



# RADIO TEST REPORT

Test Report No. : 12140568H-B-R1

**Applicant** : CASIO COMPUTER CO., LTD.  
**Type of Equipment** : Bluetooth LE module  
**Model No.** : EY240-BLE  
**FCC ID** : BBQEY240BLE  
**Test regulation** : FCC Part 15 Subpart C: 2018  
**Test Result** : Complied

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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 above regulation.
4. The test results in this 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 NVLAP, NIST, or any agency of the Federal Government.
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. This report is a revised version of 12140568H-B. 12140568H-B is replaced with this report.

**Date of test:** February 22 to March 27, 2018

**Representative test engineer:**

*T. Noguchi*

Takafumi Noguchi  
Engineer  
Consumer Technology Division

**Approved by:**

*Takayuki S.*

Takayuki Shimada  
Leader  
Consumer Technology Division



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.

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<b>CONTENTS</b>	<b>PAGE</b>
<b>SECTION 1: Customer information.....</b>	<b>4</b>
<b>SECTION 2: Equipment under test (E.U.T.).....</b>	<b>4</b>
<b>SECTION 3: Test specification, procedures &amp; results.....</b>	<b>5</b>
<b>SECTION 4: Operation of E.U.T. during testing.....</b>	<b>8</b>
<b>SECTION 5: Conducted Emission.....</b>	<b>11</b>
<b>SECTION 6: Radiated Spurious Emission .....</b>	<b>12</b>
<b>SECTION 7: Antenna Terminal Conducted Tests.....</b>	<b>14</b>
<b>APPENDIX 1: Test data .....</b>	<b>15</b>
Conducted Emission .....	15
6 dB Bandwidth and 99 % Occupied Bandwidth.....	17
Maximum Peak Output Power .....	20
Average Output Power .....	21
Radiated Spurious Emission .....	23
Conducted Spurious Emission .....	29
Power Density .....	32
<b>APPENDIX 2: Test instruments .....</b>	<b>34</b>
<b>APPENDIX 3: Photographs of test setup .....</b>	<b>36</b>
Conducted Emission .....	36
Radiated Spurious Emission .....	37
Worst Case Position .....	38

## **SECTION 1: Customer information**

Company Name : CASIO COMPUTER CO., LTD.  
Address : 6-2 Honmachi 1-chome, Shibuya-ku, Tokyo 151-8543, Japan  
Telephone Number : +81-42-639-5188  
Facsimile Number : +81-42-639-5046  
Contact Person : Katsumasa Motoki

## **SECTION 2: Equipment under test (E.U.T.)**

### **2.1 Identification of E.U.T.**

Type of Equipment : Bluetooth LE module  
Model No. : EY240-BLE  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 3.3 V  
Receipt Date of Sample : February 22, 2018  
Country of Mass-production : Indonesia  
Condition of EUT : Production 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: EY240-BLE (referred to as the EUT in this report) is a Bluetooth LE module.

### **Radio Specification**

Radio Type : Transceiver  
Frequency of Operation : 2402 MHz - 2480 MHz  
Modulation : GFSK  
Antenna type : Monopole Antenna  
Antenna Gain : -0.23 dBi  
Clock frequency (Maximum) : 26 MHz

### **2.3 Identification of Host device**

Type of Equipment : Electronic Cash Register  
Model No. : SR-S4000MB-SR  
Serial No. : Refer to Section 4, Clause 4.2  
Receipt Date of Sample : February 22, 2018  
Country of Mass-production : Indonesia  
Condition of EUT : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No Modification by the test lab

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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 March 12, 2018 and effective April 11, 2018

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928MHz,  
2400-2483.5MHz, and 5725-5850MHz

\* The revision on March 12, 2018, does not affect the test specification applied to the EUT.

\*\* 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 IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	QP 21.6 dB, 0.15000 MHz, N AV 30.5 dB, 0.15000 MHz, N	Complied	-
6dB Bandwidth	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: -	FCC: Section 15.247(a)(2) IC: RSS-247 5.2(a)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: RSS-Gen 6.12	FCC: Section 15.247(b)(3) IC: RSS-247 5.4(d)		Complied	Conducted
Power Density	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: -	FCC: Section 15.247(e) IC: RSS-247 5.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	0.7 dB 260.327 MHz, QP, Hori.	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
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 DTS Meas Guidance v04 12.2.7.					

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

#### **FCC Part 15.31 (e)**

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

#### **FCC Part 15.203 Antenna requirement**

The antenna is not removable from the EUT.  
Therefore, the equipment complies with the antenna requirement of Section 15.203.

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### 3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

### 3.4 Uncertainty

#### EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor  $k=2$ .

#### Antenna Terminal test

Test Item	Uncertainty (+/-)
RF output power	1.3 dB
Antenna terminal conducted emission / Power density /	2.7 dB
Adjacent channel power / Channel power	
Below 3GHz	1.9 dB
3 GHz or 6 GHz	2.1 dB

#### Conducted emission

using Item	Frequency range	Uncertainty (+/-)
AMN (LISN)	0.009 MHz to 0.15 MHz	3.8 dB
	0.15 MHz to 30 MHz	3.4 dB

#### Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
		(Vertical)
	200 MHz to 1000 MHz (Horizontal)	5.2 dB
		(Vertical)
10 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
		(Vertical)
	200 MHz to 1000 MHz (Horizontal)	5.0 dB
		(Vertical)
3 m	1 GHz to 6 GHz	5.0 dB
	6 GHz to 18 GHz	5.3 dB
1 m	10 GHz to 26.5 GHz	5.8 dB
	26.5 GHz to 40 GHz	5.8 dB
10 m	1 GHz to 18 GHz	5.2 dB

#### Conducted Emission test

The data listed in this test report has enough margin, more than the site margin.

#### Radiated emission test

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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### 3.5 Test Location

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NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

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

### 3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

**SECTION 4: Operation of E.U.T. during testing**

**4.1 Operating Mode(s)**

Mode	Remarks*
Bluetooth (BT) Low Energy (LE)	Maximum Packet Size, PRBS9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; - Power settings: -5.9 dBm - Software: 0323 DTEST1 *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.	

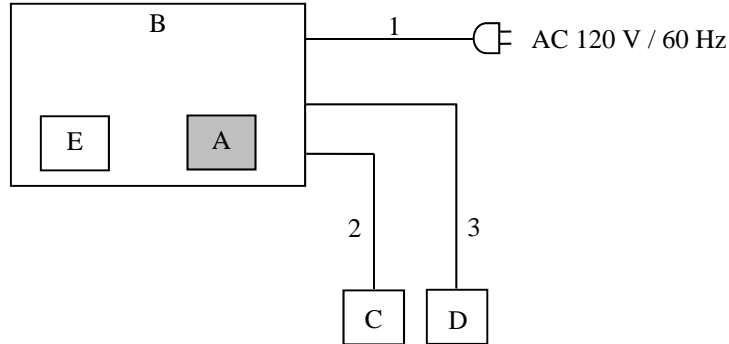
\*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Maximum Peak Output Power, Conducted Emission, 6dB Bandwidth, Power Density, 99% Occupied Bandwidth, Spurious Emission (Radiated / Conducted)	Tx BT LE	2402 MHz 2440 MHz 2480 MHz



## 4.2 Configuration and peripherals

[Except for Antenna Terminal Conducted test]



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

### Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Bluetooth LE module	EY240-BLE	*1)	CASIO COMPUTER CO., LTD.	EUT
B	Electronic Cash Register	SR-S4000MB-SR	CS-34	CASIO COMPUTER CO., LTD.	-
C	Handheld scanner	HHS-19	22222222	CASIO COMPUTER CO., LTD.	-
D	Handheld scanner	HHS-18	005640	CASIO COMPUTER CO., LTD.	-
E	SD Memory Card	RP-SD256B	BJ8CA308934	Panasonic	-

\*1) This item is controlled with B: Electronic Cash Register.

