



# RADIO TEST REPORT

Test Report No. : 11495021S-B

**Applicant** : SMK Corporation  
**Type of Equipment** : Bluetooth low energy Module  
**Model No.** : BTS04  
**FCC ID** : GT3FC023  
**Test regulation** : FCC Part 15 Subpart C: 2016  
**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. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
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)

**Date of test:** December 6 2016 to January 8, 2017

**Representative test engineer:** *S. Takano*  
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Engineer  
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**Approved by:** *T. Imamura*  
Toyokazu Imamura  
Leader  
Consumer Technology Division



- 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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13-EM-F0429



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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 : +81-3-3785-1878  
Contact Person : Takashi Ido

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

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

Type of Equipment : Bluetooth low energy Module  
Model No. : BTS04  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 1.7 V to 3.6 V (typical DC 3.3 V)  
Receipt Date of Sample : November 29, 2016  
Country of Mass-production : Japan, China, USA, Mexico  
Condition of EUT : Engineering prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No Modification by the test lab.

### **2.2 Product Description**

Model: BTS04 (referred to as the EUT in this report) is a Bluetooth low energy Module.

### **Radio Specification**

Radio Type : Transceiver  
Frequency of Operation : 2402 MHz - 2480 MHz  
Modulation : GFSK  
Power Supply (radio part input) : DC 1.3 V  
Antenna type : PWB Printed  
Antenna Gain : -1.36 dBi  
Clock frequency (Maximum) : 32 MHz

## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on November 14, 2016 and effective December 14, 2016

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 November 14, 2016, does not affect the test specification applied to the EUT.

### **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	20.0 dB 0.38575 MHz, PK, N Tx 2480 MHz	Complied	-
6dB Bandwidth	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: -	FCC: Section 15.247(a)(2) IC: RSS-247 5.2(1)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: RSS-Gen 6.12	FCC: Section 15.247(b)(3) IC: RSS-247 5.4(4)		Complied	Conducted
Power Density	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: -	FCC: Section 15.247(e) IC: RSS-247 5.2(2)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: RSS-Gen 6.13	FCC: Section 15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	4.1 dB 7440.00 MHz, AV, Vertical Tx 2480 MHz	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 v03r05 12.2.7.

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

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

The RF Module has its own regulator. The RF Module is constantly provided voltage (DC 1.3 V) through the regulator 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.

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### 3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 6.6	IC: -	N/A	-	Conducted

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

### 3.4 Uncertainty

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

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Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.5 dB	2.6 dB	2.5 dB	2.5 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.1 dB	3.1 dB	3.1 dB	-	-
	30 MHz-200 MHz	4.6 dB	4.4 dB	4.6 dB	-	-
	200 MHz-1 GHz	5.8 dB	5.7 dB	5.8 dB	-	-
	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB	-	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.6 dB	4.6 dB	4.6 dB	-	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.72 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.85 dB
Spurious emission (Conducted) below 1GHz	1.6 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.3 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.2 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.3 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.4 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

#### 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.

### 3.5 Test Location

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JAB Accreditation No. RTL02610

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

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

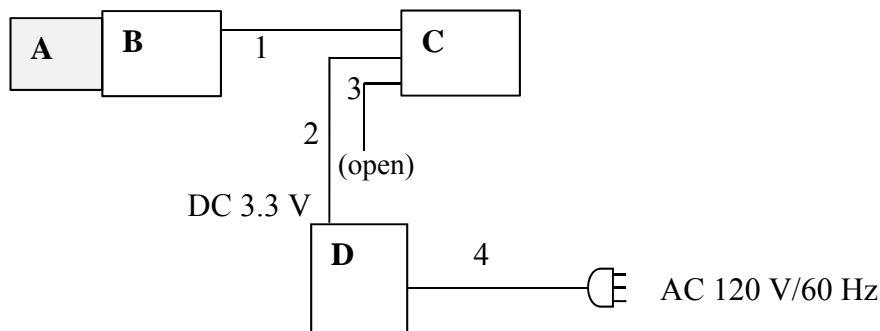
Refer to APPENDIX.

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

### 4.1 Operating Mode(s)

Mode	Remarks*
Bluetooth Low Energy	PRBS9
*Power of the EUT was set by the software as follows; Power settings: 4 dBm Software: DTM Tool for BTS04 (DLE) ver.0.0.8.1 *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.	

### 4.2 Configuration and peripherals



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

#### Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Bluetooth low energy Module	BTS04	F0F48E *1), F0F490*2)	SMK	EUT
B	Jig A	-	-	SMK	-
C	Jig B	-	-	SMK	-
D	DC Power Supply	PAN35-10A	NA000955	Kikusui	-

\*1) Used for Antenna Terminal conducted test

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

#### List of cables used

No.	Cable Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal & DC	0.48	Unshielded	Unshielded	-
2	DC	2.1	Unshielded	Unshielded	-
3	Serial	0.1	Unshielded	Unshielded	-
4	AC	1.8	Unshielded	Unshielded	-



## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.

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.

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

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

An overview sweep with peak detection has been performed.

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

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

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

### **Test Procedure**

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "558074 D01 DTS Meas Guidance v03r05".

[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. 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: <u>12.2.5.2</u> RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (Linear voltage) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3.97 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)		3.97 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)

\*1) Average Power Measurement was performed based on 6.0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v03r05".

\*2) Distance Factor:  $20 \times \log(3.97 \text{ m} / 3.0 \text{ m}) = 2.44 \text{ dB}$

\*3) Distance Factor:  $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

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

Antenna polarization	Carrier (Band edge)	Spurious			
		Below 1 GHz	Above 1 GHz		
			1 GHz -2.8 GHz	2.8 GHz -13 GHz	13 GHz -26.5 GHz
Horizontal	X	X	X	X	
Vertical	Y	X	Y	X	

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

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

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

### **Test Procedure**

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

<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	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Sample	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	9.1 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	10 kHz	30 kHz				
*1) Max 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 v03r05". *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							

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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**APPENDIX 1: Test data**

**Conducted Emission**

**DATA OF CONDUCTED EMISSION TEST**

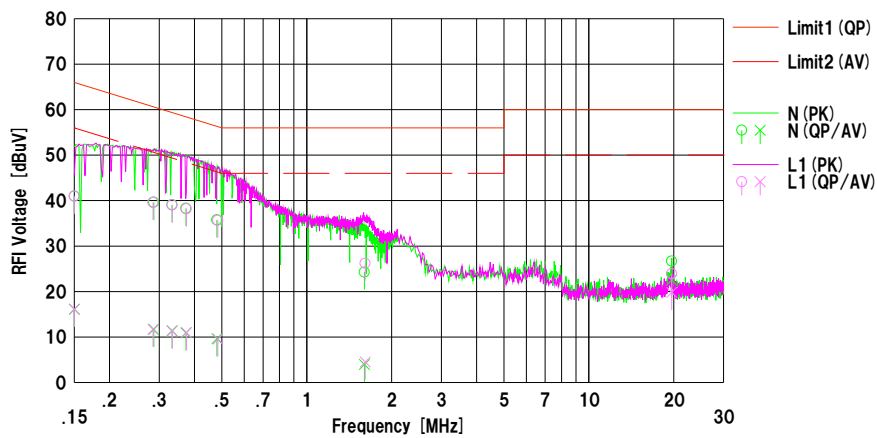
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room  
Date : 2017/01/08

Mode : Bluetooth Low Energy Tx 2402 MHz  
Power : AC 120 V/60 Hz (DC 3.3 V)  
Temp./Humi. : 21 deg.C / 21 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP  
Limit2 : FCC 15C (15.207) AV

