QP	34.70	20.67	8.94	32.04	0.00	32.27	46.0	13.7	100	26	
Vert.	4880.000	PK	52.70	32.62	5.40	45.21	2.48	47.99	73.9	25.9	112	111	
Vert.	7320.000	PK	56.70	37.54	6.63	43.80	2.48	59.55	73.9	14.3	148	100	
Vert.	9760.000	PK	45.90	38.09	7.47	41.79	2.48	52.15	73.9	21.7	140	170	
Vert.	12200.000	PK	65.00	38.74	8.45	43.56	-9.54	59.09	73.9	14.8	129	0	
Vert.	14640.000	PK	53.34	41.77	9.36	45.36	-9.54	49.57	73.90	24.3	146	142	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

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	AV	53.50	32.62	5.40	45.21	-19.44	2.48	29.35	53.9	24.5	
Hori.	7320.000	AV	57.50	37.54	6.63	43.80	-19.44	2.48	40.91	53.9	**12.9**	
Hori.	9760.000	AV	48.70	38.09	7.47	41.79	-19.44	2.48	35.51	53.9	18.3	
Hori.	12200.000	AV	65.32	38.74	8.45	43.56	-19.44	-9.54	39.97	53.9	13.9	
Hori.	14640.000	AV	60.21	41.77	9.36	45.36	-19.44	-9.54	37.00	53.9	16.9	
Vert.	4880.000	AV	52.70	32.62	5.40	45.21	-19.44	2.48	28.55	53.9	25.3	
Vert.	7320.000	AV	56.70	37.54	6.63	43.80	-19.44	2.48	40.11	53.9	13.7	
Vert.	9760.000	AV	45.90	38.09	7.47	41.79	-19.44	2.48	32.71	53.9	21.1	
Vert.	12200.000	AV	65.00	38.74	8.45	43.56	-19.44	-9.54	39.65	53.9	14.2	
Vert.	14640.000	AV	53.34	41.77	9.36	45.36	-19.44	-9.54	30.13	53.9	23.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

Radiated Spurious Emission

Report No.	13850591M-A			
Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.6	No.6
Date	June 23, 2021	June 24, 2021	July 1, 2021	July 2, 2021
Temperature / Humidity	23 deg. C / 53 % RH	22 deg. C / 52 % RH	20 deg. C / 59 % RH	21 deg. C / 52 % RH
Engineer	Hiromitsu Tanabe	Kazuhiro Ando	Kazuhiro Ando	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 1M-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.	210.360	QP	34.10	9.85	7.07	32.07	0.00	18.95	43.5	24.5	150	163	
Hori.	2483.500	PK	66.70	28.01	13.41	43.80	2.48	66.80	73.9	7.1	177	123	
Hori.	4960.000	PK	53.50	32.69	5.46	45.26	2.48	48.87	73.9	25.0	128	201	
Hori.	7440.000	PK	55.80	37.51	6.68	43.50	2.48	58.97	73.9	14.9	169	57	
Hori.	9920.000	PK	48.90	38.26	7.56	41.76	2.48	55.44	73.9	18.4	237	0	
Hori.	12400.000	PK	66.45	38.13	8.56	43.80	-9.54	59.80	73.9	14.1	158	35	
Hori.	14880.000	PK	59.01	41.41	9.38	44.84	-9.54	55.42	73.9	18.4	156	53	
Vert.	34.100	QP	33.20	12.79	5.70	32.21	0.00	19.48	40.0	20.5	100	276	
Vert.	73.100	QP	32.60	10.92	6.11	32.19	0.00	17.44	40.0	22.5	100	28	
Vert.	182.040	QP	32.80	11.38	6.91	32.09	0.00	19.00	43.5	24.5	100	159	
Vert.	210.364	QP	44.70	9.85	7.07	32.07	0.00	29.55	43.5	13.9	100	160	
Vert.	490.848	QP	34.80	17.71	8.38	32.00	0.00	28.89	46.0	17.1	100	138	
Vert.	631.080	QP	34.70	20.67	8.94	32.04	0.00	32.27	46.0	13.7	100	28	
Vert.	2483.500	PK	66.80	28.01	13.41	43.80	2.48	66.90	73.9	7.0	177	123	
Vert.	4960.000	PK	53.30	32.69	5.46	45.26	2.48	48.67	73.9	25.2	137	106	
Vert.	7440.000	PK	55.20	37.51	6.68	43.50	2.48	58.37	73.9	15.5	149	99	
Vert.	9920.000	PK	46.50	38.26	7.56	41.76	2.48	53.04	73.9	20.8	146	70	
Vert.	12400.000	PK	64.17	38.13	8.56	43.80	-9.54	57.52	73.9	16.3	127	0	
Vert.	14880.000	PK	52.94	41.41	9.38	44.84	-9.54	49.35	73.9	24.5	147	92	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

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	AV	66.70	28.01	13.41	43.80	-19.44	2.48	47.36	53.9	6.5	*1)
Hori.	4960.000	AV	53.50	32.69	5.46	45.26	-19.44	2.48	29.43	53.9	24.4	
Hori.	7440.000	AV	55.80	37.51	6.68	43.50	-19.44	2.48	39.53	53.9	14.3	
Hori.	9920.000	AV	48.90	38.26	7.56	41.76	-19.44	2.48	36.00	53.9	17.9	
Hori.	12400.000	AV	66.45	38.13	8.56	43.80	-19.44	-9.54	40.36	53.9	13.5	
Hori.	14880.000	AV	59.01	41.41	9.38	44.84	-19.44	-9.54	35.98	53.9	17.9	
Vert.	2483.500	AV	66.80	28.01	13.41	43.80	-19.44	2.48	47.46	53.9	**6.4**	*1)
Vert.	4960.000	AV	53.30	32.69	5.46	45.26	-19.44	2.48	29.23	53.9	24.6	
Vert.	7440.000	AV	55.20	37.51	6.68	43.50	-19.44	2.48	38.93	53.9	14.9	
Vert.	9920.000	AV	46.50	38.26	7.56	41.76	-19.44	2.48	33.60	53.9	20.3	
Vert.	12400.000	AV	64.17	38.13	8.56	43.80	-19.44	-9.54	38.08	53.9	15.8	
Vert.	14880.000	AV	52.94	41.41	9.38	44.84	-19.44	-9.54	29.91	53.9	23.9	

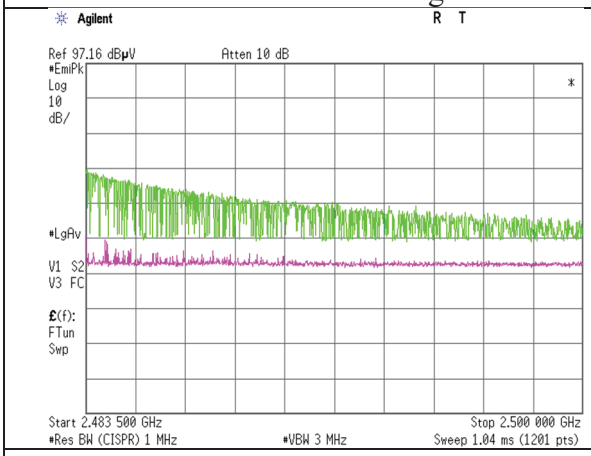
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13850591M-A
Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	June 24, 2021
Temperature / Humidity	22 deg. C / 52 % RH
Engineer	Kazuhiro Ando
	(1 GHz - 10 GHz)
Mode	Tx BT LE 1M-PHY, 2480 MHz