### List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	AC Cable	1.8	Unshielded	Unshielded	-
2	Handheld scanner Cable	1.8	Unshielded	Unshielded	-
3	Handheld scanner Cable	3.0	Unshielded	Unshielded	-

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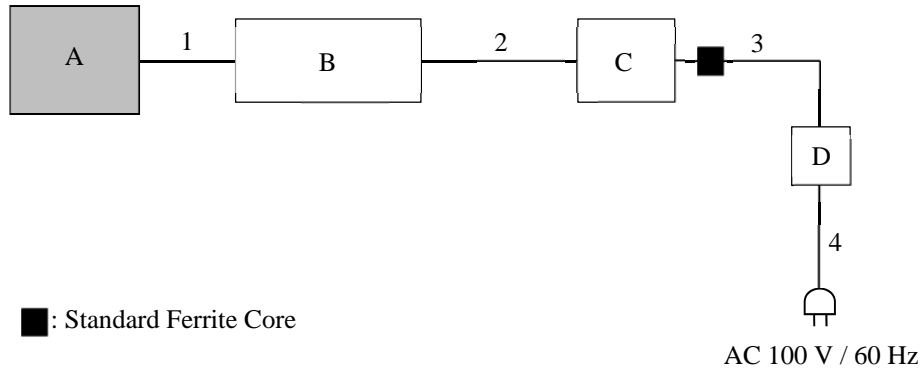
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[Antenna Terminal Conducted test]



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

**Description of EUT**

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Bluetooth LE module	EY240-BLE	BLECS-01	CASIO COMPUTER CO., LTD.	EUT *1)
B	Jig	EY240-BLE DE BUG	-	CASIO COMPUTER CO., LTD.	-
C	Laptop PC	CF-N8HWCOPS	OBKSA08723	Panasonic	-
D	AC Adapter	CF-AA6372B	6372BM409X18054B	Panasonic	-

\*1) The test was performed with the Bluetooth LE module since the existence of Host enclosure does not influence on the test result.

**List of cables used**

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	BLE Cable	0.1	Unshielded	Unshielded	-
2	USB Cable	1.5	Shielded	Shielded	-
3	DC Cable	0.8	Unshielded	Unshielded	-
4	AC Cable	1.0	Unshielded	Unshielded	-

## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

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

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

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

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

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

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

## **SECTION 6: Radiated Spurious Emission**

### **Test Procedure**

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "KDB 558074 D01 DTS Meas Guidance v04".

[For below 1 GHz]

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

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 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(IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).**

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	Average Power Method: RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces If duty cycle was less than 98%, a duty factor was added to the results.	RBW: 100 kHz VBW: 300kHz
Test Distance	3 m	3.55 m *2) (1 GHz – 10 GHz), 1 m *3) (10 GHz – 26.5 GHz)		3.55 m *2) (1 GHz – 10 GHz), 1 m *3) (10 GHz – 26.5 GHz)

\*1) Average Power Measurement was performed based on 6.0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v04".

\*2) Distance Factor:  $20 \times \log(3.55 \text{ m} / 3.0 \text{ m}) = 1.47 \text{ dB}$

\*3) Distance Factor:  $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

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

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

**Measurement range : 30 MHz - 26.5 GHz**  
**Test data : APPENDIX**  
**Test result : Pass**

## **SECTION 7: Antenna Terminal Conducted Tests**

### **Test Procedure**

The tests were made with below setting connected to the antenna port.

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

\*1) Peak hold was applied as Worst-case measurement.

\*2) Reference data

\*3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v04".

\*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 = 9.1 kHz)

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

**Test data : APPENDIX**

**Test result : Pass**

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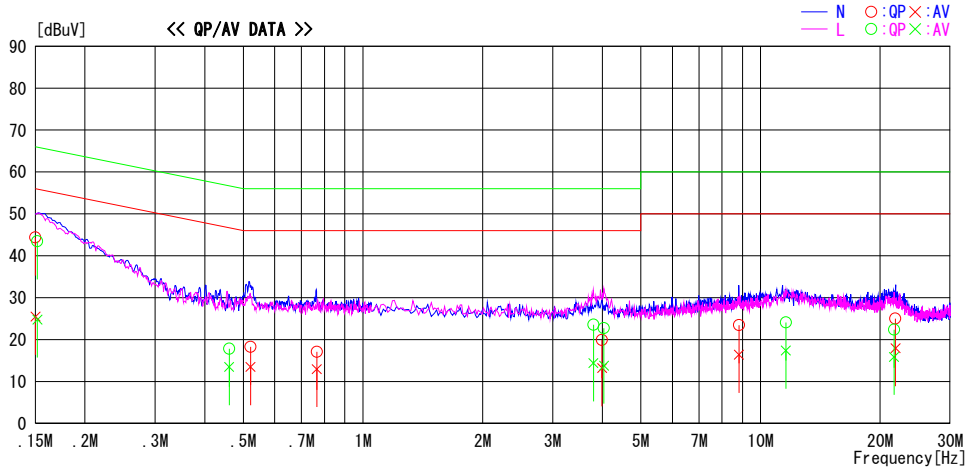
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**APPENDIX 1: Test data**

**Conducted Emission**

Report No. 12140568H  
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber  
Date March 25, 2018  
Temperature / Humidity 18 deg. C / 30 % RH  
Engineer Takafumi Noguchi  
Mode Tx BT LE 2480 MHz