Engineer : Hikaru Shirasawa



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	28.43	3.50	12.58	41.01	16.08	66.00	56.00	24.9	39.9	N	
2	0.28699	27.04	-0.90	12.60	39.84	11.70	60.61	50.61	20.9	38.9	N	
3	0.33322	26.48	-1.24	12.62	39.10	11.38	59.37	49.37	20.2	37.9	N	
4	0.37331	25.66	-1.71	12.63	38.29	10.92	58.43	48.43	20.1	37.5	N	
5	0.48049	23.13	-3.01	12.63	35.76	9.62	56.33	46.33	20.5	36.7	N	
6	1.60074	11.56	-8.74	12.71	24.27	3.97	56.00	46.00	31.7	42.0	N	
7	19.66540	13.03	8.86	13.65	26.68	22.51	60.00	50.00	33.3	27.4	N	
8	0.15000	28.38	3.56	12.58	40.96	16.14	66.00	56.00	25.0	39.8	L1	
9	0.28523	26.99	-0.92	12.60	39.59	11.68	60.66	50.66	21.0	38.9	L1	
10	0.33344	26.42	-1.33	12.62	39.04	11.29	59.37	49.37	20.3	38.0	L1	
11	0.37450	25.56	-1.64	12.63	38.19	10.99	58.40	48.40	20.2	37.4	L1	
12	0.48412	23.03	-3.10	12.63	35.66	9.53	56.27	46.27	20.6	36.7	L1	
13	1.61263	13.49	-8.19	12.71	26.20	4.52	56.00	46.00	29.8	41.4	L1	
14	19.66548	10.29	6.18	13.65	23.94	19.83	60.00	50.00	36.0	30.1	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]  
LISN: SLS-03

## Conducted Emission

### DATA OF CONDUCTED EMISSION TEST

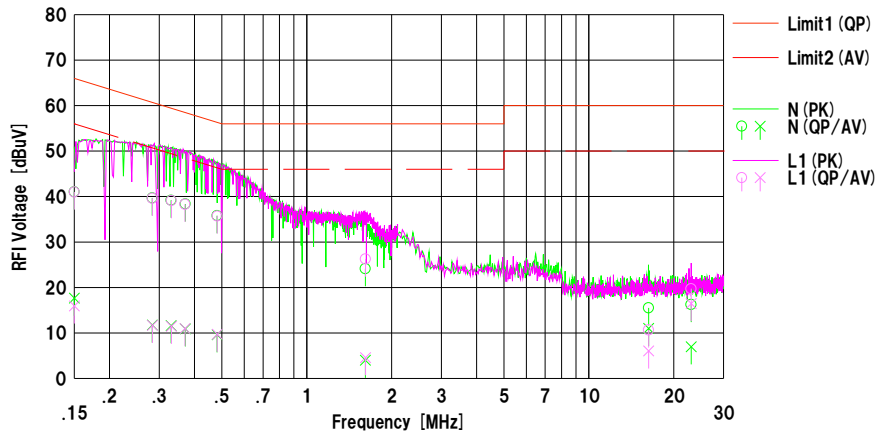
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room  
Date : 2017/01/08

Mode : Bluetooth Low Energy Tx 2440 MHz  
Power : AC 120 V/60 Hz (DC 3.3 V)  
Temp./Humi. : 21 deg.C / 21 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP  
Limit2 : FCC 15C (15.207) AV

Engineer : Hikaru Shirasawa



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	28.46	5.09	12.58	41.04	17.67	66.00	56.00	24.9	38.3	N	
2	0.28354	27.10	-0.84	12.60	39.70	11.76	60.71	50.71	21.0	38.9	N	
3	0.33067	26.57	-1.01	12.62	39.19	11.61	59.43	49.43	20.2	37.8	N	
4	0.37130	25.74	-1.73	12.63	38.37	10.90	58.47	48.47	20.1	37.5	N	
5	0.48123	23.17	-3.02	12.63	35.80	9.61	56.32	46.32	20.5	36.7	N	
6	1.61330	11.43	-8.72	12.71	24.14	3.99	56.00	46.00	31.8	42.0	N	
7	16.28802	2.01	-2.50	13.51	15.52	11.01	60.00	50.00	44.4	38.9	N	
8	23.05275	2.44	-6.86	13.81	16.25	6.95	60.00	50.00	43.7	43.0	N	
9	0.15000	28.40	3.35	12.58	40.98	15.93	66.00	56.00	25.0	40.0	L1	
10	0.28380	27.01	-0.90	12.60	39.61	11.70	60.70	50.70	21.0	39.0	L1	
11	0.33140	26.49	-1.15	12.62	39.11	11.47	59.42	49.42	20.3	37.9	L1	
12	0.37043	25.66	-1.65	12.63	38.29	10.98	58.49	48.49	20.2	37.5	L1	
13	0.48171	23.07	-2.91	12.63	35.70	9.72	56.31	46.31	20.6	36.5	L1	
14	1.61578	13.56	-8.14	12.71	26.27	4.57	56.00	46.00	29.7	41.4	L1	
15	16.28750	-2.85	-7.46	13.51	10.66	6.05	60.00	50.00	49.3	43.9	L1	
16	23.05338	5.92	2.67	13.81	19.73	16.48	60.00	50.00	40.2	33.5	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]  
LISN: SLS-03

## Conducted Emission

### DATA OF CONDUCTED EMISSION TEST

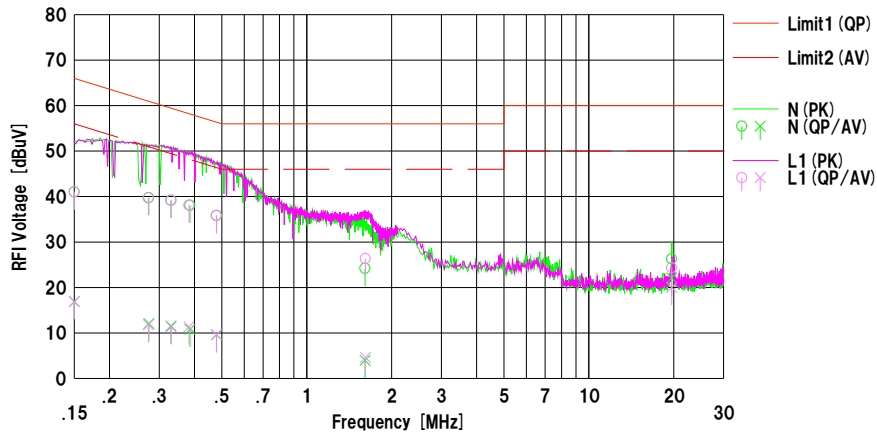
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room  
Date : 2017/01/08

Mode : Bluetooth Low Energy Tx 2480 MHz  
Power : AC 120 V/60 Hz (DC 3.3 V)  
Temp./Humi. : 21 deg.C / 21 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP  
Limit2 : FCC 15C (15.207) AV

