RADIO TEST REPORT

Test Report No. : 12418148S-A-R1

Applicant	:	**Telepower Inc.**
Type of Equipment	:	**Ultra Small 2.4GHz Band Wireless Module**
Model No.	:	**TP26CMX-01**
FCC ID	:	**WQYCMX01**
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 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 EMC technical requirements.
   It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. This report is a revised version of 12418148S-A. 12418148S-A is replaced with this report.

Date of test: July 25 and 26, 2018

Representative test engineer:
Shiro Kobayashi
Engineer
Consumer Technology Division

Approved by:
Akio Hayashi
Leader
Consumer Technology Division

RTL02610

☐ 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.: 12418148S-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12418148S-A	August 10, 2018	-	-
1	12418148S-A-R1	August 30, 2018	8	Addition of worst condition in clause 4.1.
			8	Addition of comment on determined of worst condition in clause 4.1.
			8	Addition of circuit diagram for EUT and jig-board in clause 4.2.
			8	Correction of comment in clause 4.2 From "Using the jig board does not affect the test result." to "The circuit on jig board is designed based on the Complete design required by the manufacturer of the module."
			18	Correction of Worst Rate From 1M-PHY Coded (500k) to 1M-PHY Coded (125k).

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SECTION 1: Customer information

Company Name	:	Telepower Inc.
Address	:	2-11-9 #3F, Minamiikebukuro, Toshima-ku, Tokyo, 171-0022, Japan
Telephone Number	:	+81-3-6907-8511
Facsimile Number	:	+81-3-6907-8512
Contact Person	:	Hiroshi Ohuchi

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

2.1 Identification of E.U.T.

Type of Equipment	:	Ultra Small 2.4GHz Band Wireless Module
Model No.	:	TP26CMX-01
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 1.9 V - 3.6 V
Receipt Date of Sample	:	July 18, 2018
Country of Mass-production	:	Japan
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: TP26CMX-01 (referred to as the EUT in this report) is a Ultra Small 2.4GHz Band Wireless Module.

Radio Specification

Bluetooth ver.5.0

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	GFSK
Antenna type	:	Internal
Antenna Gain	:	-23 dBi
Clock frequency (Maximum)	:	24 MHz

The module supports the following modes, but 2M-PHY Uncoded is not supported.
1M-PHY Uncoded
1M-PHY Coded (500 kbps)
1M-PHY Coded (125 kbps)

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

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	28.2 dB, 0.49710 MHz, L1 QP Tx 2402 MHz	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	5.6 dB 9608.00 MHz, AV, Horizontal Tx 2402 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 v04 12.2.7.

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)
The RF Module has its own regulator. The RF Module is constantly provided voltage 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 requirement.

3.3 Addition to standard

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

Shonan EMC Lab.

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	2.5 dB	2.5 dB	2.5 dB	2.6 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.2 dB	3.3 dB	-	-
	30 MHz-200 MHz	4.9 dB	4.8 dB	4.9 dB	-	-
	200 MHz-1 GHz	6.1 dB	6.1 dB	6.1 dB	-	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-	-
	6 GHz-18 GHz	5.3 dB	5.3 dB	5.3 dB	-	-
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	18 GHz-40 GHz	5.9 dB	5.9 dB	5.9 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	0.48 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.66 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.47 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.64 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	0.90 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.04 dB
Spurious emission (Conducted) below 1GHz	1.8 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.5 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.7 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

3.5 Test Location

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1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
JAB Accreditation No. RTL02610
FCC Test Firm Registration Number: 839876

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

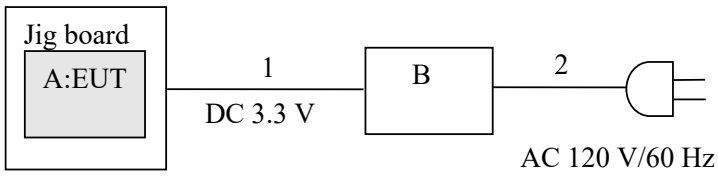
Refer to APPENDIX.

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

4.1 Operating Mode(s)

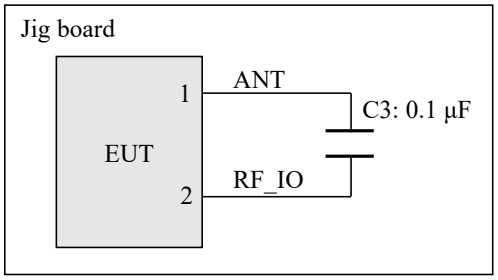
Mode	Frequency	Remarks*
Bluetooth Low Energy	2402 MHz, 2440 MHz, 2480 MHz	1M-PHY Uncoded, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)		
*Power of the EUT was set by the software as follows; - Power Setting: Fixed - Software: BTool - (For Version 01.42.01) *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