LIMIT : FCC15.207 QP  
FCC15.207 AV

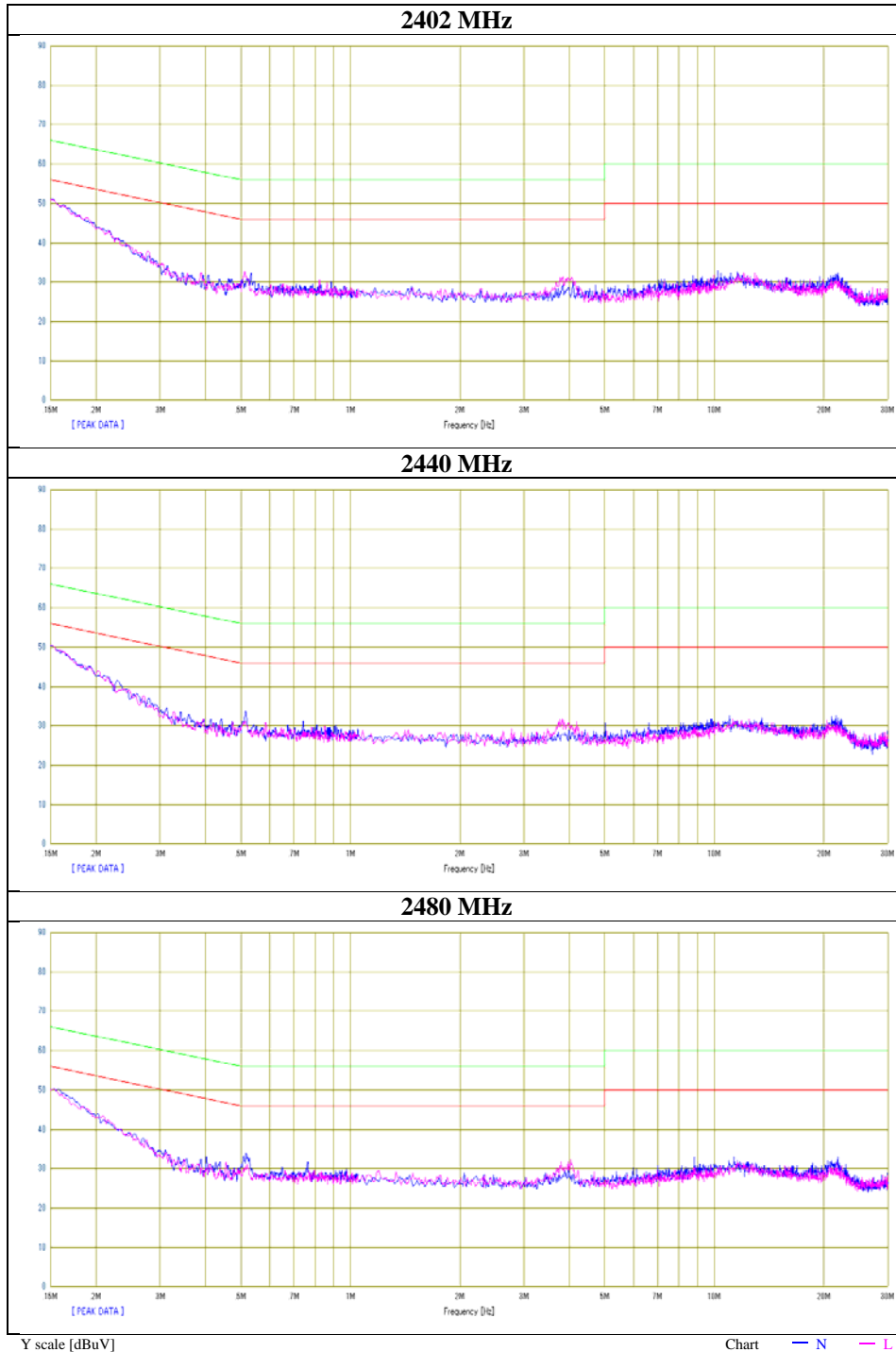


Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	31.2	12.3	13.2	44.4	25.5	66.0	56.0	21.6	30.5	N	
0.52142	5.1	0.3	13.2	18.3	13.5	56.0	46.0	37.7	32.5	N	
0.76521	3.8	-0.3	13.3	17.1	13.0	56.0	46.0	38.9	33.0	N	
3.99102	6.2	-0.5	13.7	19.9	13.2	56.0	46.0	36.1	32.8	N	
8.82552	9.4	2.3	14.1	23.5	16.4	60.0	50.0	36.5	33.6	N	
21.84428	10.2	3.2	14.8	25.0	18.0	60.0	50.0	35.0	32.0	N	
0.15175	30.3	11.6	13.2	43.5	24.8	65.9	55.9	22.4	31.1	L	
0.46080	4.6	0.3	13.2	17.8	13.5	56.7	46.7	38.9	33.2	L	
3.80069	9.9	0.7	13.7	23.6	14.4	56.0	46.0	32.4	31.6	L	
4.03924	9.0	0.1	13.7	22.7	13.8	56.0	46.0	33.3	32.2	L	
11.58628	9.8	3.1	14.3	24.1	17.4	60.0	50.0	35.9	32.6	L	
21.67332	7.6	1.1	14.8	22.4	15.9	60.0	50.0	37.6	34.1	L	

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

## Conducted Emission

Report No.	12140568H
Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Date	March 25, 2018
Temperature / Humidity	18 deg. C / 30 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE



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**6 dB Bandwidth and 99 % Occupied Bandwidth**

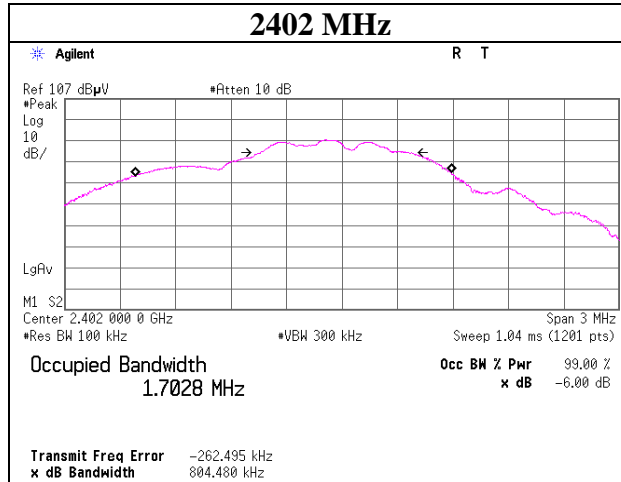
Report No. 12140568H  
Test place Ise EMC Lab. No.11 Measurement Room  
Date February 22, 2018  
Temperature / Humidity 23 deg. C / 40 % RH  
Engineer Yuta Moriya  
Mode Tx BT LE

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
BT LE	2402	1451.0	0.804	> 0.5000
	2440	1233.9	0.731	> 0.5000
	2480	1087.5	0.686	> 0.5000