Engineer : Hikaru Shirasawa



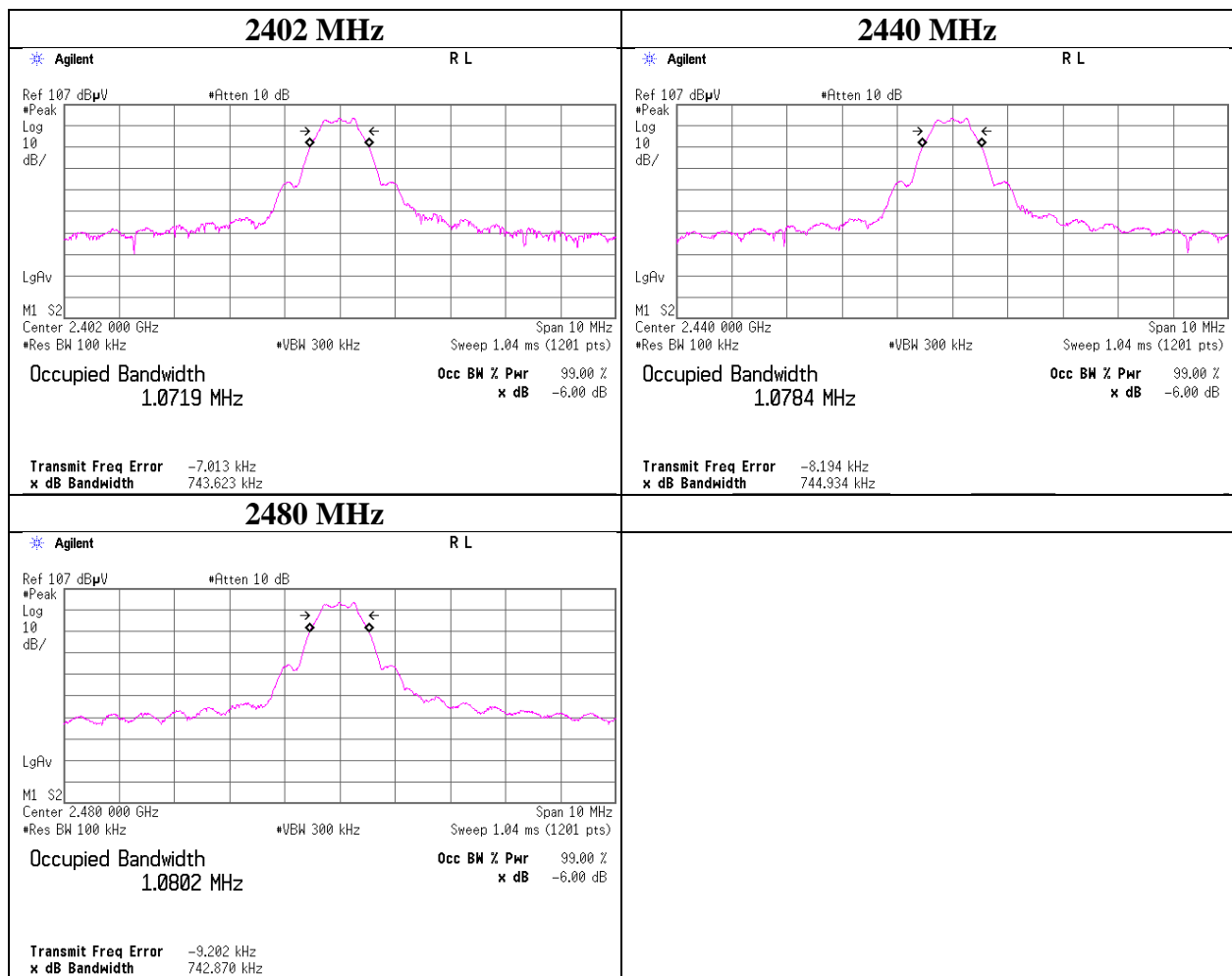
No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	28.47	4.33	12.58	41.05	16.91	66.00	56.00	24.9	39.0	N	
2	0.27575	27.16	-0.50	12.59	39.75	12.09	60.94	50.94	21.1	38.8	N	
3	0.33020	26.57	-1.08	12.62	39.19	11.54	59.45	49.45	20.2	37.9	N	
4	0.38575	25.46	-1.84	12.62	38.08	10.78	58.15	48.15	20.0	37.3	N	
5	0.47907	23.22	-3.03	12.63	35.85	9.60	56.36	46.36	20.5	36.7	N	
6	1.60999	11.50	-8.73	12.71	24.21	3.98	56.00	46.00	31.7	42.0	N	
7	19.66540	12.64	8.43	13.65	26.29	22.08	60.00	50.00	33.7	27.9	N	
8	0.15000	28.40	4.29	12.58	40.98	16.87	66.00	56.00	25.0	39.1	L1	
9	0.27472	27.11	-0.75	12.59	39.70	11.84	60.97	50.97	21.2	39.1	L1	
10	0.33096	26.50	-1.30	12.62	39.12	11.32	59.43	49.43	20.3	38.1	L1	
11	0.38243	25.49	-1.28	12.62	38.11	11.34	58.23	48.23	20.1	36.8	L1	
12	0.47827	23.17	-2.96	12.63	35.80	9.67	56.37	46.37	20.5	36.7	L1	
13	1.61503	13.66	-8.12	12.71	26.37	4.59	56.00	46.00	29.6	41.4	L1	
14	19.66530	10.68	6.34	13.65	24.33	19.99	60.00	50.00	35.6	30.0	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]  
LISN: SLS-03

## 6dB Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11495021S-B
Date	December 6, 2016
Temperature / Humidity	23 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx BT LE

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
BT LE	2402	0.744	> 500
	2440	0.745	> 500
	2480	0.743	> 500





### Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11495021S-B  
Date : December 6, 2016  
Temperature / Humidity : 23 deg. C / 42 % RH  
Engineer : Shinichi Takano  
Mode : Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-6.31	0.98	9.64	4.31	2.70	30.00	1000	25.69
2440	-6.38	0.99	9.64	4.25	2.66	30.00	1000	25.75
2480	-6.47	0.99	9.65	4.17	2.61	30.00	1000	25.83

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)**

Test place                      Shonan EMC Lab. No.5 Shielded Room  
Report No.                      11495021S-B  
Date                              December 6, 2016  
Temperature / Humidity      23 deg. C / 42 % RH  
Engineer                        Shinichi Takano  
Mode                              Tx 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	-7.22	0.98	9.64	3.40	2.19	0.67	4.07	2.55
2440	-7.27	0.99	9.64	3.36	2.17	0.67	4.03	2.53
2480	-7.37	0.99	9.65	3.27	2.12	0.67	3.94	2.48

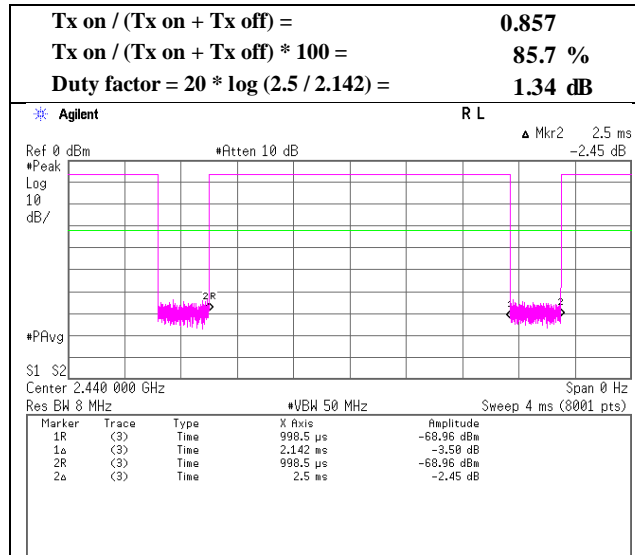
Sample Calculation:

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

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11495021S-B
Date	December 6, 2016
Temperature / Humidity	23 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx BT LE



## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11495021S-B  
Date : December 14, 2016      December 15, 2016  
Temperature / Humidity : 22 deg. C / 35 % RH      22 deg. C / 35 % RH  
Engineer : Hikaru Shirasawa      Takahiro Suzuki  
            (30 MHz – 1000MHz)      (1 GHz -13 GHz)  
            (13 GHz -26.5 GHz)  
Mode : Tx BT LE 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.	32.115	QP	22.18	16.78	6.77	32.19	0.00	13.54	40.00	26.4	100	0	
Hori.	90.759	QP	21.96	8.36	7.36	32.15	0.00	5.53	43.50	37.9	100	0	
Hori.	188.210	QP	22.21	16.26	8.05	32.06	0.00	14.46	43.50	29.0	100	0	
Hori.	741.740	QP	21.53	20.15	10.52	31.79	0.00	20.41	46.00	25.5	100	0	
Hori.	2390.000	PK	43.58	27.41	13.77	37.06	2.44	50.14	73.90	23.7	155	0	
Hori.	4804.000	PK	42.80	31.13	5.95	37.12	2.44	45.20	73.90	28.7	145	0	
Hori.	7206.000	PK	47.20	36.44	7.48	37.84	2.44	55.72	73.90	<b>18.1</b>	118	296	
Hori.	9608.000	PK	44.20	38.63	8.40	39.13	2.44	54.54	73.90	19.3	153	0	
Vert.	31.922	QP	22.24	16.84	6.77	32.19	0.00	13.66	40.00	26.3	100	0	
Vert.	194.289	QP	22.37	16.24	8.09	32.05	0.00	14.65	43.50	28.8	100	0	
Vert.	868.735	QP	21.00	21.53	10.91	31.23	0.00	22.21	46.00	23.7	100	0	
Vert.	923.208	QP	20.42	21.98	11.10	30.84	0.00	22.66	46.00	23.3	100	0	
Vert.	2390.000	PK	33.71	27.41	13.77	37.06	2.44	40.27	73.90	33.6	150	0	
Vert.	4804.000	PK	42.86	31.13	5.95	37.12	2.44	45.26	73.90	28.6	149	0	
Vert.	7206.000	PK	46.59	36.44	7.48	37.84	2.44	55.11	73.90	18.7	147	287	
Vert.	9608.000	PK	44.43	38.63	8.40	39.13	2.44	54.77	73.90	19.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.44 dB  
                          13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

### Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	33.23	27.41	13.77	37.06	1.34	2.44	41.13	53.90	12.8	*1)
Hori.	4804.000	AV	35.87	31.13	5.95	37.12	1.34	2.44	39.61	53.90	14.3	
Hori.	7206.000	AV	38.93	36.44	7.48	37.84	1.34	2.44	48.79	53.90	<b>5.1</b>	
Hori.	9608.000	AV	35.83	38.63	8.40	39.13	1.34	2.44	47.51	53.90	6.4	
Vert.	2390.000	AV	34.33	27.41	13.77	37.06	1.34	2.44	42.23	53.90	11.7	*1)
Vert.	4804.000	AV	34.56	31.13	5.95	37.12	1.34	2.44	38.30	53.90	15.6	
Vert.	7206.000	AV	38.46	36.44	7.48	37.84	1.34	2.44	48.32	53.90	5.6	
Vert.	9608.000	AV	35.65	38.63	8.40	39.13	1.34	2.44	47.33	53.90	6.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor  
Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.44 dB  
                          13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Duty factor Calculation chart" 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	88.07	27.46	13.78	37.05	2.44	94.70	-	-	Carrier
Hori.	2400.000	PK	37.39	27.45	13.78	37.05	2.44	44.01	74.70	30.7	
Vert.	2402.000	PK	86.21	27.46	13.78	37.05	2.44	92.84	-	-	Carrier
Vert.	2400.000	PK	33.70	27.45	13.78	37.05	2.44	40.32	72.84	32.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.44 dB  
                          13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

**UL Japan, Inc.**

**Shonan EMC Lab.**

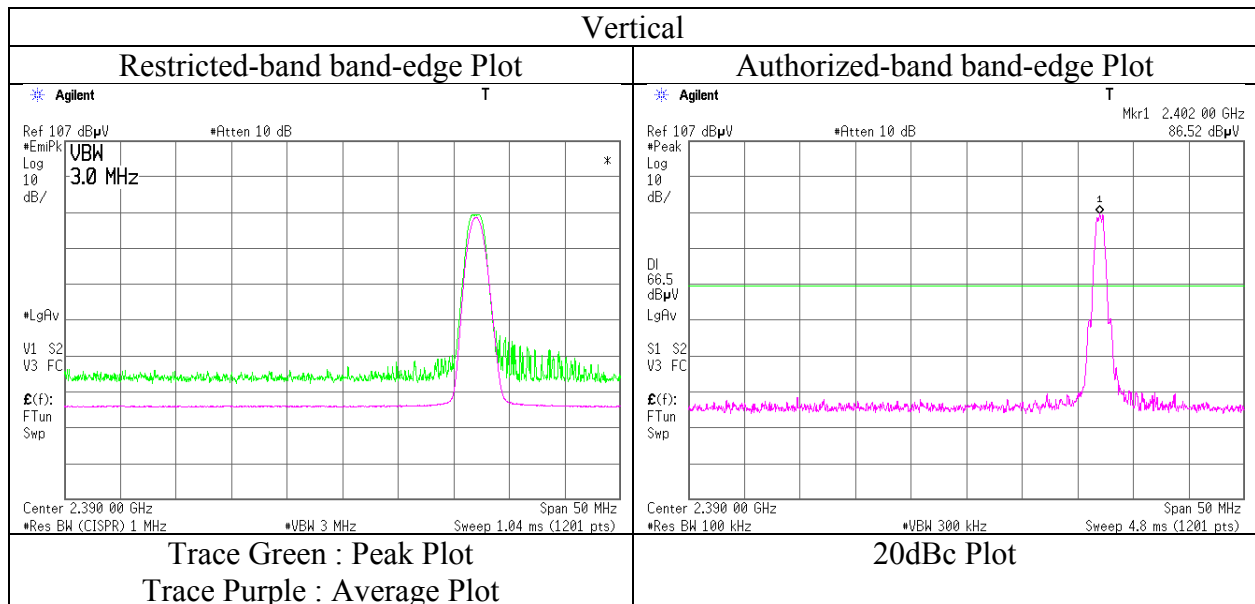
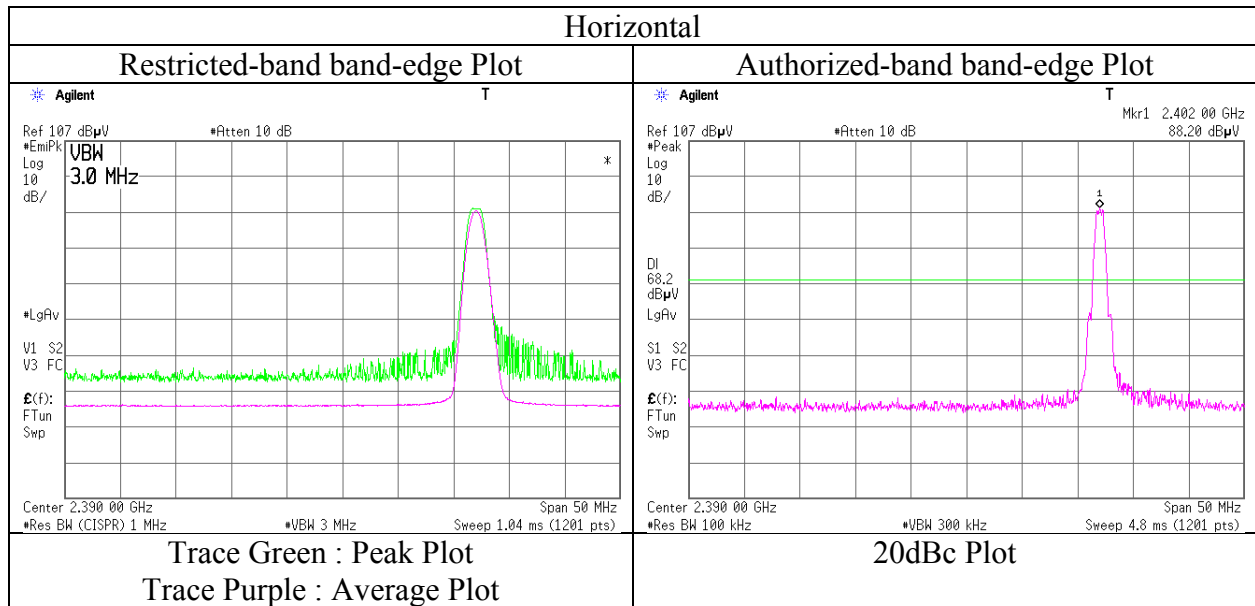
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11495021S-B  
Date : December 15, 2016  
Temperature / Humidity : 22 deg. C / 35 % RH  
Engineer : Takahiro Suzuki  
(1 GHz -13 GHz)  
Mode : Tx BT LE 2402 MHz