Horizontal

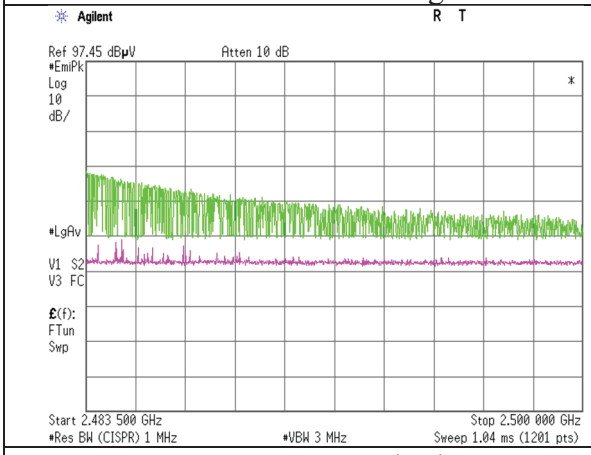
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Report No.	13850591M-A			
Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.6	No.6
Date	June 23, 2021	June 24, 2021	July 1, 2021	July 2, 2021
Temperature / Humidity	23 deg. C / 53 % RH	22 deg. C / 52 % RH	20 deg. C / 59 % RH	21 deg. C / 52 % RH
Engineer	Hiromitsu Tanabe	Kazuhiro Ando	Kazuhiro Ando	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2M-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.	210.360	QP	34.10	9.85	7.07	32.07	0.00	18.95	43.5	24.5	150	161	
Hori.	2390.000	PK	56.00	27.61	13.33	43.84	2.48	55.58	73.9	18.3	207	307	
Hori.	4804.000	PK	53.60	32.69	5.35	45.17	2.48	48.95	73.9	24.9	218	201	
Hori.	7206.000	PK	57.60	37.26	6.64	44.07	2.48	59.91	73.9	13.9	178	43	
Hori.	9608.000	PK	46.20	38.09	7.44	41.90	2.48	52.31	73.9	21.5	283	303	
Hori.	12010.000	PK	63.91	38.66	8.39	43.38	-9.54	58.04	73.9	15.8	157	43	
Hori.	14412.000	PK	59.36	41.15	9.35	44.91	-9.54	55.41	73.9	18.4	168	46	
Vert.	34.100	QP	33.40	12.79	5.70	32.21	0.00	19.68	40.0	20.3	100	274	
Vert.	73.100	QP	32.20	10.92	6.11	32.19	0.00	17.04	40.0	22.9	100	22	
Vert.	190.200	QP	36.30	10.47	6.96	32.09	0.00	21.64	43.5	21.8	100	159	
Vert.	210.364	QP	44.50	9.85	7.07	32.07	0.00	29.35	43.5	14.1	100	161	
Vert.	490.848	QP	34.00	17.71	8.38	32.00	0.00	28.09	46.0	17.9	100	137	
Vert.	631.080	QP	35.00	20.67	8.94	32.04	0.00	32.57	46.00	13.4	100	29	
Vert.	2390.000	PK	56.80	27.61	13.33	43.84	2.48	56.38	73.90	17.5	252	120	
Vert.	4804.000	PK	53.30	32.69	5.35	45.17	2.48	48.65	73.90	25.2	127	121	
Vert.	7206.000	PK	57.50	37.26	6.64	44.07	2.48	59.81	73.90	14.0	206	87	
Vert.	9608.000	PK	46.60	38.09	7.44	41.90	2.48	52.71	73.90	21.1	113	212	
Vert.	12010.000	PK	61.40	38.66	8.39	43.38	-9.54	55.53	73.90	18.3	138	0	
Vert.	14412.000	PK	51.77	41.15	9.35	44.91	-9.54	47.82	73.90	26.0	139	138	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

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	AV	56.00	27.61	13.33	43.84	-25.40	2.48	30.18	53.9	23.7	*1)
Hori.	4804.000	AV	53.60	32.69	5.35	45.17	-25.40	2.48	23.55	53.9	30.3	
Hori.	7206.000	AV	57.60	37.26	6.64	44.07	-25.40	2.48	34.51	53.9	19.3	
Hori.	9608.000	AV	46.20	38.09	7.44	41.90	-25.40	2.48	26.91	53.9	26.9	
Hori.	12010.000	AV	63.91	38.66	8.39	43.38	-25.40	-9.54	32.64	53.9	21.2	
Hori.	14412.000	AV	59.36	41.15	9.35	44.91	-25.40	-9.54	30.01	53.9	23.8	
Vert.	2390.000	AV	56.80	27.61	13.33	43.84	-25.40	2.48	30.98	53.9	22.9	*1)
Vert.	4804.000	AV	53.30	32.69	5.35	45.17	-25.40	2.48	23.25	53.9	30.6	
Vert.	7206.000	AV	57.50	37.26	6.64	44.07	-25.40	2.48	34.41	53.9	19.4	
Vert.	9608.000	AV	46.60	38.09	7.44	41.90	-25.40	2.48	27.31	53.9	26.5	
Vert.	12010.000	AV	61.40	38.66	8.39	43.38	-25.40	-9.54	30.13	53.9	23.7	
Vert.	14412.000	AV	51.77	41.15	9.35	44.91	-25.40	-9.54	22.42	53.9	31.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.
*1) Not out of band emission (Leakage Power)

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

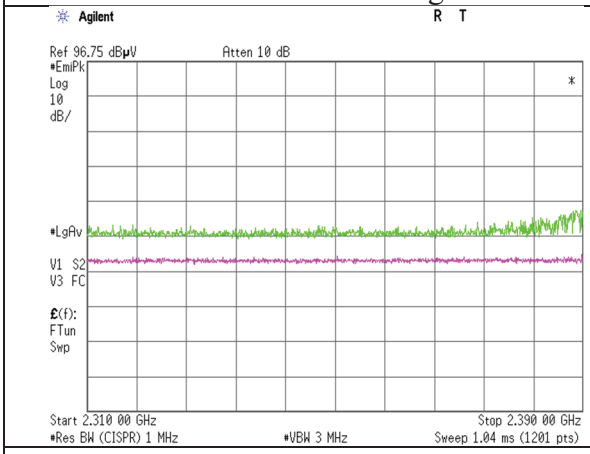
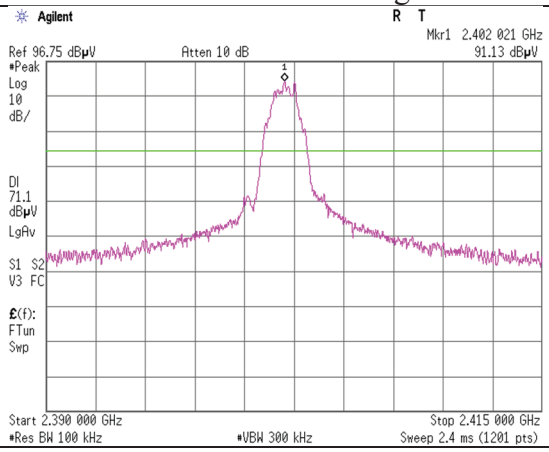
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	91.20	27.61	13.34	43.83	2.48	90.80	-	-	Carrier
Hori.	2400.000	PK	58.70	27.60	13.34	43.83	2.48	58.29	70.80	**12.5**	
Vert.	2402.000	PK	92.00	27.61	13.34	43.83	2.48	91.60	-	-	Carrier
Vert.	2400.000	PK	59.40	27.60	13.34	43.83	2.48	58.99	71.60	12.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