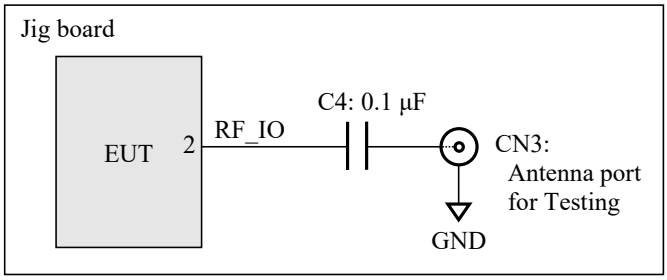


Circuit Description

For Radiated Emission



For Antenna Terminal Test



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.
The circuit on jig board is designed based on the Complete design required by the manufacturer of the module.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Ultra Small 2.4GHz Band Wireless Module	TP26CMX-01	2 *1) 3 *2)	Telepower Inc.	EUT
B	DC Power Supply	PAN60-10A	NL002383	Kikusui	-

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

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	AC Cable	3.0	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a platform of nominal size, 1.0 m by 1.5 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 80 cm 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.

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.

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) via DC power supply.
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 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 expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity. 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: 12.2.5.2 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	3.98 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)		3.98 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 v04".
*2) Distance Factor: 20 x log (3.98 m / 3.0 m) = 2.46 dB
*3) Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.54 dB

- 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	Frequency			
	Below 1 GHz	1 GHz - 2.8 GHz	2.8 GHz - 13 GHz	13 GHz - 26.5 GHz
Horizontal	Y	Z	Z	X
Vertical	Y	Y	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.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
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	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)	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 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.

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

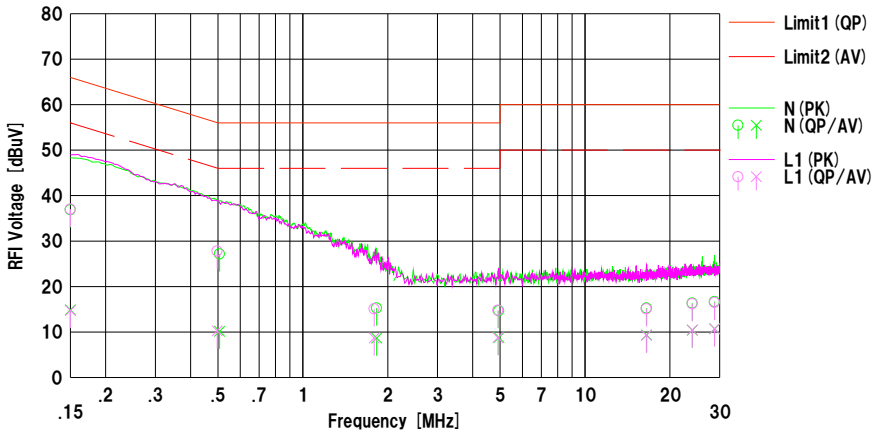
UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/07/26

Mode : Tx 2402 MHz

Power : DC 3.3 V
Temp./Humi. : 23 deg.C / 61 %RH

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

Engineer : Kazuya Noda



No.	Freq.	Reading <QP> [dBuV]	Reading <AV> [dBuV]	C.Fac [dB]	Results <QP> [dBuV]	Results <AV> [dBuV]	Limit <QP> [dBuV]	Limit <AV> [dBuV]	Margin <QP> [dB]	Margin <AV> [dB]	Phase	Comment
1	0.15000	24.50	2.50	12.38	36.88	14.88	66.00	56.00	29.1	41.1	N	
2	0.50700	14.77	-2.24	12.40	27.17	10.16	56.00	46.00	28.8	35.8	N	
3	1.82538	2.76	-3.84	12.50	15.26	8.66	56.00	46.00	40.7	37.3	N	
4	4.95496	2.00	-3.88	12.67	14.67	8.79	56.00	46.00	41.3	37.2	N	
5	16.53086	2.10	-3.80	13.16	15.26	9.36	60.00	50.00	44.7	40.6	N	
6	24.00000	2.90	-3.05	13.45	16.35	10.40	60.00	50.00	43.6	39.6	N	
7	28.80138	3.08	-2.89	13.61	16.69	10.72	60.00	50.00	43.3	39.2	N	
8	0.15000	24.64	2.35	12.38	37.02	14.73	66.00	56.00	28.9	41.2	L1	
9	0.49710	15.41	-2.12	12.40	27.81	10.28	56.05	46.05	28.2	35.7	L1	
10	1.79062	2.60	-3.81	12.50	15.10	8.69	56.00	46.00	40.9	37.3	L1	
11	4.91500	2.13	-3.89	12.67	14.80	8.78	56.00	46.00	41.2	37.2	L1	
12	16.49830	1.95	-3.89	13.16	15.11	9.27	60.00	50.00	44.8	40.7	L1	
13	24.00000	2.78	-2.99	13.45	16.23	10.46	60.00	50.00	43.7	39.5	L1	
14	28.78709	2.91	-2.91	13.61	16.52	10.70	60.00	50.00	43.4	39.3	L1	