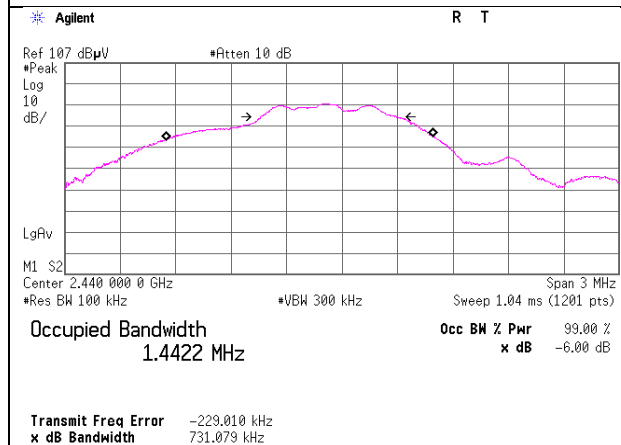
## 6dB Bandwidth

### BT LE

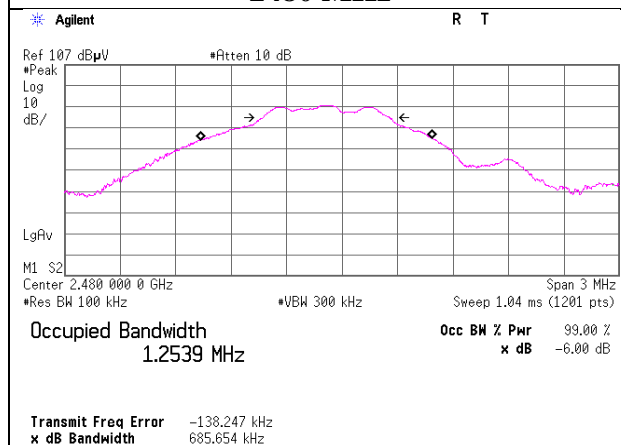
#### 2402 MHz



#### 2440 MHz



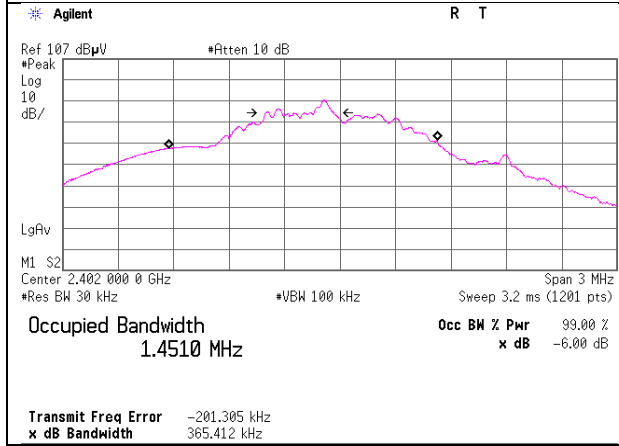
#### 2480 MHz



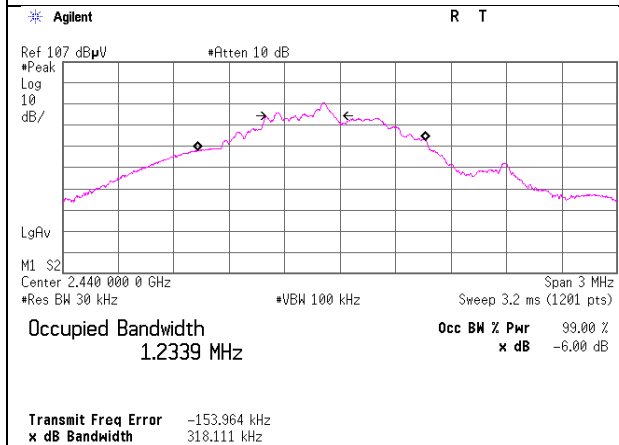
## 99% Occupied Bandwidth

### BT LE

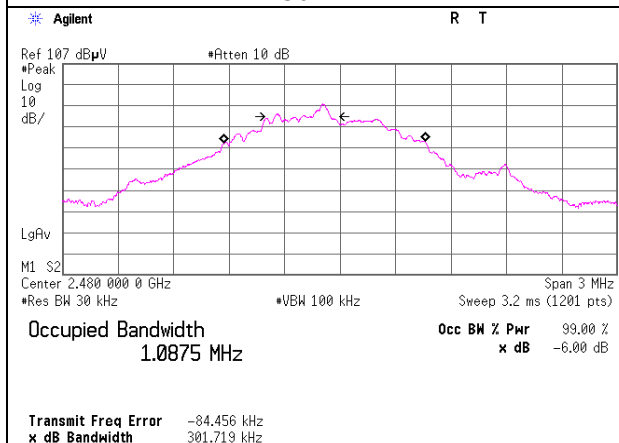
#### 2402 MHz



#### 2440 MHz



#### 2480 MHz



### Maximum Peak Output Power

Report No. 12140568H  
Test place Ise EMC Lab. No.11 Measurement Room  
Date March 26, 2018  
Temperature / Humidity 23 deg. C / 24 % RH  
Engineer Tomoki Matsui  
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-13.74	1.64	0.00	-12.10	0.06	30.00	1000	42.10
2440	-13.48	1.64	0.00	-11.84	0.07	30.00	1000	41.84
2480	-13.48	1.65	0.00	-11.83	0.07	30.00	1000	41.83

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.

**Average Output Power**  
**(Reference data for RF Exposure / SAR testing)**

Report No. 12140568H  
Test place Ise EMC Lab. No.11 Measurement Room  
Date March 26, 2018  
Temperature / Humidity 23 deg. C / 24 % RH  
Engineer Tomoki Matsui  
Mode Tx BT LE

BT LE

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	-15.70	1.64	0.00	-14.06	0.04	0.86	-13.20	0.05
2440	-15.43	1.64	0.00	-13.79	0.04	0.86	-12.93	0.05
2480	-15.42	1.65	0.00	-13.77	0.04	0.86	-12.91	0.05

Sample Calculation:

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

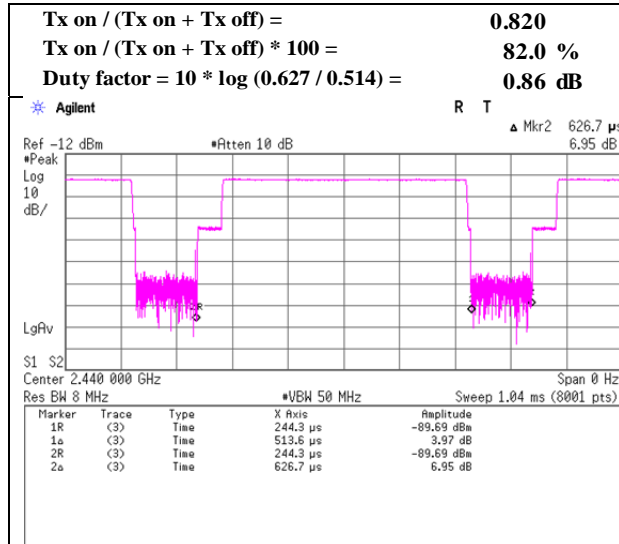
Result (Burst power average) = Time average + Duty factor

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

### Burst rate confirmation

Report No. 12140568H  
 Test place Ise EMC Lab. No.11 Measurement Room  
 Date February 22, 2018  
 Temperature / Humidity 23 deg. C / 40 % RH  
 Engineer Yuta Moriya  
 Mode Tx BT LE

#### BT LE



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

## Radiated Spurious Emission

Report No.	12140568H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.1
Date	March 17, 2018	March 23, 2018	March 27, 2018
Temperature / Humidity	19 deg. C / 25 % RH	22 deg. C / 30 % RH	25 deg. C / 33 % RH
Engineer	Masafumi Niwa (1 GHz - 10 GHz)	Takafumi Noguchi (10 GHz - 26.5 GHz)	Ryota Yamanaka (Below 1 GHz)
Mode	Tx BT LE 2402 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	80.112	QP	45.4	6.7	7.9	32.2	-	27.8	40.0	12.2	
Hori	110.153	QP	52.3	11.5	8.3	32.2	-	39.9	43.5	3.6	
Hori	120.168	QP	48.8	12.7	8.4	32.2	-	37.7	43.5	5.8	
Hori	300.422	QP	46.7	13.3	10.0	32.0	-	38.0	46.0	8.0	
Hori	340.475	QP	43.4	14.3	10.3	32.0	-	36.0	46.0	10.0	
Hori	821.166	QP	30.9	20.9	13.1	31.4	-	33.5	46.0	12.5	
Hori	2390.000	PK	45.6	27.2	4.7	34.4	-	43.1	73.9	30.8	
Hori	4804.000	PK	49.7	31.3	7.0	33.7	-	54.3	73.9	19.6	
Hori	7206.000	PK	43.1	35.8	8.3	33.6	-	53.6	73.9	20.3	Floor noise
Hori	12010.000	PK	51.7	39.5	-2.8	33.2	-	55.2	73.9	18.7	
Hori	2390.000	AV	33.2	27.2	4.7	34.4	0.9	31.6	53.9	22.3	*1)
Hori	4804.000	AV	41.1	31.3	7.0	33.7	0.9	46.6	53.9	7.3	
Hori	7206.000	AV	32.6	35.8	8.3	33.6	-	43.1	53.9	10.8	Floor noise
Hori	12010.000	AV	44.7	39.5	-2.8	33.2	0.9	49.1	53.9	4.8	
Vert	80.112	QP	48.6	6.7	7.9	32.2	-	31.0	40.0	9.0	
Vert	110.153	QP	50.5	11.5	8.3	32.2	-	38.1	43.5	5.4	
Vert	120.168	QP	48.4	12.7	8.4	32.2	-	37.3	43.5	6.2	
Vert	260.376	QP	44.3	11.9	9.7	32.0	-	33.9	46.0	12.1	
Vert	300.422	QP	45.9	13.3	10.0	32.0	-	37.2	46.0	8.8	
Vert	580.828	QP	35.7	18.8	11.8	32.0	-	34.3	46.0	11.7	
Vert	2390.000	PK	48.1	27.2	4.7	34.4	-	45.6	73.9	28.3	
Vert	4804.000	PK	50.4	31.3	7.0	33.7	-	55.0	73.9	18.9	
Vert	7206.000	PK	43.4	35.8	8.3	33.6	-	53.9	73.9	20.0	Floor noise
Vert	12010.000	PK	48.3	39.5	-2.8	33.2	-	51.8	73.9	22.1	
Vert	2390.000	AV	33.3	27.2	4.7	34.4	0.9	31.7	53.9	22.2	*1)
Vert	4804.000	AV	41.7	31.3	7.0	33.7	0.9	47.2	53.9	6.7	
Vert	7206.000	AV	32.4	35.8	8.3	33.6	-	42.9	53.9	11.0	Floor noise
Vert	12010.000	AV	40.9	39.5	-2.8	33.2	0.9	45.3	53.9	8.6	

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

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

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

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

### 20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	86.4	27.2	4.7	34.4	83.9	-	-	Carrier
Hori	2399.706	PK	53.4	27.2	4.7	34.4	50.9	63.9	13.0	
Hori	2400.000	PK	44.4	27.2	4.7	34.4	41.9	63.9	22.0	
Hori	9608.000	PK	45.4	38.4	9.1	33.9	59.0	63.9	4.9	
Vert	2402.000	PK	88.6	27.2	4.7	34.4	86.1	-	-	Carrier
Vert	2399.706	PK	55.9	27.2	4.7	34.4	53.4	66.1	12.7	
Vert	2400.000	PK	45.9	27.2	4.7	34.4	43.4	66.1	22.7	
Vert	9608.000	PK	40.8	38.4	9.1	33.9	54.4	66.1	11.7	