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

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11495021S-B  
Date : December 14, 2016      December 15, 2016  
Temperature / Humidity : 22 deg. C / 35 % RH      22 deg. C / 35 % RH  
Engineer : Hikaru Shirasawa      Takahiro Suzuki  
            (30 MHz – 1000MHz)      (1 GHz -13 GHz)  
            (13 GHz -26.5 GHz)  
Mode : Tx BT LE 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.	31.781	QP	22.34	16.88	6.77	32.19	0.00	13.80	40.00	26.2	100	0	
Hori.	165.864	QP	22.01	15.65	7.91	32.08	0.00	13.49	43.50	30.0	100	0	
Hori.	796.388	QP	21.06	20.75	10.69	31.59	0.00	20.91	46.00	25.0	100	0	
Hori.	866.914	QP	20.86	21.51	10.90	31.24	0.00	22.03	46.00	23.9	100	0	
Hori.	4880.000	PK	42.98	31.29	5.98	37.15	2.44	45.54	73.90	28.3	136	255	
Hori.	7320.000	PK	41.86	36.77	7.55	37.91	2.44	50.71	73.90	23.1	146	265	
Hori.	9760.000	PK	45.82	38.75	8.49	39.19	2.44	56.31	73.90	17.5	151	0	
Vert.	31.908	QP	22.26	16.84	6.77	32.19	0.00	13.68	40.00	26.3	100	0	
Vert.	177.551	QP	21.58	16.17	7.98	32.07	0.00	13.66	43.50	29.8	100	0	
Vert.	234.093	QP	22.81	11.66	8.32	32.01	0.00	10.78	46.00	35.2	165	358	
Vert.	725.188	QP	21.40	19.97	10.47	31.80	0.00	20.04	46.00	25.9	100	0	
Vert.	4880.000	PK	42.80	31.29	5.98	37.15	2.44	45.36	73.90	28.5	145	74	
Vert.	7320.000	PK	47.12	36.77	7.55	37.91	2.44	55.97	73.90	17.9	154	298	
Vert.	9760.000	PK	44.89	38.75	8.49	39.19	2.44	55.38	73.90	18.5	100	0	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.44 dB

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

### Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	AV	35.57	31.29	5.98	37.15	1.34	2.44	39.47	53.90	14.4	
Hori.	7320.000	AV	36.46	36.77	7.55	37.91	1.34	2.44	46.65	53.90	7.3	
Hori.	9760.000	AV	36.10	38.75	8.49	39.19	1.34	2.44	47.93	53.90	6.0	
Vert.	4880.000	AV	36.58	31.29	5.98	37.15	1.34	2.44	40.48	53.90	13.4	
Vert.	7320.000	AV	39.39	36.77	7.55	37.91	1.34	2.44	49.58	53.90	4.3	
Vert.	9760.000	AV	34.92	38.75	8.49	39.19	1.34	2.44	46.75	53.90	7.2	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.97 m / 3.0 m) = 2.44 dB

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

Duty factor refer to "Duty factor Calculation chart" sheet.

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

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11495021S-B  
Date : December 14, 2016      December 15, 2016  
Temperature / Humidity : 22 deg. C / 35 % RH      22 deg. C / 35 % RH  
Engineer : Hikaru Shirasawa      Takahiro Suzuki  
            (30 MHz – 1000MHz)      (1 GHz -13 GHz)  
            (13 GHz -26.5 GHz)  
Mode : Tx BT LE 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.	31.529	QP	22.41	16.95	6.77	32.19	0.00	13.94	40.00	26.0	100	0	
Hori.	186.528	QP	21.98	16.26	8.04	32.06	0.00	14.22	43.50	29.2	100	0	
Hori.	795.697	QP	21.08	20.74	10.69	31.59	0.00	20.92	46.00	25.0	100	0	
Hori.	916.166	QP	20.86	21.94	11.06	30.90	0.00	22.96	46.00	23.0	100	0	
Hori.	2483.500	PK	54.06	27.79	13.86	37.01	2.44	61.14	73.90	12.7	152	40	
Hori.	4960.000	PK	44.83	31.45	6.00	37.19	2.44	47.53	73.90	26.3	134	258	
Hori.	7440.000	PK	43.18	37.11	7.62	37.99	2.44	52.36	73.90	21.5	141	4	
Hori.	9920.000	PK	44.77	38.87	8.57	39.26	2.44	55.39	73.90	18.5	160	0	
Vert.	32.103	QP	22.12	16.78	6.77	32.19	0.00	13.48	40.00	26.5	100	0	
Vert.	193.333	QP	21.86	16.25	8.08	32.06	0.00	14.13	43.50	29.3	100	0	
Vert.	640.879	QP	21.37	19.26	10.15	31.94	0.00	18.84	46.00	27.1	100	0	
Vert.	779.388	QP	21.07	20.56	10.64	31.66	0.00	20.61	46.00	25.3	100	0	
Vert.	2483.500	PK	55.64	27.79	13.86	37.01	2.44	62.72	73.90	11.1	160	22	
Vert.	4960.000	PK	45.17	31.45	6.00	37.19	2.44	47.87	73.90	26.0	122	304	
Vert.	7440.000	PK	47.47	37.11	7.62	37.99	2.44	56.65	73.90	17.2	135	308	
Vert.	9920.000	PK	45.23	38.87	8.57	39.26	2.44	55.85	73.90	18.0	155	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 13 GHz :  $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.44\text{ dB}$   
13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