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) =SLS-05

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

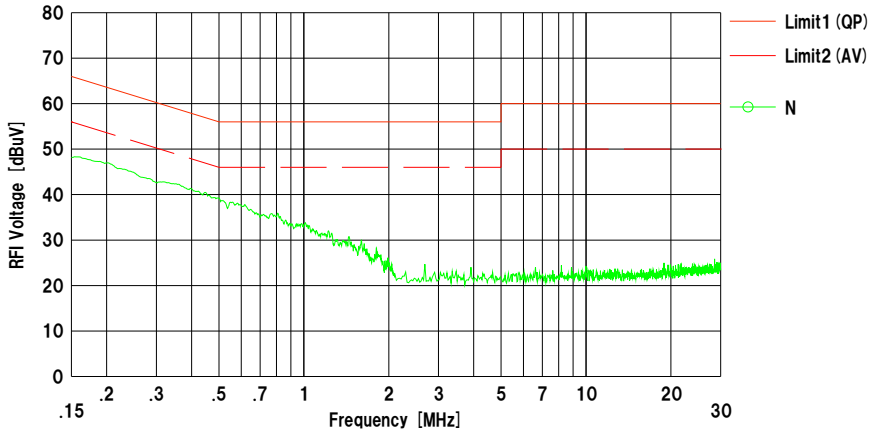
UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/07/26

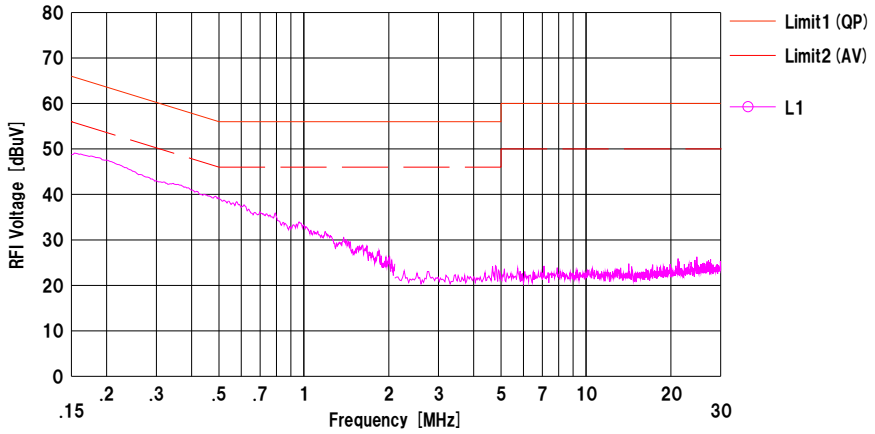
Mode : Tx 2440 MHz

Power : DC 3.3 V
Temp./Humi. : 23 deg.C / 61 %RH

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

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) =SLS-05

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

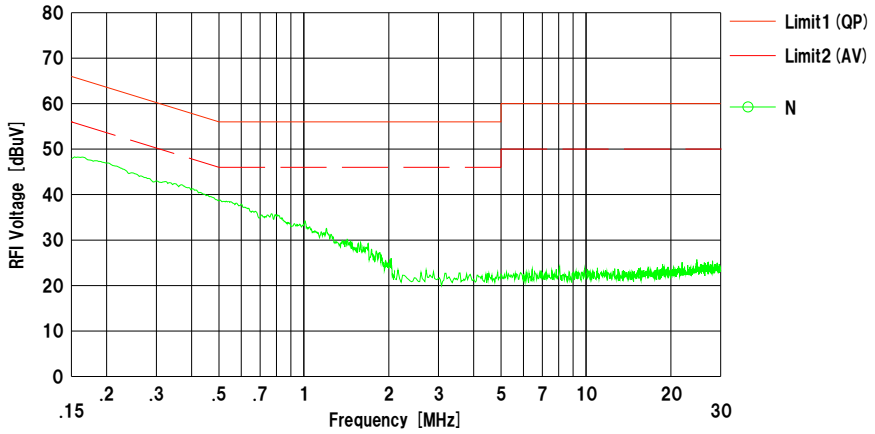
UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/07/26