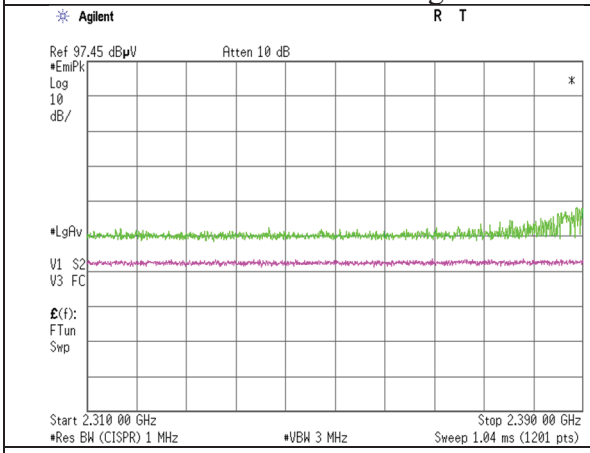
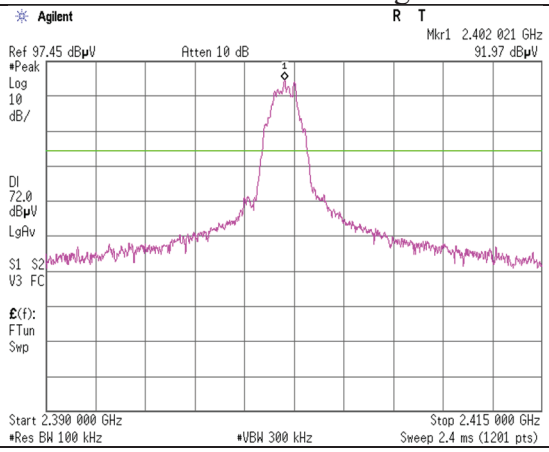
Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13850591M-A
Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	June 24, 2021
Temperature / Humidity	22 deg. C / 52 % RH
Engineer	Kazuhiro Ando
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2M-PHY, 2402 MHz

Horizontal

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Report No.	13850591M-A			
Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.6	No.6
Date	June 23, 2021	June 24, 2021	July 1, 2021	July 2, 2021
Temperature / Humidity	23 deg. C / 53 % RH	22 deg. C / 52 % RH	20 deg. C / 59 % RH	21 deg. C / 52 % RH
Engineer	Hiromitsu Tanabe	Kazuhiro Ando	Kazuhiro Ando	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2M-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.	210.360	QP	34.10	9.85	7.07	32.07	0.00	18.95	43.5	24.5	150	157	
Hori.	4880.000	PK	52.00	32.62	5.40	45.21	2.48	47.29	73.9	26.6	162	202	
Hori.	7320.000	PK	56.40	37.54	6.63	43.80	2.48	59.25	73.9	14.6	235	46	
Hori.	9760.000	PK	47.30	38.09	7.47	41.79	2.48	53.55	73.9	20.3	266	0	
Hori.	12200.000	PK	65.22	38.74	8.45	43.56	-9.54	59.31	73.9	14.5	157	33	
Hori.	14640.000	PK	59.40	41.77	9.36	45.36	-9.54	55.63	73.9	18.2	153	51	
Vert.	34.100	QP	35.10	12.79	5.70	32.21	0.00	21.38	40.0	18.6	100	276	
Vert.	73.100	QP	32.30	10.92	6.11	32.19	0.00	17.14	40.0	22.8	100	28	
Vert.	190.200	QP	37.10	10.47	6.96	32.09	0.00	22.44	43.5	21.0	100	160	
Vert.	210.364	QP	44.80	9.85	7.07	32.07	0.00	29.65	43.5	13.8	100	167	
Vert.	490.848	QP	34.00	17.71	8.38	32.00	0.00	28.09	46.0	17.9	100	136	
Vert.	631.080	QP	35.00	20.67	8.94	32.04	0.00	32.57	46.0	**13.4**	100	24	
Vert.	4880.000	PK	50.80	32.62	5.40	45.21	2.48	46.09	73.9	27.8	148	255	
Vert.	7320.000	PK	56.50	37.54	6.63	43.80	2.48	59.35	73.9	14.5	177	97	
Vert.	9760.000	PK	45.80	38.09	7.47	41.79	2.48	52.05	73.9	21.8	166	122	
Vert.	12200.000	PK	64.48	38.74	8.45	43.56	-9.54	58.57	73.9	15.3	128	0	
Vert.	14640.000	PK	52.34	41.77	9.36	45.36	-9.54	48.57	73.9	25.3	142	145	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

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	AV	52.00	32.62	5.40	45.21	-25.40	2.48	21.89	53.9	32.0	
Hori.	7320.000	AV	56.40	37.54	6.63	43.80	-25.40	2.48	33.85	53.9	20.0	
Hori.	9760.000	AV	47.30	38.09	7.47	41.79	-25.40	2.48	28.15	53.9	25.7	
Hori.	12200.000	AV	65.22	38.74	8.45	43.56	-25.40	-9.54	33.91	53.9	19.9	
Hori.	14640.000	AV	59.40	41.77	9.36	45.36	-25.40	-9.54	30.23	53.9	23.6	
Vert.	4880.000	AV	50.80	32.62	5.40	45.21	-25.40	2.48	20.69	53.9	33.2	
Vert.	7320.000	AV	56.50	37.54	6.63	43.80	-25.40	2.48	33.95	53.9	19.9	
Vert.	9760.000	AV	45.80	38.09	7.47	41.79	-25.40	2.48	26.65	53.9	27.2	
Vert.	12200.000	AV	64.48	38.74	8.45	43.56	-25.40	-9.54	33.17	53.9	20.7	
Vert.	14640.000	AV	52.34	41.77	9.36	45.36	-25.40	-9.54	23.17	53.9	30.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