### Average measurement value with duty factor

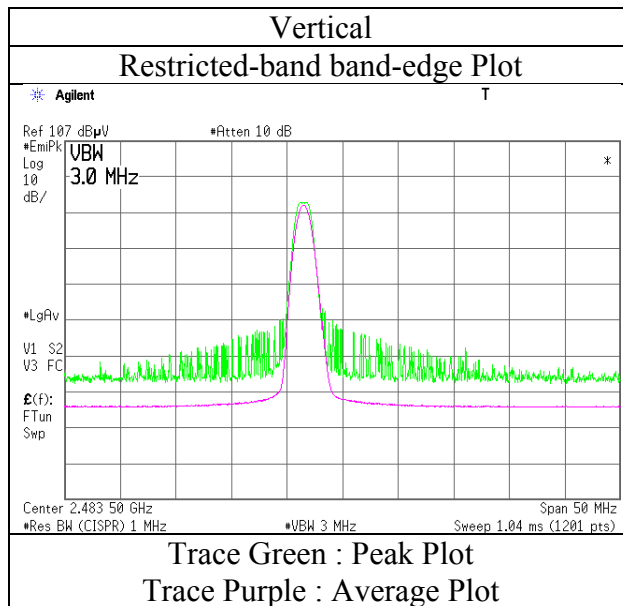
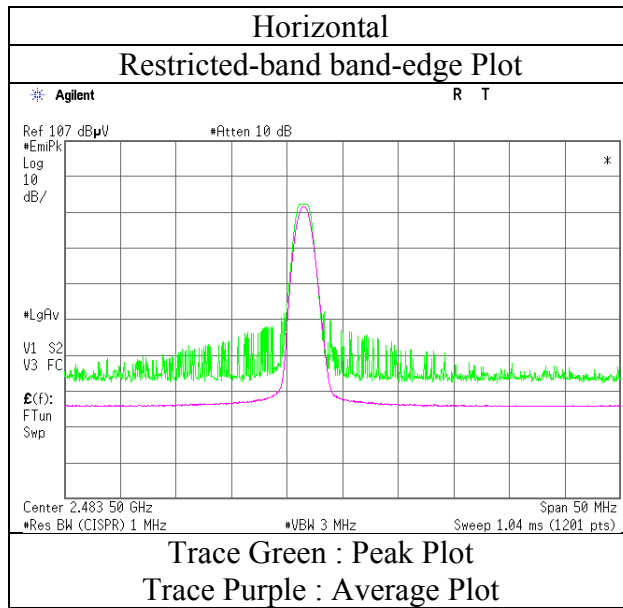
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	36.15	27.79	13.86	37.01	1.34	2.44	44.57	53.90	9.3	*1)
Hori.	4960.000	AV	37.46	31.45	6.00	37.19	1.34	2.44	41.50	53.90	12.4	
Hori.	7440.000	AV	36.23	37.11	7.62	37.99	1.34	2.44	46.75	53.90	7.2	
Hori.	9920.000	AV	36.33	38.87	8.57	39.26	1.34	2.44	48.29	53.90	5.6	
Vert.	2483.500	AV	35.76	27.79	13.86	37.01	1.34	2.44	44.18	53.90	9.7	*1)
Vert.	4960.000	AV	38.09	31.45	6.00	37.19	1.34	2.44	42.13	53.90	11.8	
Vert.	7440.000	AV	39.32	37.11	7.62	37.99	1.34	2.44	49.84	53.90	4.1	
Vert.	9920.000	AV	36.06	38.87	8.57	39.26	1.34	2.44	48.02	53.90	5.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor  
Distance factor : 1 GHz - 13 GHz :  $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.44\text{ dB}$   
13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$   
Duty factor refer to "Duty factor Calculation chart" sheet.

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

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

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11495021S-B
Date	December 15, 2016
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Takahiro Suzuki (1 GHz -13 GHz)
Mode	Tx BT LE 2480 MHz

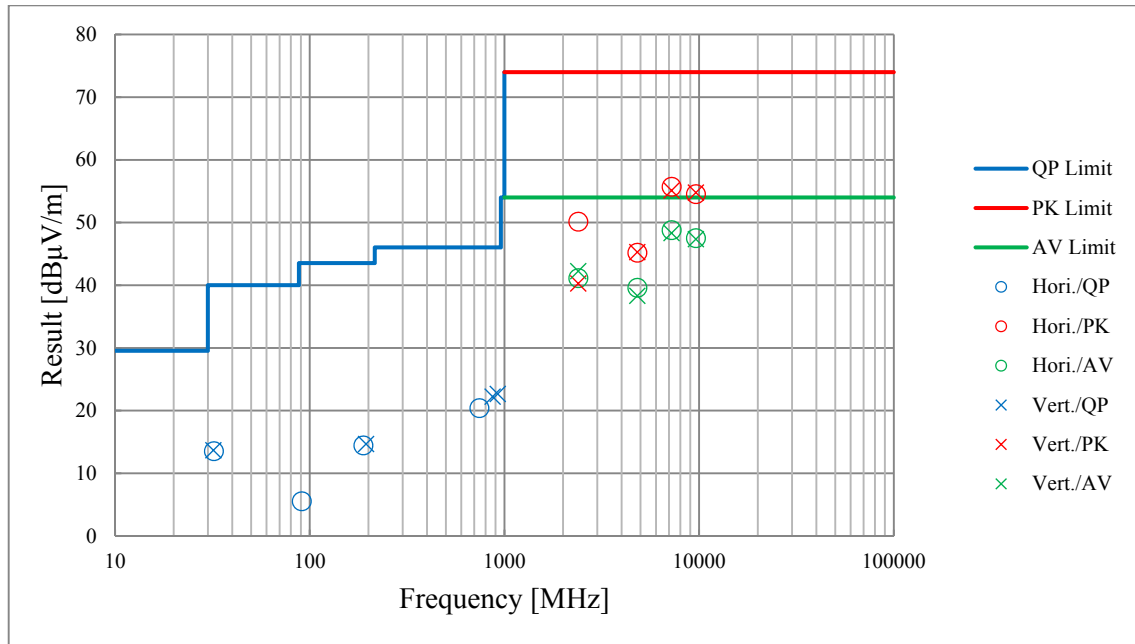


\* Final result of restricted band edge was shown in tabular data.



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

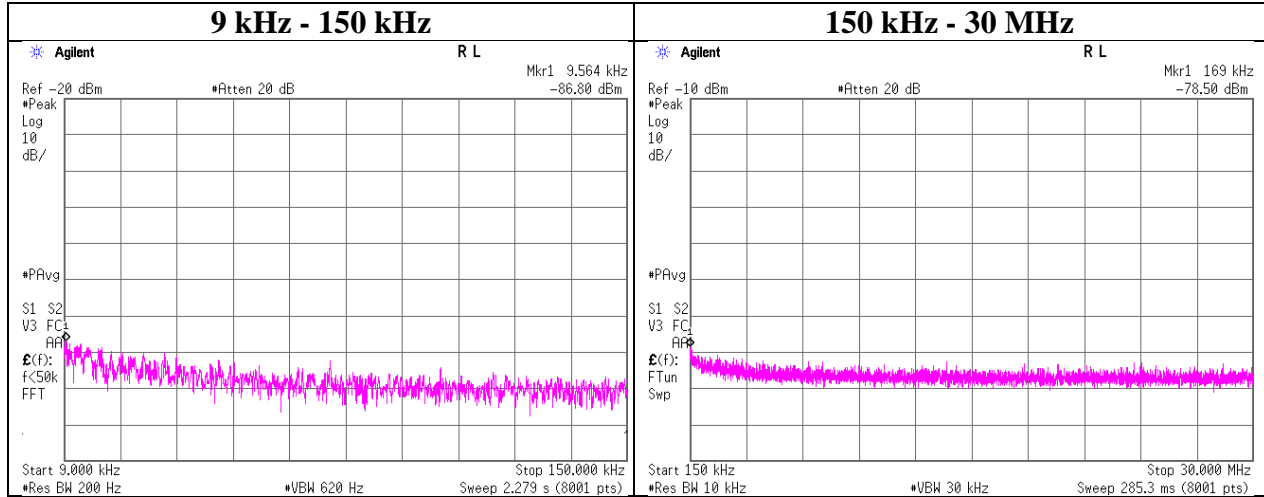
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11495021S-B	
Date	December 14, 2016	December 15, 2016
Temperature / Humidity	22 deg. C / 35 % RH	22 deg. C / 35 % RH
Engineer	Hikaru Shirasawa (30 MHz – 1000MHz)	Takahiro Suzuki (1 GHz -13 GHz)
Mode	Tx BT LE 2402 MHz	



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

### Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11495021S-B  
Date : December 6, 2016  
Temperature / Humidity : 23 deg. C / 42 % RH  
Engineer : Shinichi Takano  
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
9.56	-86.8	0.21	9.5	2.0	1	-75.1	300	6.0	-13.8	47.9	61.7	
169.00	-78.5	0.21	9.5	2.0	1	-66.8	300	6.0	-5.5	23.0	28.5	

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

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator Loss} + \text{Antenna Gain} + 10 * \log(N)$

\*If antenna gain is less than 2.0 dBi, 2.0 dBi is applied to the test result based on KDB 558074.