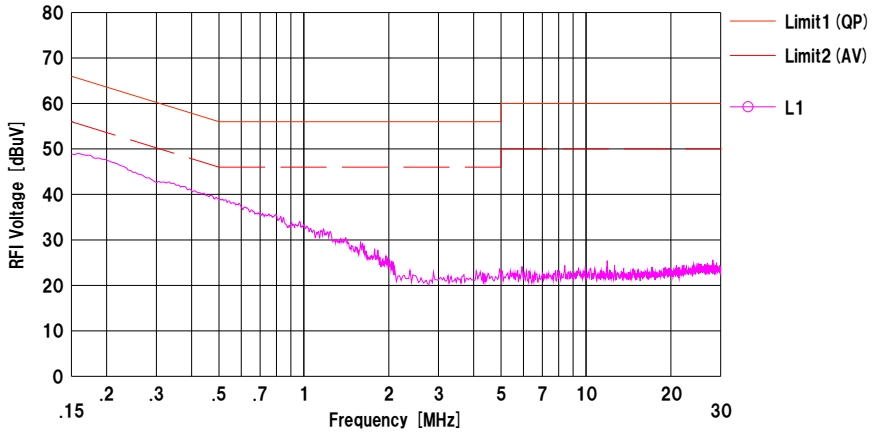
Mode : Tx 2480 MHz

Power : DC 3.3 V
Temp./Humi. : 23 deg.C / 61 %RH

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

Engineer : Kazuya Noda



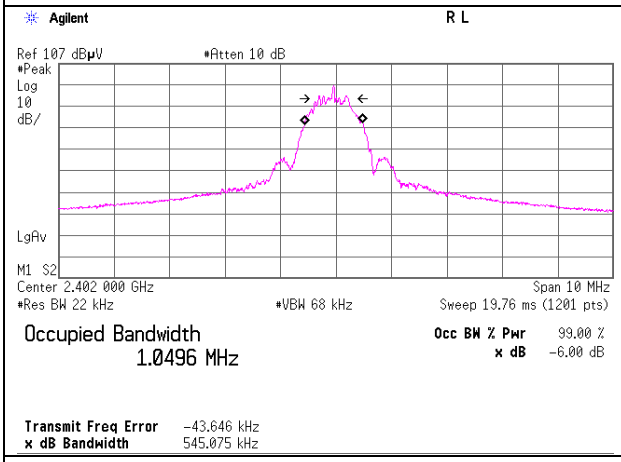
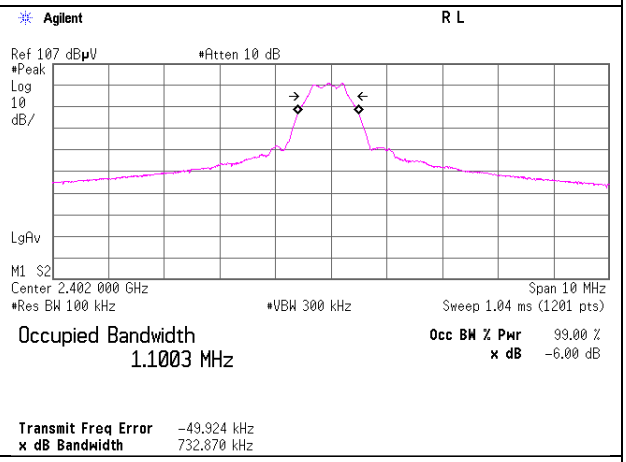
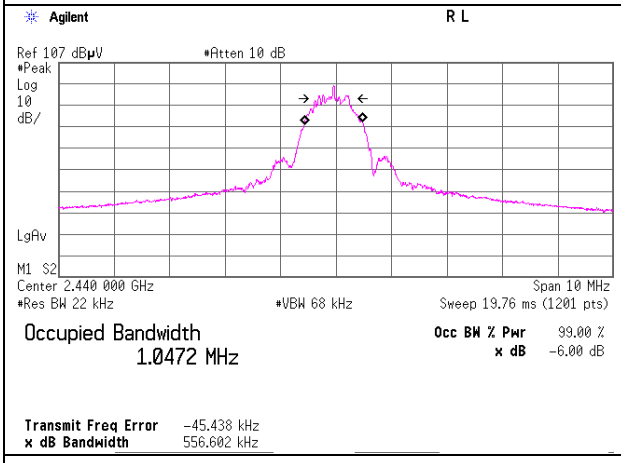
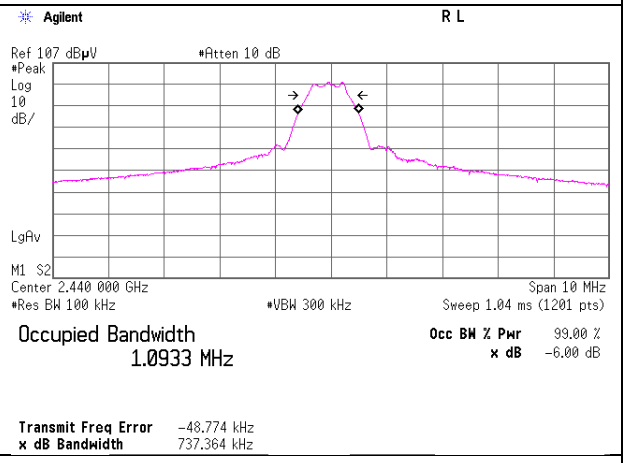
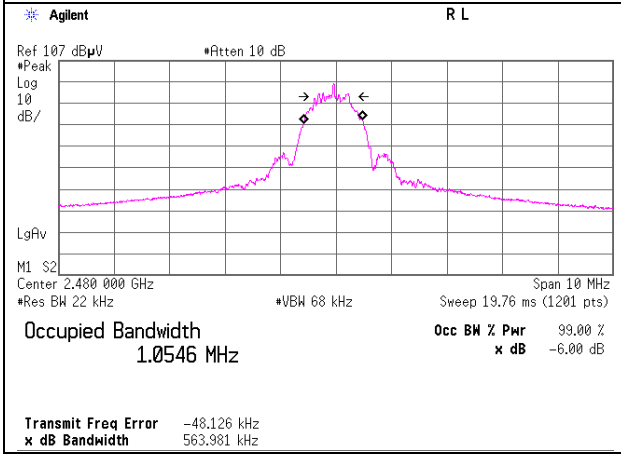
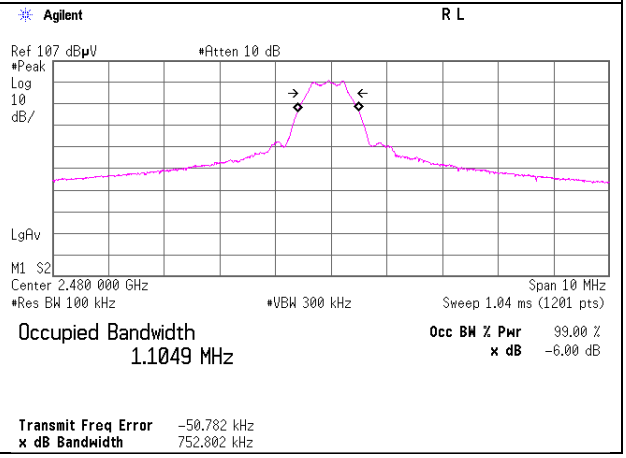


Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) =SLS-05

6 dB Bandwidth and 99 % Occupied Bandwidth

Report No.	12418148S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2018
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
BT LE	2402	1049.6	0.733	> 0.5000
	2440	1047.2	0.737	> 0.5000
	2480	1054.6	0.753	> 0.5000

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

Maximum Peak Output Power

Report No.	12418148S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2018
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE

				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	-8.18	1.66	9.82	3.30	2.14	30.00	1000	26.70	-23.00	-19.70	0.01	36.02	4000	55.72
2440	-8.33	1.70	9.82	3.19	2.08	30.00	1000	26.81	-23.00	-19.81	0.01	36.02	4000	55.83
2480	-8.44	1.69	9.82	3.07	2.03	30.00	1000	26.93	-23.00	-19.93	0.01	36.02	4000	55.95

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.

2440 MHz

Mode	Reading [dBm]	Remark
1M-PHY Uncoded	-8.33	*
1M-PHY Coded(125k)	-9.12	
1M-PHY Coded(500k)	-9.18	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Average Output Power
(Reference data for RF Exposure)

Report No.	12418148S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2018
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE

BT LE

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	-9.45	1.66	9.82	2.03	1.60	0.11	2.14	1.64
2440	-9.59	1.70	9.82	1.93	1.56	0.11	2.04	1.60
2480	-9.66	1.69	9.82	1.85	1.53	0.11	1.96	1.57

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.

2440 MHz

Mode	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
1M-PHY Uncoded	-10.13	0.64	-9.49	
1M-PHY Coded(125k)	-9.59	0.11	-9.48	*
1M-PHY Coded(500k)	-9.88	0.39	-9.49	

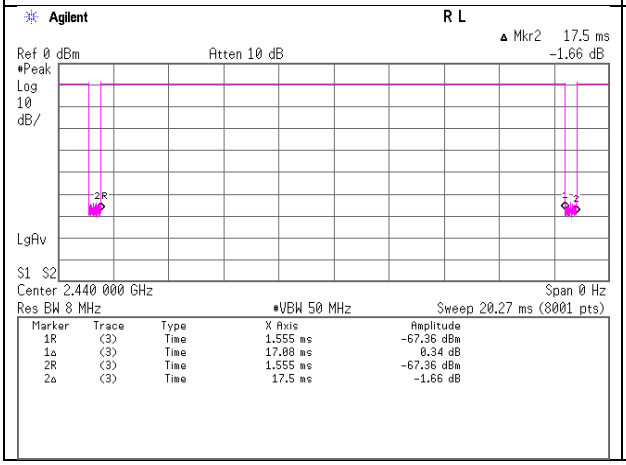
*: Worst Rate
All comparizon were carried out on same frequency and measurement factors.

Duty factor Calculation chart

Report No.	12418148S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2018
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE

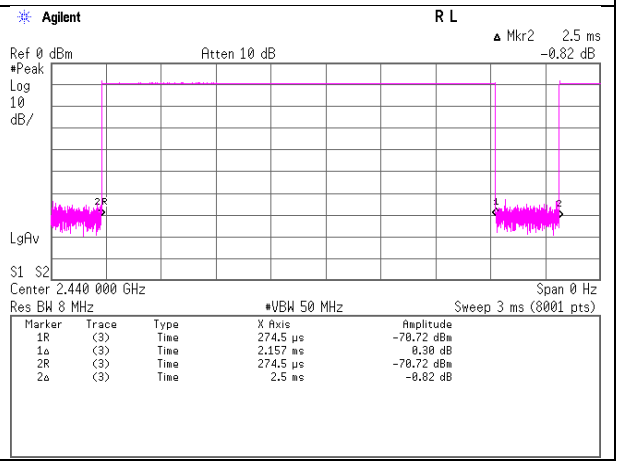
1 M-PHY Coded(125 kbps) (for Average Output Power)

Tx on / (Tx on + Tx off) = 0.976
Tx on / (Tx on + Tx off) * 100 = 97.6 %
Duty factor = 10 * log (17.5 / 17.08) = 0.11 dB