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

**UL Japan, Inc.**

**Ise EMC Lab.**

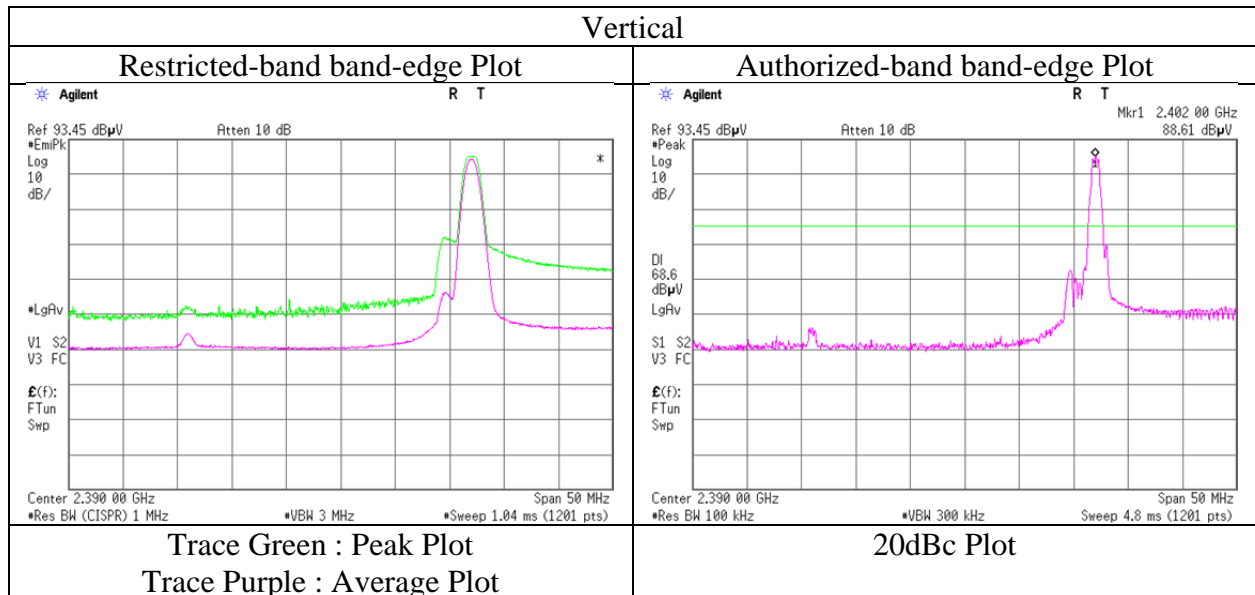
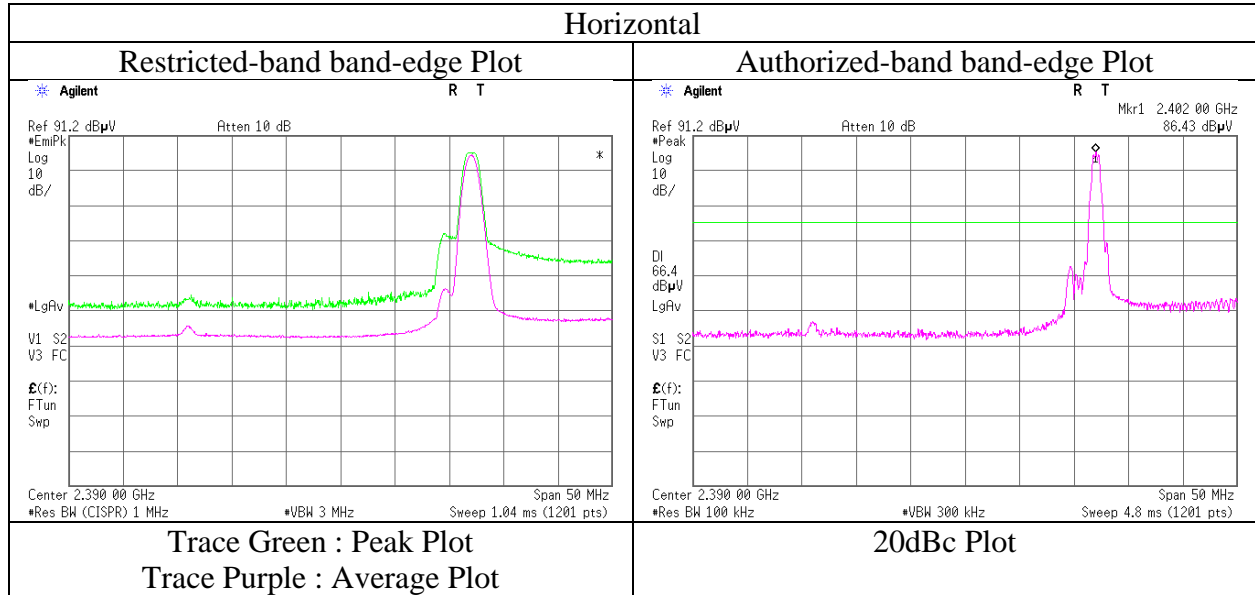
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

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

Report No. 12140568H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date March 17, 2018  
Temperature / Humidity 19 deg. C / 25 % RH  
Engineer Masafumi Niwa  
(1 GHz - 10 GHz)  
Mode Tx BT LE 2402 MHz



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



## Radiated Spurious Emission

Report No.	12140568H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.1
Date	March 17, 2018	March 23, 2018	March 27, 2018
Temperature / Humidity	19 deg. C / 25 % RH	22 deg. C / 30 % RH	25 deg. C / 33 % RH
Engineer	Masafumi Niwa (1 GHz - 10 GHz)	Takafumi Noguchi (10 GHz - 26.5 GHz)	Ryota Yamanaka (Below 1 GHz)
Mode	Tx BT LE 2440 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	80.112	QP	45.2	6.7	7.9	32.2	-	27.6	40.0	12.4	
Hori	110.153	QP	52.1	11.5	8.3	32.2	-	39.7	43.5	3.8	
Hori	120.168	QP	48.7	12.7	8.4	32.2	-	37.6	43.5	5.9	
Hori	300.442	QP	46.7	13.3	10.0	32.0	-	38.0	46.0	8.0	
Hori	340.475	QP	43.4	14.3	10.3	32.0	-	36.0	46.0	10.0	
Hori	821.166	QP	30.5	20.9	13.1	31.4	-	33.1	46.0	12.9	
Hori	4880.000	PK	49.6	31.5	7.0	33.7	-	54.4	73.9	19.5	
Hori	7320.000	PK	43.7	36.1	8.4	33.6	-	54.6	73.9	19.3	Floor noise
Hori	12200.000	PK	49.5	39.4	-2.6	33.0	-	53.3	73.9	20.6	
Hori	4880.000	AV	43.5	31.5	7.0	33.7	0.9	49.2	53.9	4.7	
Hori	7320.000	AV	34.8	36.1	8.4	33.6	-	45.7	53.9	8.2	Floor noise
Hori	12200.000	AV	42.2	39.4	-2.6	33.0	0.9	46.9	53.9	7.0	
Vert	80.112	QP	48.3	6.7	7.9	32.2	-	30.7	40.0	9.3	
Vert	110.153	QP	51.1	11.5	8.3	32.2	-	38.7	43.5	4.8	
Vert	120.168	QP	47.3	12.7	8.4	32.2	-	36.2	43.5	7.3	
Vert	260.376	QP	44.3	11.9	9.7	32.0	-	33.9	46.0	12.1	
Vert	300.442	QP	46.0	13.3	10.0	32.0	-	37.3	46.0	8.7	
Vert	580.828	QP	35.8	18.8	11.8	32.0	-	34.4	46.0	11.6	
Vert	4880.000	PK	49.6	31.5	7.0	33.7	-	54.4	73.9	19.5	
Vert	7320.000	PK	43.4	36.1	8.4	33.6	-	54.3	73.9	19.6	Floor noise
Vert	12200.000	PK	47.5	39.4	-2.6	33.0	-	51.3	73.9	22.6	
Vert	4880.000	AV	44.5	31.5	7.0	33.7	0.9	50.2	53.9	3.7	
Vert	7320.000	AV	34.0	36.1	8.4	33.6	-	44.9	53.9	9.0	Floor noise
Vert	12200.000	AV	40.2	39.4	-2.6	33.0	0.9	44.9	53.9	9.0	