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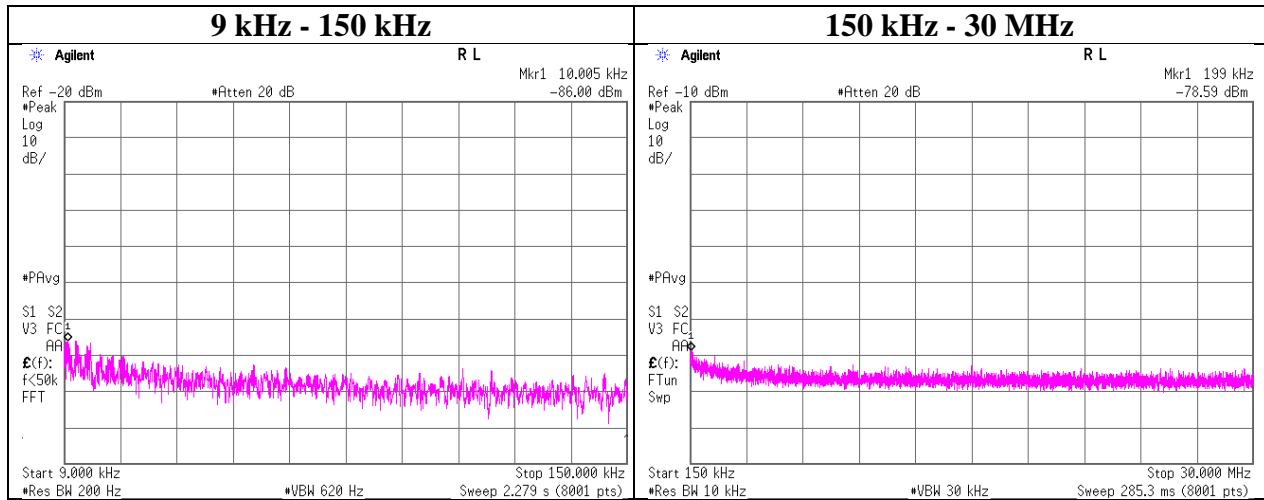
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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## Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11495021S-B
Date	December 6, 2016
Temperature / Humidity	23 deg. C / 42 % RH
Engineer	Shinichi Takano
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
10.01	-86.0	0.21	9.5	2.0	1	-74.3	300	6.0	-13.0	47.5	60.5	
199.00	-78.6	0.21	9.5	2.0	1	-66.8	300	6.0	-5.6	21.6	27.2	

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

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator Loss} + \text{Antenna Gain} + 10 * \log(N)$

\*If antenna gain is less than 2.0 dBi, 2.0 dBi is applied to the test result based on KDB 558074.

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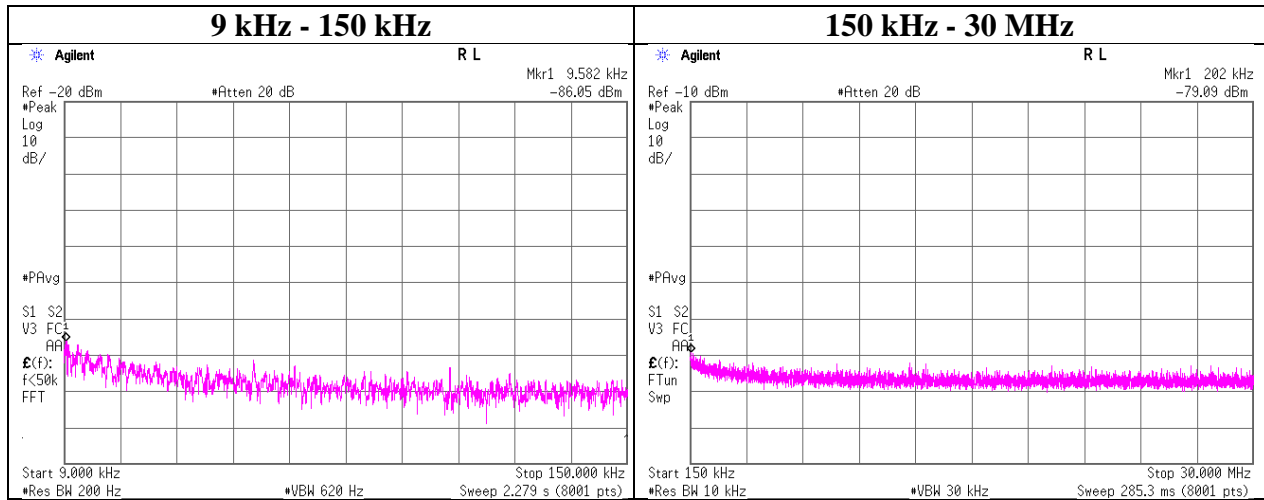
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### Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11495021S-B  
Date : December 6, 2016  
Temperature / Humidity : 23 deg. C / 42 % RH  
Engineer : Shinichi Takano  
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
9.58	-86.1	0.21	9.5	2.0	1	-74.3	300	6.0	-13.0	47.9	60.9	
202.00	-79.1	0.21	9.5	2.0	1	-67.3	300	6.0	-6.1	21.4	27.5	

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

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator Loss} + \text{Antenna Gain} + 10 * \log(N)$

\*If antenna gain is less than 2.0 dBi, 2.0 dBi is applied to the test result based on KDB 558074.