1 M-PHY Uncoded (for Radiated Spurious Emission)

Tx on / (Tx on + Tx off) = 0.863
Tx on / (Tx on + Tx off) * 100 = 86.3 %
Duty factor = 20 * log (2.5 / 2.157) = 1.28 dB



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

Radiated Spurious Emission

Report No.	12418148S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	July 26, 2018	July 25, 2018
Temperature / Humidity	23 deg. C / 61 % RH	26 deg. C / 47 % RH
Engineer	Kazuya Noda	Kazutaka Takeyama
	(30 MHz -1 GHz)	(1 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.	72.000	QP	22.25	6.43	6.95	32.18	0.00	3.45	40.00	36.5	100	0	
Hori.	188.485	QP	22.05	16.33	7.84	32.08	0.00	14.14	43.50	29.3	150	272	
Hori.	219.537	QP	21.77	11.13	8.17	32.05	0.00	9.02	46.00	36.9	100	245	
Hori.	443.084	QP	21.65	16.63	9.42	31.97	0.00	15.73	46.00	30.2	150	23	
Hori.	810.954	QP	21.23	21.06	10.79	31.55	0.00	21.53	46.00	24.4	100	92	
Hori.	2390.000	PK	48.40	27.78	14.13	44.13	2.46	48.64	73.90	25.2	133	6	
Hori.	4804.000	PK	55.90	31.27	6.42	44.45	2.46	51.60	73.90	22.3	107	344	
Hori.	7206.000	PK	50.11	36.06	8.24	43.99	2.46	52.88	73.90	21.0	131	6	
Hori.	9608.000	PK	49.91	38.46	9.14	43.83	2.46	56.14	73.90	**17.7**	150	1	
Vert.	72.000	QP	23.20	6.43	6.95	32.18	0.00	4.40	40.00	35.6	100	0	
Vert.	77.508	QP	25.53	6.36	7.39	32.17	0.00	7.11	40.00	32.8	100	263	
Vert.	106.734	QP	30.62	11.33	7.27	32.15	0.00	17.07	43.50	26.4	390	305	
Vert.	347.045	QP	21.55	15.07	9.01	31.95	0.00	13.68	46.00	32.3	100	302	
Vert.	686.273	QP	21.08	19.71	10.34	31.90	0.00	19.23	46.00	26.7	100	319	
Vert.	2390.000	PK	49.04	27.78	14.13	44.13	2.46	49.28	73.90	24.6	152	343	
Vert.	4804.000	PK	54.62	31.27	6.42	44.45	2.46	50.32	73.90	23.5	106	337	
Vert.	7206.000	PK	49.01	36.06	8.24	43.99	2.46	51.78	73.90	22.1	160	3	
Vert.	9608.000	PK	49.37	38.46	9.14	43.83	2.46	55.60	73.90	18.3	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.98 m / 3.0 m) = 2.46 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	39.35	27.78	14.13	44.13	1.28	2.46	40.87	53.90	13.0	*1)
Hori.	4804.000	AV	50.24	31.27	6.42	44.45	1.28	2.46	47.22	53.90	6.7	
Hori.	7206.000	AV	40.35	36.06	8.24	43.99	1.28	2.46	44.40	53.90	9.5	
Hori.	9608.000	AV	40.84	38.46	9.14	43.83	1.28	2.46	48.35	53.90	**5.6**	
Vert.	2390.000	AV	39.16	27.78	14.13	44.13	1.28	2.46	40.68	53.90	13.2	*1)
Vert.	4804.000	AV	49.99	31.27	6.42	44.45	1.28	2.46	46.97	53.90	6.9	
Vert.	7206.000	AV	40.31	36.06	8.24	43.99	1.28	2.46	44.36	53.90	9.5	
Vert.	9608.000	AV	39.93	38.46	9.14	43.83	1.28	2.46	47.44	53.90	6.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.98 m / 3.0 m) = 2.46 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)

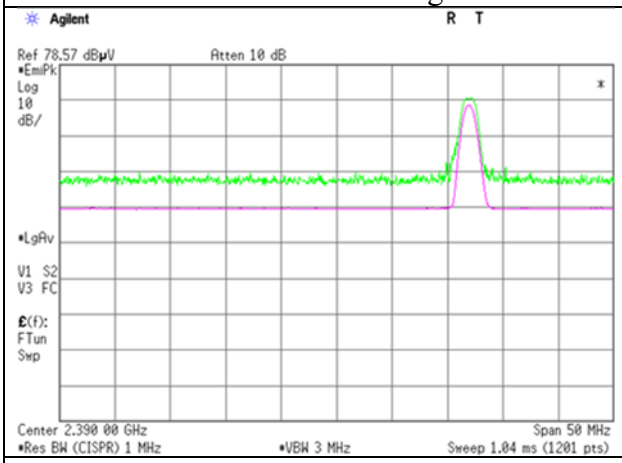
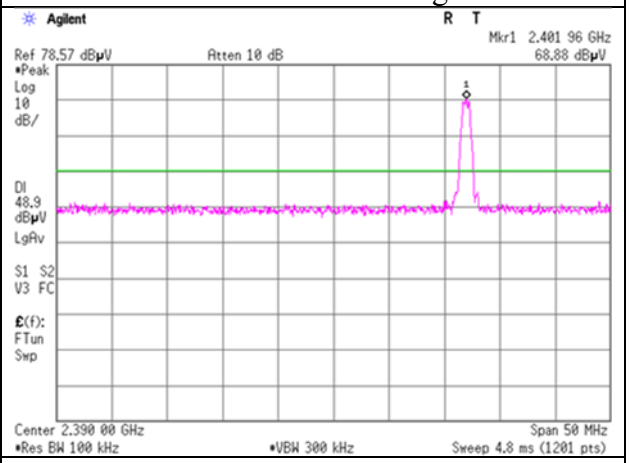
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