Radiated Spurious Emission

Report No.	13850591M-A			
Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.6	No.6
Date	June 23, 2021	June 24, 2021	July 1, 2021	July 2, 2021
Temperature / Humidity	23 deg. C / 53 % RH	22 deg. C / 52 % RH	20 deg. C / 59 % RH	21 deg. C / 52 % RH
Engineer	Hiromitsu Tanabe	Kazuhiro Ando	Kazuhiro Ando	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2M-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.	210.360	QP	34.00	9.85	7.07	32.07	0.00	18.85	43.5	24.6	150	160	
Hori.	2483.500	PK	68.60	28.01	13.41	43.80	2.48	68.70	73.9	**5.2**	261	0	
Hori.	4960.000	PK	52.30	32.69	5.46	45.26	2.48	47.67	73.9	26.2	146	58	
Hori.	7440.000	PK	55.40	37.51	6.68	43.50	2.48	58.57	73.9	15.3	170	55	
Hori.	9920.000	PK	48.80	38.26	7.56	41.76	2.48	55.34	73.9	18.5	100	0	
Hori.	12400.000	PK	66.73	38.13	8.56	43.80	-9.54	60.08	73.9	13.8	160	34	
Hori.	14880.000	PK	59.11	41.41	9.38	44.84	-9.54	55.52	73.9	18.3	154	51	
Vert.	34.100	QP	33.80	12.79	5.70	32.21	0.00	20.08	40.0	19.9	100	278	
Vert.	73.100	QP	32.20	10.92	6.11	32.19	0.00	17.04	40.0	22.9	100	25	
Vert.	190.200	QP	36.10	10.47	6.96	32.09	0.00	21.44	43.5	22.0	100	151	
Vert.	210.364	QP	44.70	9.85	7.07	32.07	0.00	29.55	43.5	13.9	100	171	
Vert.	490.848	QP	33.50	17.71	8.38	32.00	0.00	27.59	46.0	18.4	100	132	
Vert.	631.080	QP	34.90	20.67	8.94	32.04	0.00	32.47	46.00	13.5	100	20	
Vert.	2483.500	PK	67.30	28.01	13.41	43.80	2.48	67.40	73.90	6.5	204	129	
Vert.	4960.000	PK	51.80	32.69	5.46	45.26	2.48	47.17	73.90	26.7	169	97	
Vert.	7440.000	PK	54.60	37.51	6.68	43.50	2.48	57.77	73.90	16.1	152	88	
Vert.	9920.000	PK	46.30	38.26	7.56	41.76	2.48	52.84	73.90	21.0	151	85	
Vert.	12400.000	PK	63.75	38.13	8.56	43.80	-9.54	57.10	73.90	16.8	124	0	
Vert.	14880.000	PK	51.14	41.41	9.38	44.84	-9.54	47.55	73.90	26.3	148	89	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Peak measurement value with Duty cycle correction factor (DCCF)

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	AV	68.60	28.01	13.41	43.80	-25.40	2.48	43.30	53.9	**10.6**	*1)
Hori.	4960.000	AV	52.30	32.69	5.46	45.26	-25.40	2.48	22.27	53.9	31.6	
Hori.	7440.000	AV	55.40	37.51	6.68	43.50	-25.40	2.48	33.17	53.9	20.7	
Hori.	9920.000	AV	48.80	38.26	7.56	41.76	-25.40	2.48	29.94	53.9	23.9	
Hori.	12400.000	AV	66.73	38.13	8.56	43.80	-25.40	-9.54	34.68	53.9	19.2	
Hori.	14880.000	AV	59.11	41.41	9.38	44.84	-25.40	-9.54	30.12	53.9	23.7	
Vert.	2483.500	AV	67.30	28.01	13.41	43.80	-25.40	2.48	42.00	53.9	11.9	*1)
Vert.	4960.000	AV	51.80	32.69	5.46	45.26	-25.40	2.48	21.77	53.9	32.1	
Vert.	7440.000	AV	54.60	37.51	6.68	43.50	-25.40	2.48	32.37	53.9	21.5	
Vert.	9920.000	AV	46.30	38.26	7.56	41.76	-25.40	2.48	27.44	53.9	26.4	
Vert.	12400.000	AV	63.75	38.13	8.56	43.80	-25.40	-9.54	31.70	53.9	22.2	
Vert.	14880.000	AV	51.14	41.41	9.38	44.84	-25.40	-9.54	22.15	53.9	31.7	

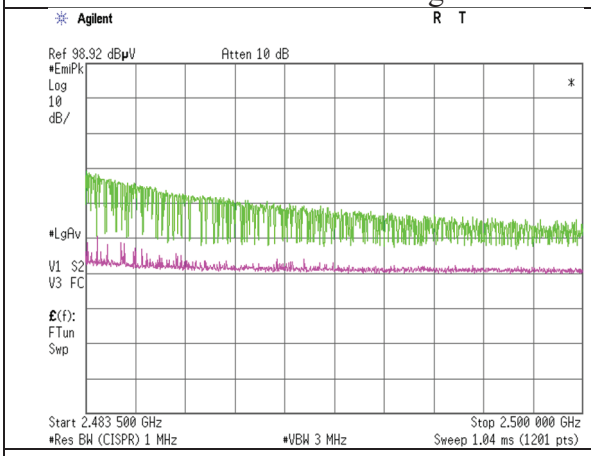
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.99 m / 3.0 m) = 2.48 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13850591M-A
Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	June 24, 2021
Temperature / Humidity	22 deg. C / 52 % RH
Engineer	Kazuhiro Ando
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2M-PHY, 2480 MHz

Horizontal

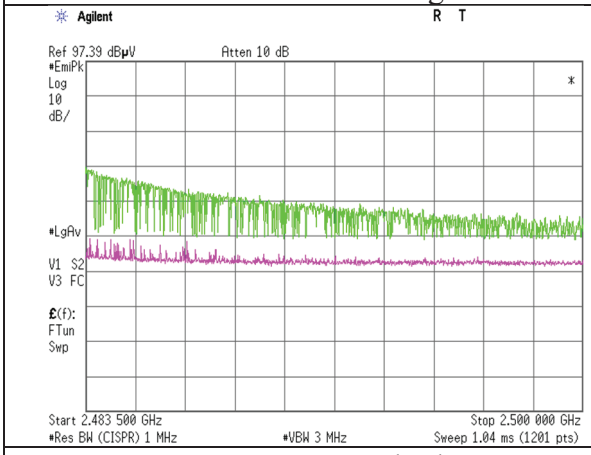
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