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

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

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

### 20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2440.000	PK	88	27.3	4.8	34.4	85.7	-	-	Carrier
Hori	9760.000	PK	46.7	38.5	9	34	60.2	65.7	5.5	
Vert	2440.000	PK	88.9	27.3	4.8	34.4	86.6	-	-	Carrier
Vert	9760.000	PK	45.8	38.5	9	34	59.3	66.6	7.3	

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

## Radiated Spurious Emission

Report No.	12140568H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.1	No.2
Date	March 17, 2018	March 18, 2018	March 23, 2018
Temperature / Humidity	19 deg. C / 25 % RH	21 deg. C / 35 % RH	22 deg. C / 30 % RH
Engineer	Masafumi Niwa	Ryota Yamanaka	Takafumi Noguchi
	(1 GHz - 10 GHz)	(Below 1 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx BT LE 2480 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	47.999	QP	47.0	11.3	7.6	38.9	-	27.0	40.0	13.0	
Hori	120.149	QP	52.6	12.5	8.8	39.0	-	34.9	43.5	8.6	
Hori	130.157	QP	49.5	13.4	8.9	39.0	-	32.8	43.5	10.7	
Hori	240.293	QP	62.1	11.5	10.0	38.9	-	44.7	46.0	1.3	
Hori	260.327	QP	62.1	11.9	10.2	38.9	-	45.3	46.0	0.7	
Hori	300.371	QP	50.4	13.4	10.5	38.8	-	35.5	46.0	10.5	
Hori	2483.500	PK	58.2	27.4	4.8	34.4	-	56.0	73.9	17.9	
Hori	4960.000	PK	48.2	31.6	7.1	33.7	-	53.2	73.9	20.7	
Hori	7440.000	PK	43.8	36.3	8.3	33.6	-	54.8	73.9	19.1	Floor noise
Hori	12400.000	PK	50.4	39.3	-2.5	32.8	-	54.4	73.9	19.5	
Hori	2483.500	AV	44.0	27.4	4.8	34.4	0.9	42.7	53.9	11.2	*1)
Hori	4960.000	AV	42.0	31.6	7.1	33.7	0.9	47.9	53.9	6.0	
Hori	7440.000	AV	35.4	36.3	8.3	33.6	-	46.4	53.9	7.5	Floor noise
Hori	12400.000	AV	43.7	39.3	-2.5	32.8	0.9	48.6	53.9	5.3	
Vert	47.999	QP	55.9	11.3	7.6	38.9	-	35.9	40.0	4.1	
Vert	110.148	QP	56.2	11.3	8.6	39.0	-	37.1	43.5	6.4	
Vert	120.149	QP	52.4	12.5	8.8	39.0	-	34.7	43.5	8.8	
Vert	300.371	QP	52.1	13.4	10.5	38.8	-	37.2	46.0	8.8	
Vert	582.781	QP	42.6	18.8	12.5	38.3	-	35.6	46.0	10.4	
Vert	941.269	QP	37.6	22.0	14.7	37.9	-	36.4	46.0	9.6	
Vert	2483.500	PK	60.1	27.4	4.8	34.4	-	57.9	73.9	16.0	
Vert	4960.000	PK	49.3	31.6	7.1	33.7	-	54.3	73.9	19.6	
Vert	7440.000	PK	43.4	36.3	8.3	33.6	-	54.4	73.9	19.5	Floor noise
Vert	12400.000	PK	48.0	39.3	-2.5	32.8	-	52.0	73.9	21.9	
Vert	2483.500	AV	45.8	27.4	4.8	34.4	0.9	44.5	53.9	9.4	*1)
Vert	4960.000	AV	44.0	31.6	7.1	33.7	0.9	49.9	53.9	4.0	
Vert	7440.000	AV	35.3	36.3	8.3	33.6	-	46.3	53.9	7.6	Floor noise
Vert	12400.000	AV	40.3	39.3	-2.5	32.8	0.9	45.2	53.9	8.7	

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

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

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

10 GHz - 26.5 GHz  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

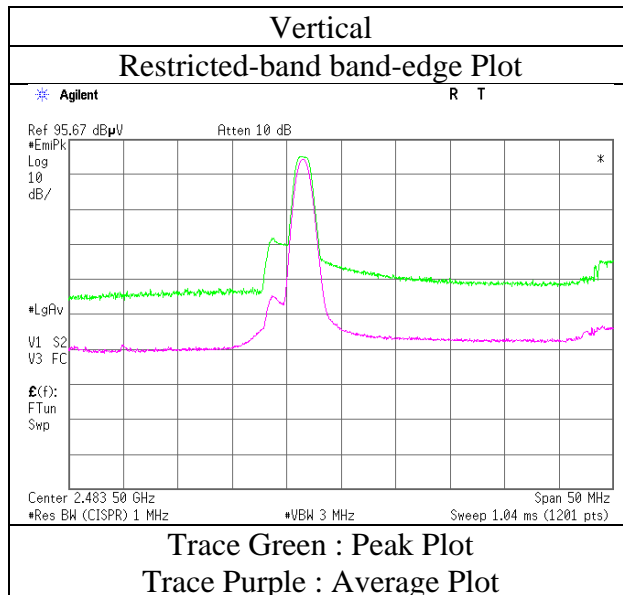
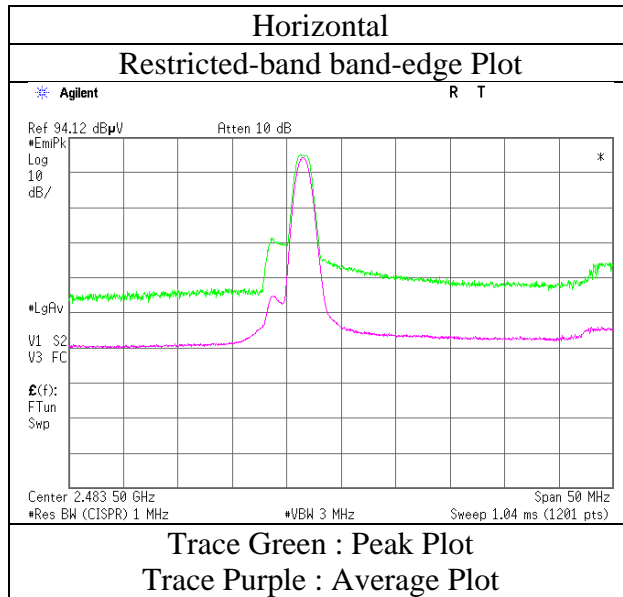
### 20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2480	PK	88.9	27.4	4.8	34.4	86.7	-	-	Carrier
Hori	9920	PK	46.7	38.6	9.1	34	60.4	66.7	6.3	
Vert	2480	PK	90.7	27.4	4.8	34.4	88.5	-	-	Carrier
Vert	9920	PK	42.4	38.6	9.1	34	56.1	68.5	12.4	