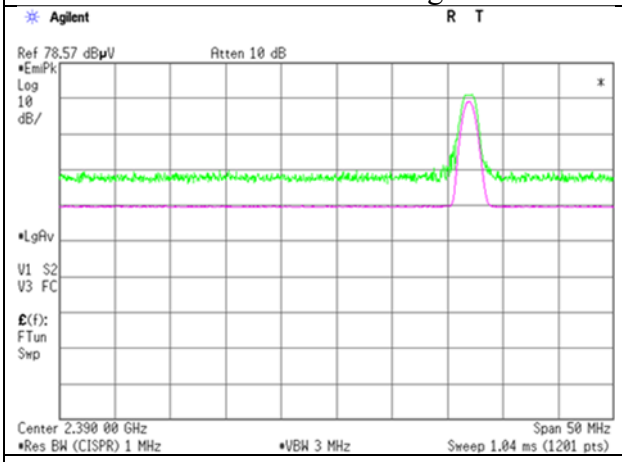
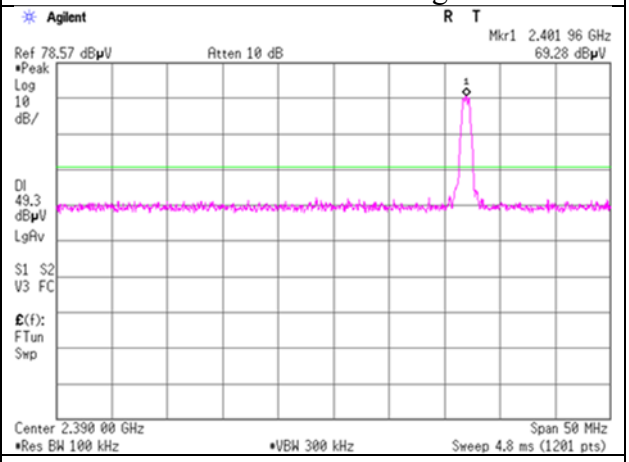
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	68.85	27.96	14.14	44.14	2.46	69.27	-	-	Carrier
Hori.	2400.000	PK	40.33	27.98	14.14	44.14	2.46	40.77	49.27	8.5	
Vert.	2402.000	PK	69.12	27.96	14.14	44.14	2.46	69.54	-	-	Carrier
Vert.	2400.000	PK	40.64	27.98	14.14	44.14	2.46	41.08	49.54	8.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12418148S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	July 25, 2018
Temperature / Humidity	26 deg. C / 47 % RH
Engineer	Kazutaka Takeyama
	(1 GHz -13 GHz)
Mode	Tx BT LE 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

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

Radiated Spurious Emission

Report No.	12418148S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	July 26, 2018	July 25, 2018
Temperature / Humidity	23 deg. C / 61 % RH	26 deg. C / 47 % RH
Engineer	Kazuya Noda	Kazutaka Takeyama
	(30 MHz -1 GHz)	(1 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.	72.000	QP	22.26	6.43	6.95	32.18	0.00	3.46	40.00	36.5	100	0	
Hori.	106.731	QP	28.23	11.33	7.27	32.15	0.00	14.68	43.50	28.8	117	130	
Hori.	195.444	QP	22.01	16.40	7.86	32.08	0.00	14.19	43.50	29.3	150	26	
Hori.	468.180	QP	21.45	16.97	9.51	31.97	0.00	15.96	46.00	30.0	150	263	
Hori.	822.986	QP	21.25	21.07	10.84	31.50	0.00	21.66	46.00	24.3	100	330	
Hori.	4880.000	PK	54.11	31.32	6.45	44.48	2.46	49.86	73.90	24.0	191	343	
Hori.	7320.000	PK	47.82	36.18	8.32	44.03	2.46	50.75	73.90	23.1	198	11	
Hori.	9760.000	PK	47.24	39.00	9.17	43.85	2.46	54.02	73.90	19.8	150	1	
Vert.	72.000	QP	23.08	6.43	6.95	32.18	0.00	4.28	40.00	35.7	100	0	
Vert.	120.482	QP	22.36	13.15	7.26	32.14	0.00	10.63	43.50	32.8	100	177	
Vert.	197.448	QP	21.78	16.53	7.87	32.08	0.00	14.10	43.50	29.4	100	5	
Vert.	337.203	QP	21.75	14.86	8.95	31.96	0.00	13.60	46.00	32.4	100	170	
Vert.	883.343	QP	21.00	22.20	11.03	31.19	0.00	23.04	46.00	22.9	100	217	
Vert.	4880.000	PK	53.64	31.32	6.45	44.48	2.46	49.39	73.90	24.5	196	318	
Vert.	7320.000	PK	48.71	36.18	8.32	44.03	2.46	51.64	73.90	22.2	190	342	
Vert.	9760.000	PK	47.61	39.00	9.17	43.85	2.46	54.39	73.90	**19.5**	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.98 m / 3.0 m) = 2.46 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	48.41	31.32	6.45	44.48	1.28	2.46	45.44	53.90	8.5	
Hori.	7320.000	AV	38.94	36.18	8.32	44.03	1.28	2.46	43.15	53.90	10.8	
Hori.	9760.000	AV	38.59	39.00	9.17	43.85	1.28	2.46	46.65	53.90	**7.3**	
Vert.	4880.000	AV	47.31	31.32	6.45	44.48	1.28	2.46	44.34	53.90	9.6	
Vert.	7320.000	AV	38.98	36.18	8.32	44.03	1.28	2.46	43.19	53.90	10.7	
Vert.	9760.000	AV	37.33	39.00	9.17	43.85	1.28	2.46	45.39	53.90	8.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.98 m / 3.0 m) = 2.46 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