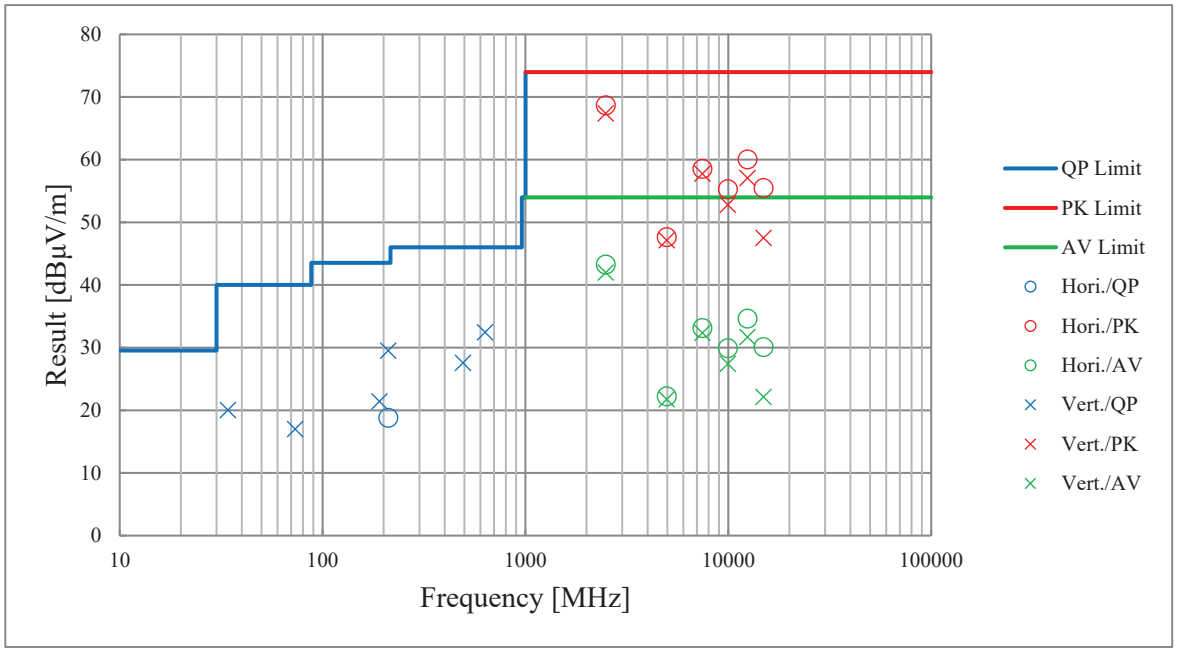


Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13850591M-A			
Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.6	No.6
Date	June 23, 2021	June 24, 2021	July 1, 2021	July 2, 2021
Temperature / Humidity	23 deg. C / 53 % RH	22 deg. C / 52 % RH	20 deg. C / 59 % RH	21 deg. C / 52 % RH
Engineer	Hiromitsu Tanabe	Kazuhiro Ando	Kazuhiro Ando	Hiromitsu Tanabe
	(30 MHz - 1000 MHz)	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx BT LE 2M-PHY, 2480 MHz			

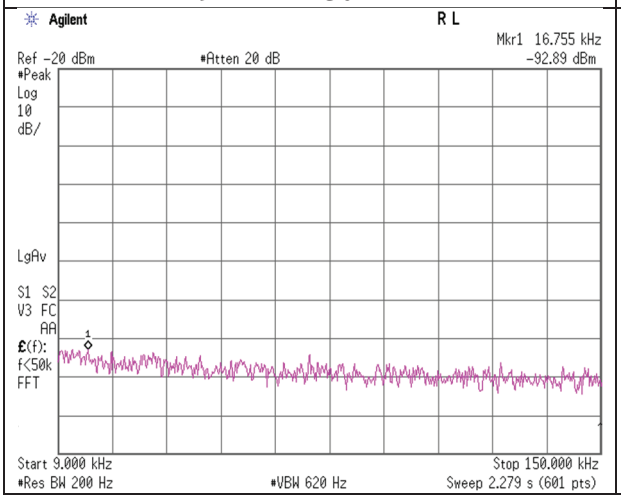


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

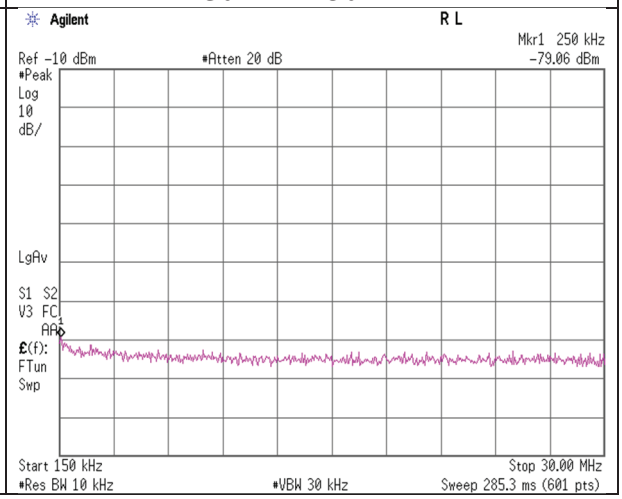
Conducted Spurious Emission

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 18, 2021
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx BT LE 1M-PHY, 2402 MHz

9 kHz - 150 kHz



150 kHz - 30 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
16.76	-92.89	0.01	9.95	2.0	1	-80.9	300	6.0	-19.7	43.1	62.8	
250.00	-79.06	0.01	9.95	2.0	1	-67.1	300	6.0	-5.8	19.6	25.4	

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)

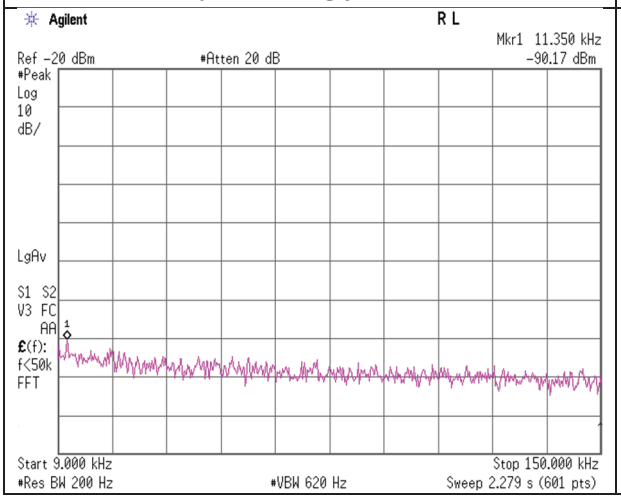
N: Number of output

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

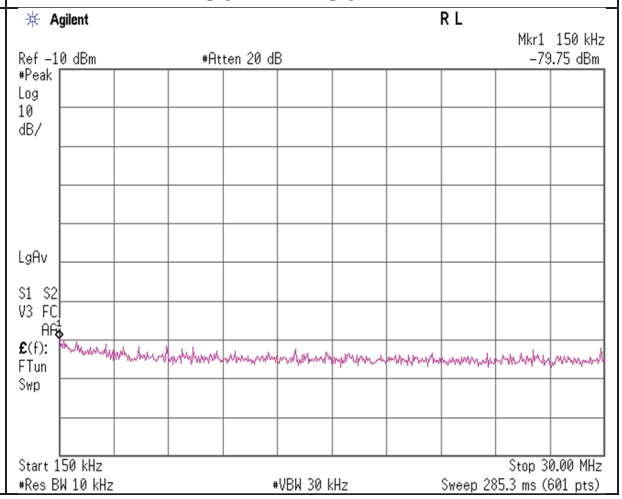
Conducted Spurious Emission

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 18, 2021
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx BT LE 1M-PHY, 2440 MHz

9 kHz - 150 kHz



150 kHz - 30 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
11.35	-90.17	0.01	9.95	2.0	1	-78.2	300	6.0	-17.0	46.5	63.5	
150.00	-79.75	0.01	9.95	2.0	1	-67.8	300	6.0	-6.5	24.0	30.5	