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

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

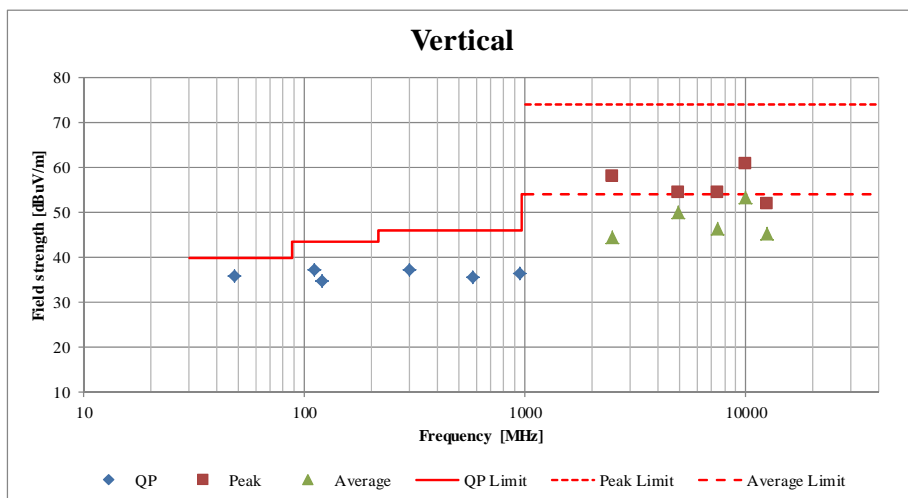
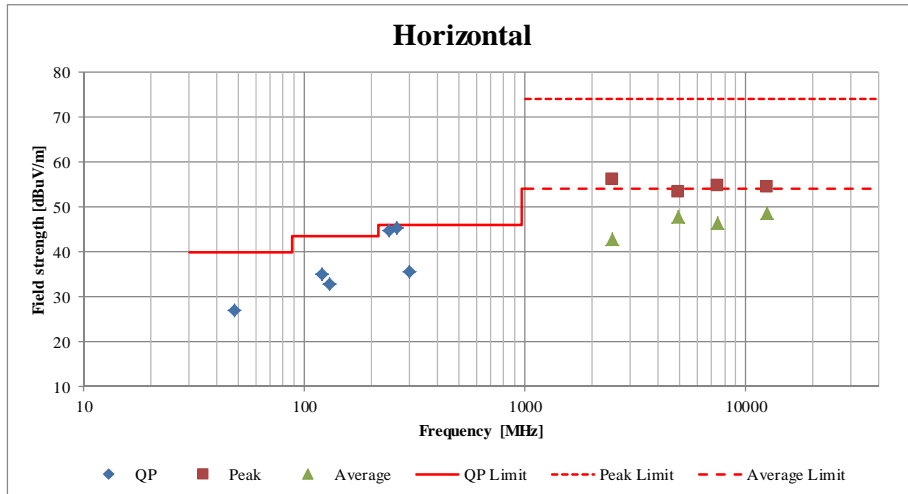
Report No. 12140568H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date March 17, 2018  
Temperature / Humidity 19 deg. C / 25 % RH  
Engineer Masafumi Niwa  
(1 GHz - 10 GHz)  
Mode Tx BT LE 2480 MHz



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

**Radiated Spurious Emission**  
**(Plot data, Worst case)**

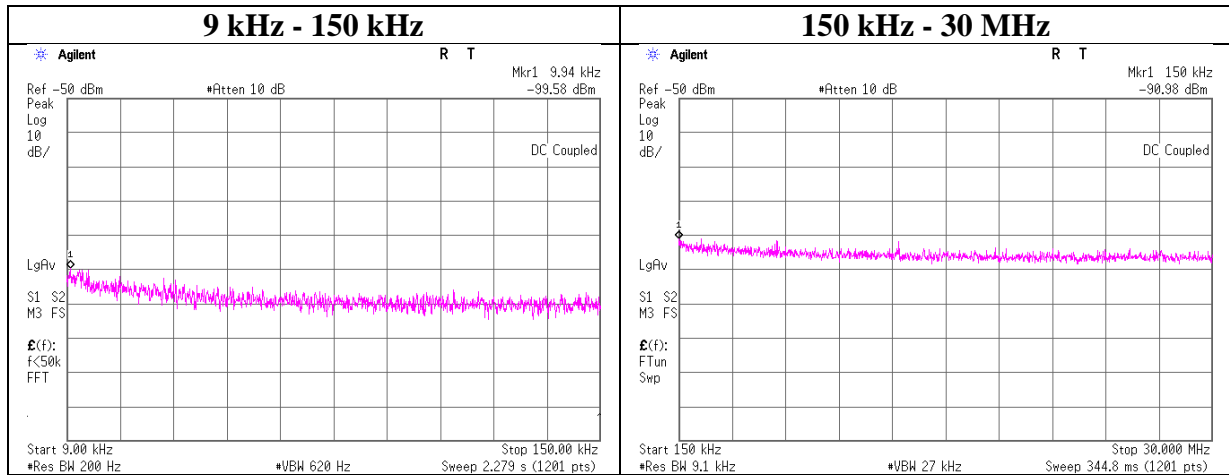
Report No.	12140568H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.1	No.2
Date	March 17, 2018	March 18, 2018	March 23, 2018
Temperature / Humidity	19 deg. C / 25 % RH	21 deg. C / 35 % RH	22 deg. C / 30 % RH
Engineer	Masafumi Niwa (1 GHz - 10 GHz)	Ryota Yamanaka (Below 1 GHz)	Takafumi Noguchi (10 GHz - 26.5 GHz)
Mode	Tx BT LE 2480 MHz		



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

## Conducted Spurious Emission

Report No. 12140568H  
 Test place Ise EMC Lab. No.11 Measurement Room  
 Date February 22, 2018  
 Temperature / Humidity 23 deg. C / 40 % RH  
 Engineer Yuta Moriya  
 Mode Tx BT LE 2402 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
9.94	-99.6	0.67	9.83	2.0	1	-87.1	300	6.0	-25.8	47.6	73.4	
150.00	-91.0	0.67	9.84	2.0	1	-78.5	300	6.0	-17.2	24.0	41.2	

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

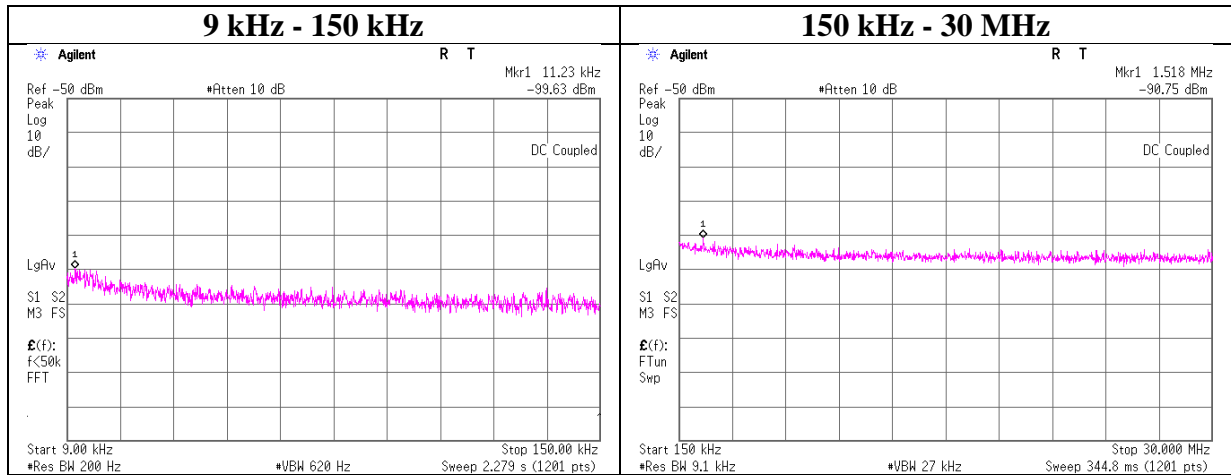
$$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log(N)$$

N: Number of output

\*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

## Conducted Spurious Emission

Report No. 12140568H  
 Test place Ise EMC Lab. No.11 Measurement Room  
 Date February 22, 2018  
 Temperature / Humidity 23 deg. C / 40 % RH  
 Engineer Yuta Moriya  
 Mode Tx BT LE 2440 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.23	-99.6	0.67	9.83	2.0	1	-87.1	300	6.0	-25.9	46.5	72.4	
1518.00	-90.8	0.67	9.84	2.0	1	-78.2	30	6.0	3.0	23.9	20.9	