## Power Density

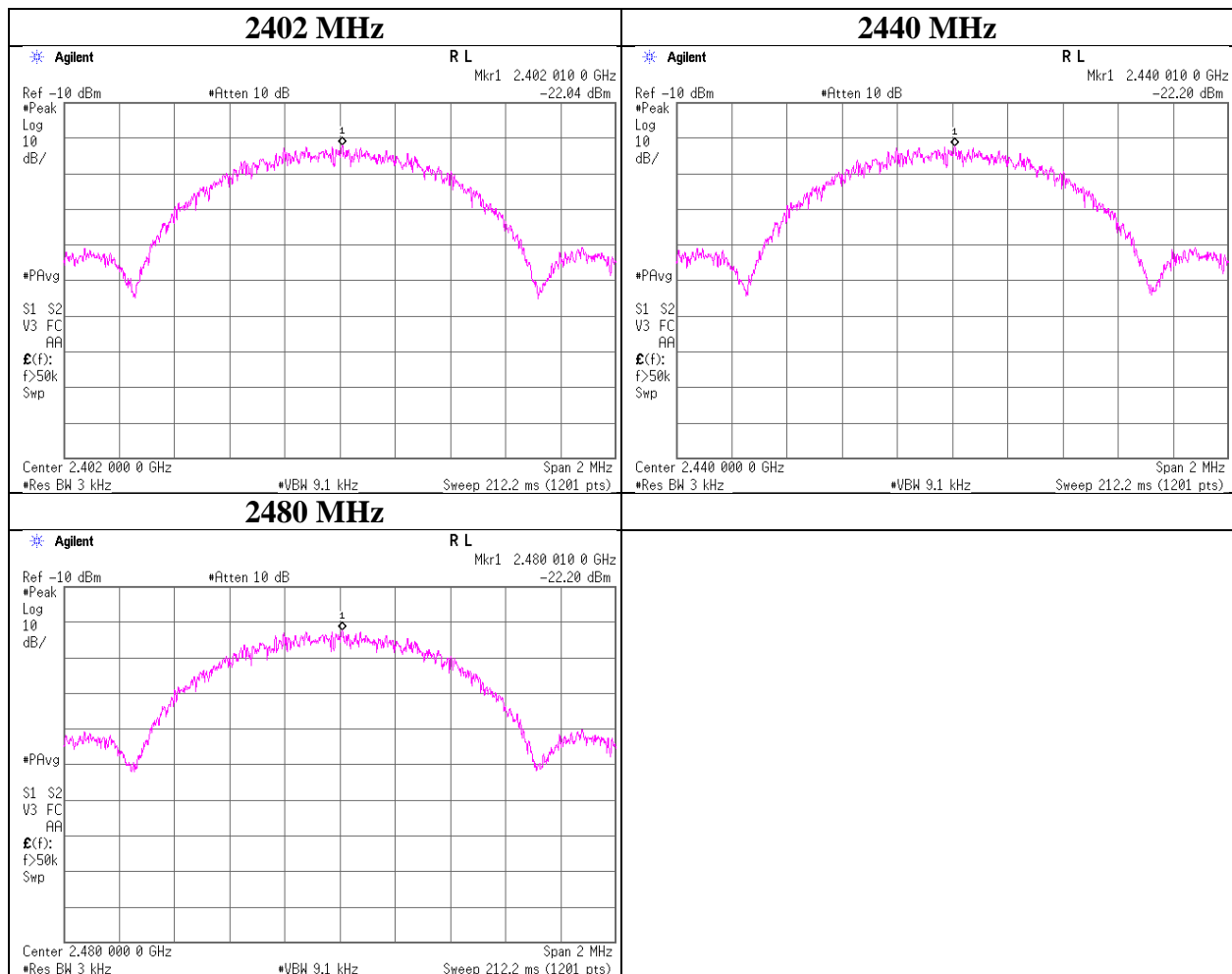
Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11495021S-B
Date	December 6, 2016
Temperature / Humidity	23 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402	-22.04	0.98	9.64	-11.42	8.00	19.42
2440	-22.20	0.99	9.64	-11.57	8.00	19.57
2480	-22.20	0.99	9.65	-11.56	8.00	19.56

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.



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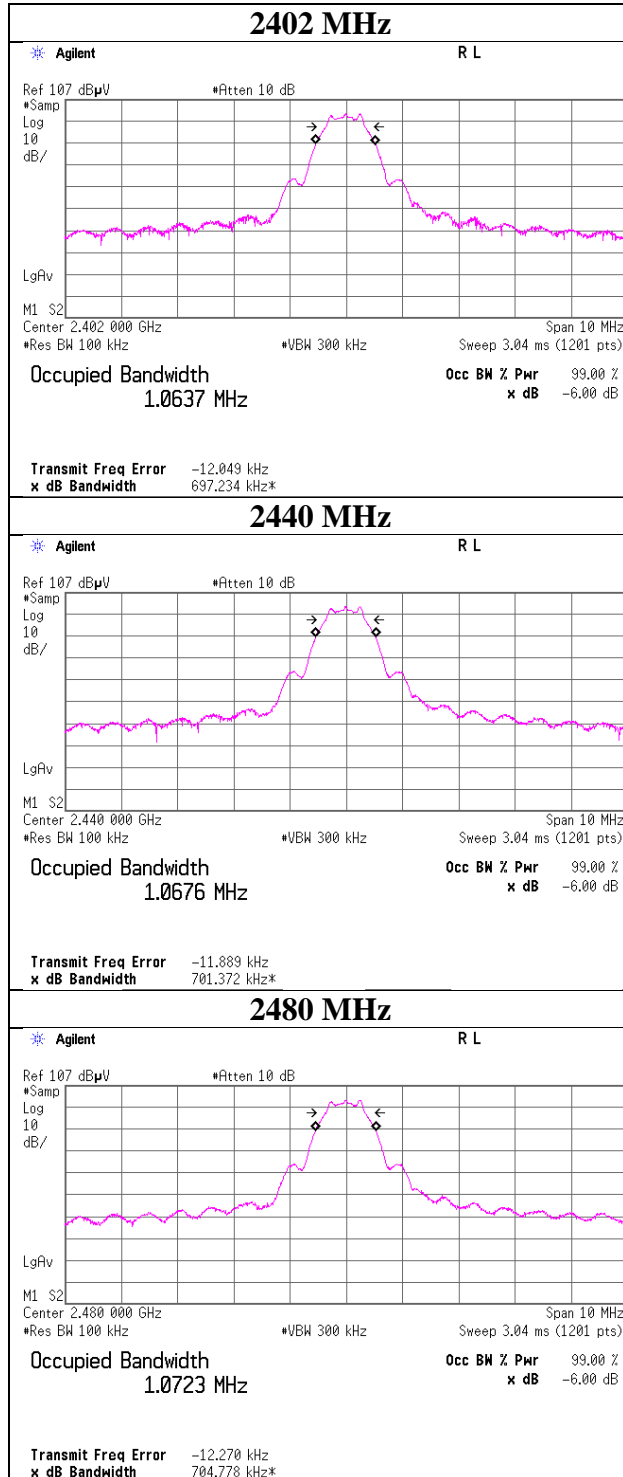
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## 99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11495021S-B
Date	December 6, 2016
Temperature / Humidity	23 deg. C / 42 % RH
Engineer	Shinichi Takano
Mode	Tx BT LE



## APPENDIX 2: Test instruments

### Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SRENT-08	Spectrum Analyzer	Agilent	E4448A	MY50180019	AT,RE	2016/10/24 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2016/03/23 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2016/11/07 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2016/04/01 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2016/04/01 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/07 * 12
STS-05	Digital Hitester	Hioki	3805-50	080997828	AT	2016/10/17 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA )	3	RE	2016/07/15 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2016/10/18 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	RE	2016/01/30 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2016/08/04 * 12
SCC-C1/C2/C3/C 4/C5/C10/SRSE- 03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner /Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA /141PE/141PE/ 141PE/141PE/ NS4906	-/0901-271(R F Selector)	RE	2016/04/22 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2016/02/25 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2016/03/28 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE ,CE,RFL,MF)	-	RE,CE	-
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2016/10/12 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2016/10/17 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2016/02/10 * 12
SCC-G04	Coaxial Cable	Junkosha	J12J102207-00	JUN-12-14-0 18	RE	2016/06/23 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2016/05/11 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2016/08/22 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2016/10/11 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2016/11/07 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2016/11/29 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2016/03/24 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2016/09/27 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2016/03/08 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-0100 0KMSKMS	-	RE	2016/04/18 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2016/03/15 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2016/03/23 * 12
SAEC-03(SVSW R)	Semi-Anechoic Chamber	TDK	SAEC-03(SVS WR)	3	RE	2016/07/25 * 12
SCC-B12/B13/S RSE-02	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141P E/NS4906	-/0901-270(R F Selector)	CE	2016/04/22 * 12
SLS-03	LISN	Rohde & Schwarz	ENV216	100513	CE	2016/02/08 * 12
SAT3-06	Attenuator	JFW	50HF-003N	-	CE	2016/02/25 * 12
SOS-04	Humidity Indicator	A&D	AD-5681	4061512	CE	2016/12/13 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	CE	2016/09/28 * 12
SJM-09	Measure	PROMART	SEN1935	-	CE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	CE	2016/03/22 * 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 Conducted test

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