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

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

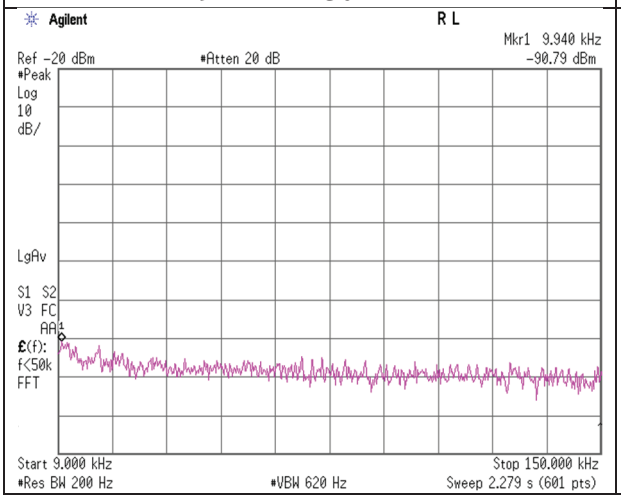
N: Number of output

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

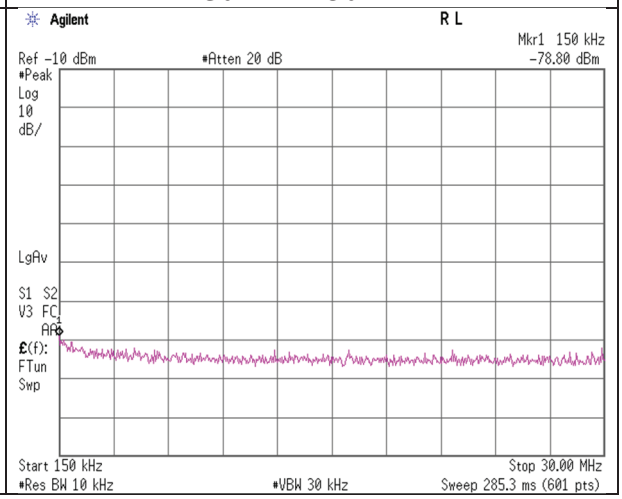
Conducted Spurious Emission

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 18, 2021
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx BT LE 1M-PHY, 2480 MHz

9 kHz - 150 kHz



150 kHz - 30 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
9.94	-90.79	0.01	9.95	2.0	1	-78.8	300	6.0	-17.6	47.6	65.2	
150.00	-78.80	0.01	9.95	2.0	1	-66.8	300	6.0	-5.6	24.0	29.6	

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)

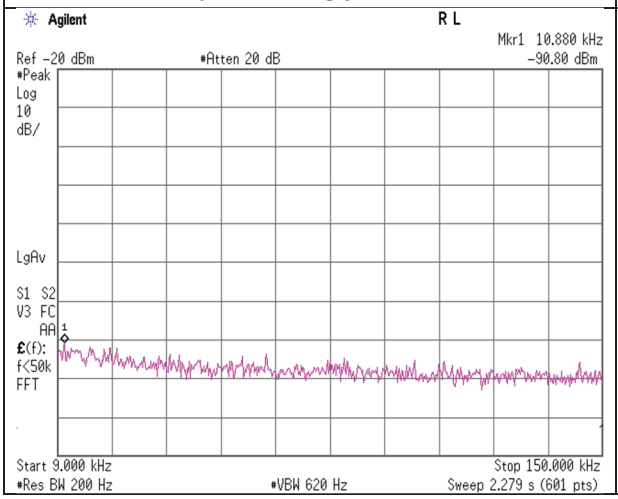
N: Number of output

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

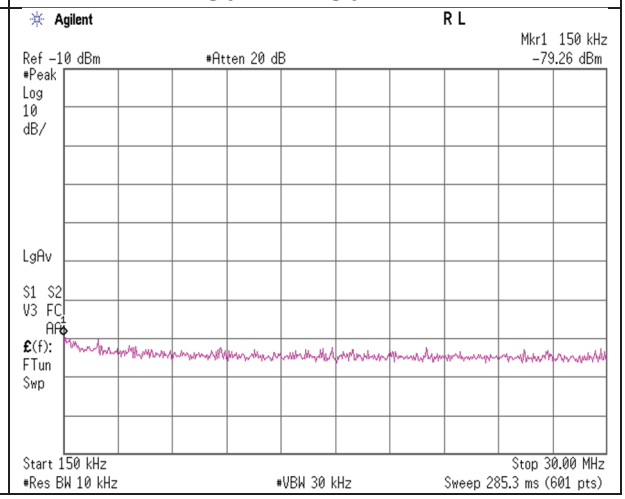
Conducted Spurious Emission

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 18, 2021
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx BT LE 2M-PHY, 2402 MHz

9 kHz - 150 kHz



150 kHz - 30 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
10.88	-90.80	0.01	9.95	2.0	1	-78.8	300	6.0	-17.6	46.8	64.4	
150.00	-79.26	0.01	9.95	2.0	1	-67.3	300	6.0	-6.0	24.0	30.0	

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

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

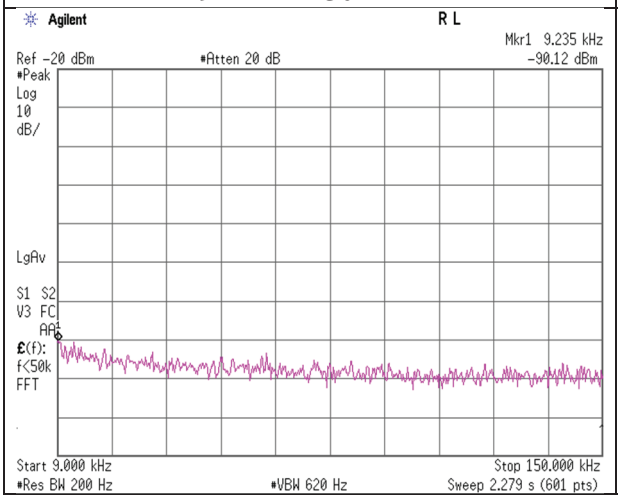
N: Number of output

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

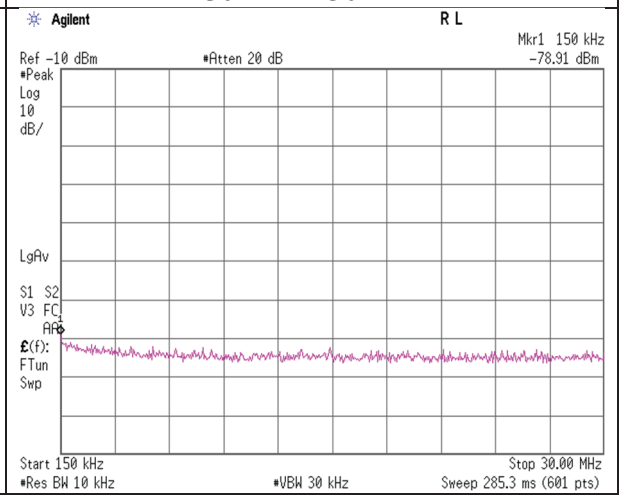
Conducted Spurious Emission

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 18, 2021
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx BT LE 2M-PHY, 2440 MHz