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

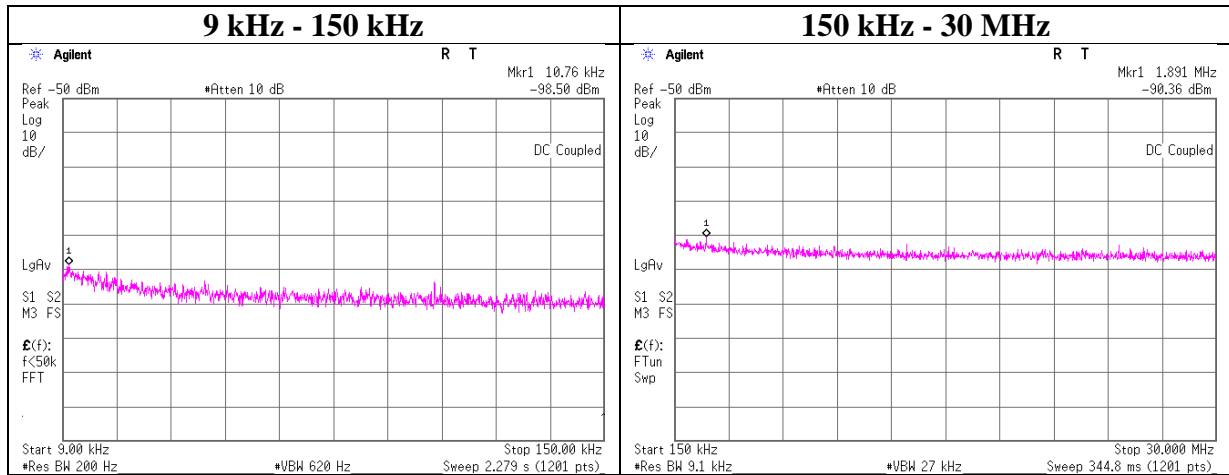
$$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log(N)$$

N: Number of output

\*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

## Conducted Spurious Emission

Report No. 12140568H  
 Test place Ise EMC Lab. No.11 Measurement Room  
 Date February 22, 2018  
 Temperature / Humidity 23 deg. C / 40 % RH  
 Engineer Yuta Moriya  
 Mode Tx BT LE 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
10.76	-98.5	0.67	9.83	2.0	1	-86.0	300	6.0	-24.7	46.9	71.6	
1891.00	-90.4	0.67	9.84	2.0	1	-77.9	30	6.0	3.4	29.5	26.1	

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

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

N: Number of output

\*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

**UL Japan, Inc.**

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### Power Density

Report No. 12140568H  
Test place Ise EMC Lab. No.11 Measurement Room  
Date March 26, 2018  
Temperature / Humidity 23 deg. C / 24 % RH  
Engineer Tomoki Matsui  
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402.00	-33.79	1.64	10.04	-22.11	8.00	30.11
2440.00	-33.45	1.64	10.04	-21.77	8.00	29.77
2480.00	-32.98	1.65	10.04	-21.29	8.00	29.29

Sample Calculation:

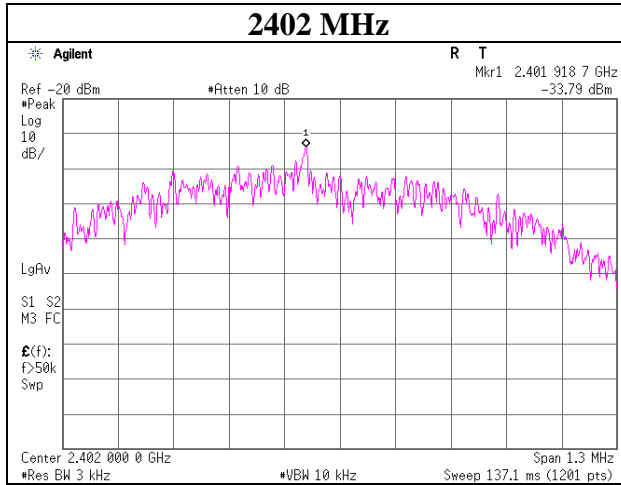
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss



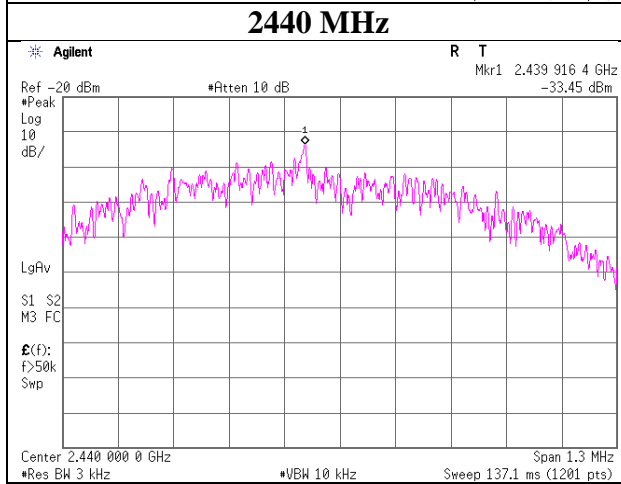
**Power Density**

**BT LE**

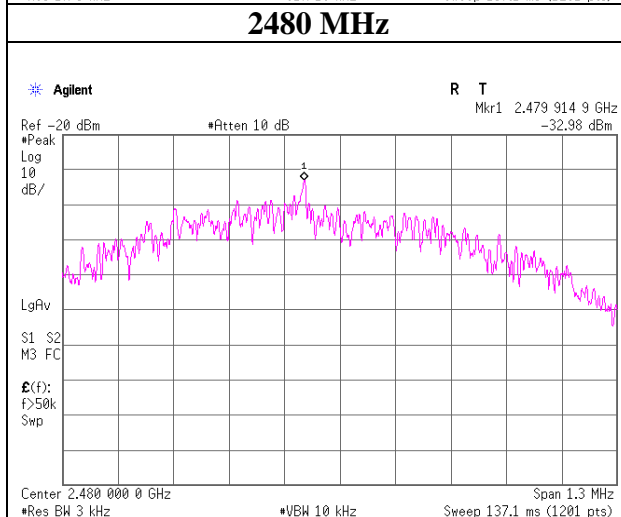
**2402 MHz**



**2440 MHz**



**2480 MHz**



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## APPENDIX 2: Test instruments

### Test Instruments (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE,CE	2017/08/31 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE,CE	2017/12/21 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE,CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE,CE	-
MSA-16	Spectrum Analyzer	Agilent	E4440A	MY46186390	RE	2017/09/20 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2018/02/26 * 12
MCC-216	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	RE	2017/08/04 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2018/01/23 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE	2018/02/27 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE,CE	2017/08/07 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2017/05/30 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	CE	2017/11/14 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	CE	2017/08/21 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE (EUT)	2017/07/24 * 12
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE (AE)	2017/07/20 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2017/12/11 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/ 5D-2W(5m)/ 5D-2W(0.8m)/ 5D-2W(1m)	-	CE	2018/02/23 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2017/12/19 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2017/10/31 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2018/01/24 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2017/11/07 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2017/08/22 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2017/10/02 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2018/01/30 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2017/07/12 * 12
MAT-98	Attenuator	KEYSIGHT	8491A	MY52462349	RE	2017/12/14 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2017/03/27 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2018/01/09 * 12
MRENT-130	Spectrum Analyzer	Agilent	E4440A	MY46187750	AT	2017/11/17 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2018/03/12 * 12
MCC-144	Microwave Cable	Junkosha	MWX221	1207S407	AT	2017/08/02 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2017/11/14 * 12
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2017/06/20 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2017/06/20 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2017/12/21 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2017/09/30 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2018/01/24 * 12
MJM-25	Measure	KOMELON	KMC-36	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2017/06/27 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2017/11/23 * 12
MLA-20	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-189	RE	2018/01/30 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2017/11/14 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	RE	2017/09/26 * 12

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**Test Instruments (2/2)**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2018/02/20 * 12
MMM-03	Digital Tester	Fluke	FLUKE 26-3	78030621	RE	2017/08/07 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2017/09/11 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2017/08/22 * 12

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

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

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

**Test item: CE: Conducted Emission test  
RE: Radiated Emission test  
AT: Antenna terminal disturbance voltage**