9 kHz - 150 kHz



150 kHz - 30 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
9.92	-90.12	0.01	9.95	2.0	1	-78.2	300	6.0	-16.9	47.6	64.5	
150.00	-78.91	0.01	9.95	2.0	1	-67.0	300	6.0	-5.7	24.0	29.7	

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)

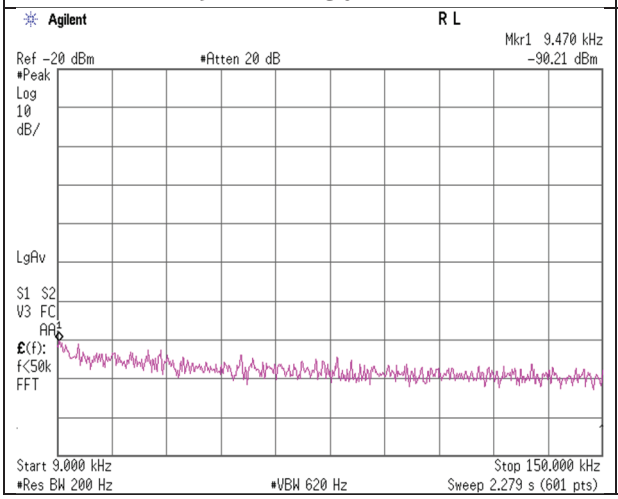
N: Number of output

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

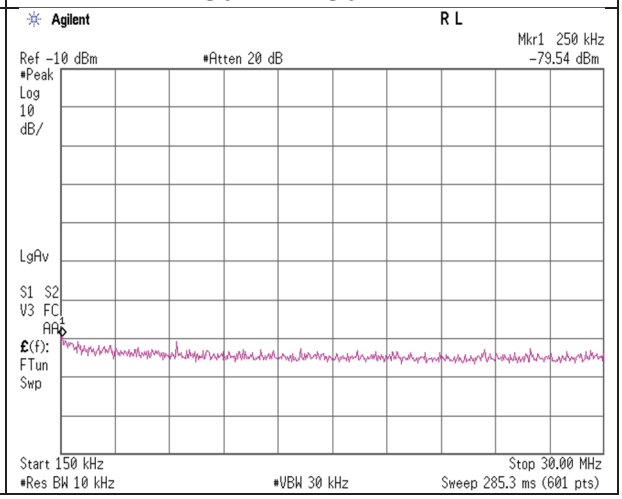
Conducted Spurious Emission

Report No.	13850591M-A
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 18, 2021
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx BT LE 2M-PHY, 2480 MHz

9 kHz - 150 kHz



150 kHz - 30 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
9.47	-90.21	0.01	9.95	2.0	1	-78.3	300	6.0	-17.0	48.0	65.0	
250.00	-79.54	0.01	9.95	2.0	1	-67.6	300	6.0	-6.3	19.6	25.9	

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.	13850591M-A
Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 18, 2021
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx BT LE

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	-23.38	1.71	10.05	-11.62	8.00	19.62
2440	-23.55	1.72	10.05	-11.78	8.00	19.78
2480	-23.56	1.73	10.05	-11.78	8.00	19.78

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	-25.98	1.71	10.05	-14.22	8.00	22.22
2440	-26.14	1.72	10.05	-14.37	8.00	22.37
2480	-26.34	1.73	10.05	-14.56	8.00	22.56

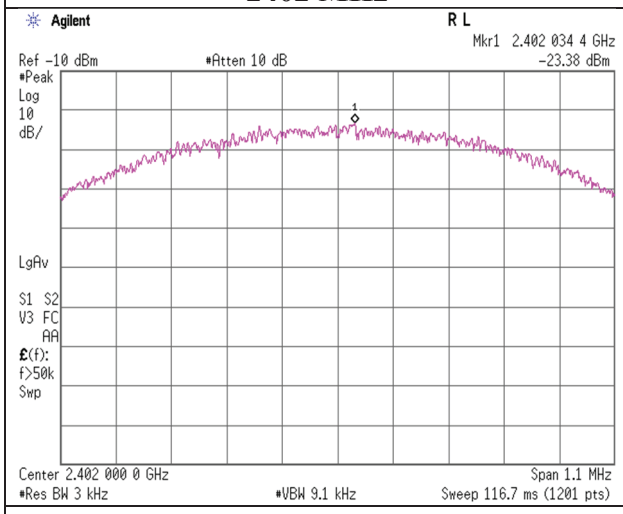
Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

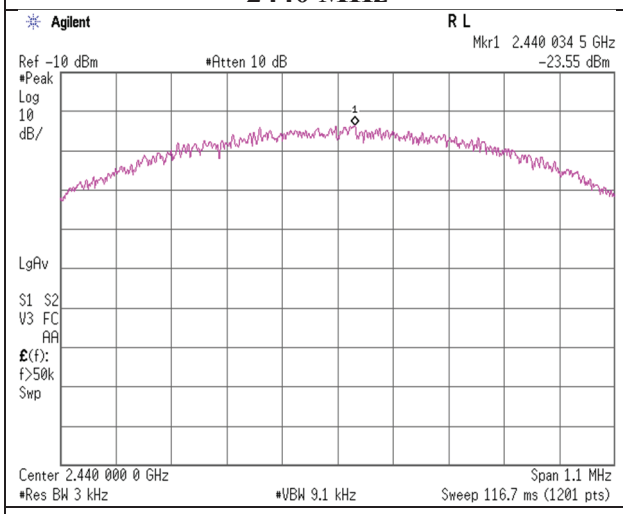
Power Density

BT LE 1M-PHY

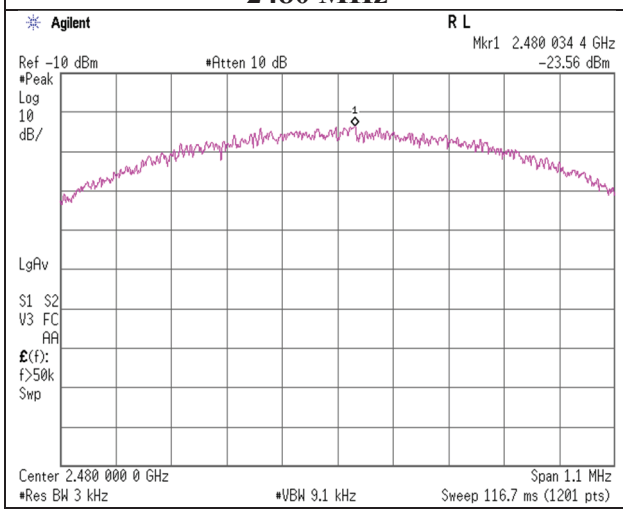
2402 MHz



2440 MHz

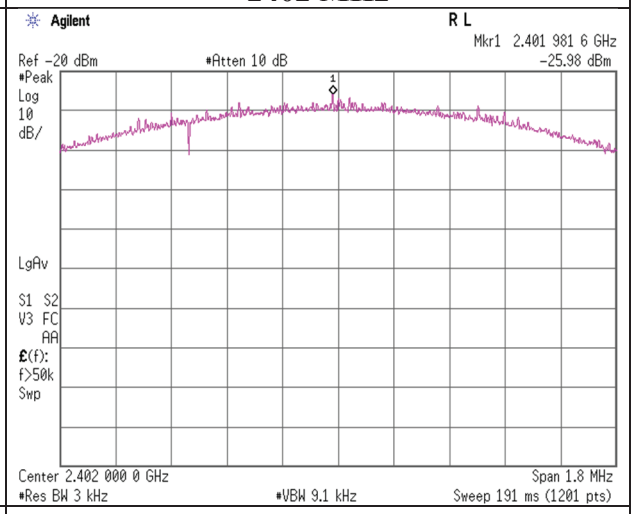


2480 MHz

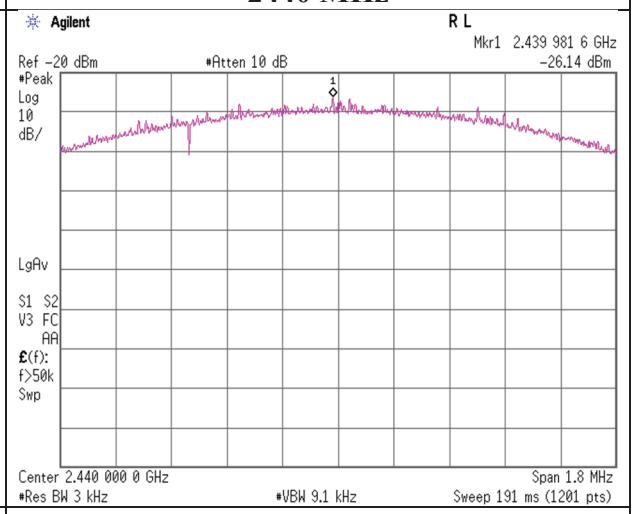


BT LE 2M-PHY

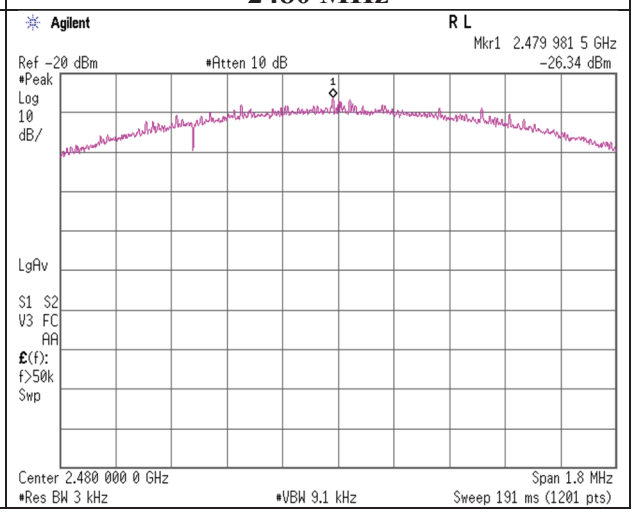
2402 MHz



2440 MHz



2480 MHz



APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	CPM-16	143588	Peak Power Analyzer	Keysight Technologies Inc	8990B	MY51000276	2020/06/18	12
AT	CPSO-24	143606	Power Sensor	Keysight Technologies Inc	N1923A	MY54070024	2020/06/18	12
AT	CSA-07	143643	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY52490024	2021/06/08	12
AT	CAT10-17	143023	10dB Fixed Atten.	Weinschel - API Technologies Corp	54A-10	56251	2021/05/14	12
AT	CCC-W02	143110	Micro Wave Cable	Suhner	SUCOFLEX102	MY3773/2	2021/05/27	12
AT	CTS-18	144220	Digital Multimeter	Fluke Corporation	87-3	85220051	-	-
AT	COS-02	143534	Temperature & Humidity Indicator	A&D Company	AD-5681	6878345	-	-
RE	CCC-S11-R	143169	11Site RE 3m System	None	none(No.11 RE)	none	2020/11/10	12
RE	CBL-09	143122	LOGBICON	Schwarzbeck Mess-Elektronik OHG	VULB 9168	508	2021/04/19	12
RE	CAT5-04	178807	5dB Fixed Atten.	Pasternack Enterprises	PE7047-5	none	2021/04/21	12
RE	CAF-16	142936	Pre-Amplifier	SONOMA INSTRUMENT	310N	325015	2021/05/27	12
RE	CTR-01	144193	Test Receiver	Rohde & Schwarz	ESU40	100426	2021/04/23	12
EMI	CSCL-16	143655	Ruler	TAJIMA	G3 gold	none	-	-
EMI	COS-11	143543	Temperature, Humidity & Atmospheric Logger	T&D	TR-73U	F8060468	2020/07/21	12
EMI	CTS-13	144215	Digital Multimeter	Fluke Corporation	FLK-83-V	14610320	2020/10/20	12
EMI	COTS-CEMI-03	178804	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	Ver 3.1.0484	-	-
RE(GHz)	CHA-24	143455	Double Ridged Wave Guide	ETS-Lindgren (Cedar Park, Texas)	3115	00204569	2021/02/06	12
RE(GHz)	TSA-01	143642	Spectrum Analyzer	Keysight Technologies Inc	N9030A	MY53310670 Version A.13.12	2021/05/24	12
RE(GHz)	CAF-22	142940	Pre-Amplifier	Micro Wave Factory	MPR-1G26.5-35	161399	2021/06/11	12
RE(GHz)	CCC-G14	192241	Microwave Cable	Huber+Suhner	SF104/PC35m/PC35m /1000mm	805411/4	2021/01/19	12
RE(GHz)	CCC-G17	192244	Microwave Cable	Huber+Suhner	SF104/11N/11PC35/8 000MM	808996/4	2021/01/19	12
RE(GHz)	CSA-07	143643	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY52490024	2021/06/08	12
RE(GHz)	CHF-04	143442	HPF	MICRO-TRONICS	HPM50111-02	009	2021/05/14	12
RE(GHz)	CAT10-17	143023	10dB Fixed Atten.	Weinschel - API Technologies Corp	54A-10	56251	2021/05/14	12
RE(GHz)	CHA-07	143438	Double Ridged Horn	ETS-Lindgren (Cedar Park, Texas)	3160-09	00166043	2021/06/05	12
RE(GHz)	CAF-19	142937	Pre-Amplifier	TOYO	HAP18-26W	00000035	2021/06/23	12
RE(GHz)	CCC-W09	143113	Micro Wave Cable	Suhner	SUCOFLEX104	MY588/4	2020/07/05	12
CE	CLS-11	143505	A.M.N.	Rohde & Schwarz	ESH3-Z5	835239/022	2020/07/16	12
CE	CCC-S5-C(SR)	143167	5 Site CE (SR) System	None	none(No.5 CE SR)	-	2020/07/17	12
CE	CTR-06	143739	Test Receiver	Rohde & Schwarz	ESCI	100107	2020/09/14	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