Report No.	12418148S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	July 26, 2018	July 25, 2018
Temperature / Humidity	23 deg. C / 61 % RH	26 deg. C / 47 % RH
Engineer	Kazuya Noda	Kazutaka Takeyama
	(30 MHz -1 GHz)	(1 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.	72.000	QP	22.35	6.43	6.95	32.18	0.00	3.55	40.00	36.4	100	0	
Hori.	106.692	QP	27.02	11.33	7.27	32.15	0.00	13.47	43.50	30.0	333	0	
Hori.	198.915	QP	21.41	16.54	7.87	32.07	0.00	13.75	43.50	29.7	100	358	
Hori.	493.504	QP	21.79	17.69	9.60	31.96	0.00	17.12	46.00	28.8	100	243	
Hori.	921.879	QP	21.15	22.02	11.14	30.90	0.00	23.41	46.00	22.5	100	357	
Hori.	2483.500	PK	48.96	27.28	14.22	44.16	2.46	48.76	73.90	25.1	155	346	
Hori.	4960.000	PK	53.71	31.58	6.48	44.51	2.46	49.72	73.90	24.1	154	341	
Hori.	7440.000	PK	48.67	36.37	8.41	44.08	2.46	51.83	73.90	22.0	112	9	
Hori.	9920.000	PK	46.72	38.88	9.22	43.87	2.46	53.41	73.90	20.4	150	1	
Vert.	72.000	QP	23.06	6.43	6.95	32.18	0.00	4.26	40.00	35.7	100	0	
Vert.	77.512	QP	26.36	6.36	7.39	32.17	0.00	7.94	40.00	32.0	100	192	
Vert.	186.825	QP	21.99	16.15	7.84	32.09	0.00	13.89	43.50	29.6	100	314	
Vert.	638.423	QP	20.95	19.51	10.15	31.97	0.00	18.64	46.00	27.3	100	32	
Vert.	874.615	QP	21.09	22.14	11.00	31.24	0.00	22.99	46.00	23.0	100	8	
Vert.	2483.500	PK	48.90	27.28	14.22	44.16	2.46	48.70	73.90	25.2	151	25	
Vert.	4960.000	PK	54.50	31.58	6.48	44.51	2.46	50.51	73.90	23.3	242	319	
Vert.	7440.000	PK	48.01	36.37	8.41	44.08	2.46	51.17	73.90	22.7	159	337	
Vert.	9920.000	PK	47.12	38.88	9.22	43.87	2.46	53.81	73.90	**20.0**	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.98 m / 3.0 m) = 2.46 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.	2483.500	AV	39.17	27.28	14.22	44.16	1.28	2.46	40.25	53.90	13.7	*1)
Hori.	4960.000	AV	47.60	31.58	6.48	44.51	1.28	2.46	44.89	53.90	9.0	
Hori.	7440.000	AV	38.70	36.37	8.41	44.08	1.28	2.46	43.14	53.90	10.8	
Hori.	9920.000	AV	37.23	38.88	9.22	43.87	1.28	2.46	45.20	53.90	8.7	
Vert.	2483.500	AV	39.66	27.28	14.22	44.16	1.28	2.46	40.74	53.90	13.2	*1)
Vert.	4960.000	AV	48.06	31.58	6.48	44.51	1.28	2.46	45.35	53.90	**8.6**	
Vert.	7440.000	AV	38.81	36.37	8.41	44.08	1.28	2.46	43.25	53.90	10.7	
Vert.	9920.000	AV	37.26	38.88	9.22	43.87	1.28	2.46	45.23	53.90	8.7	

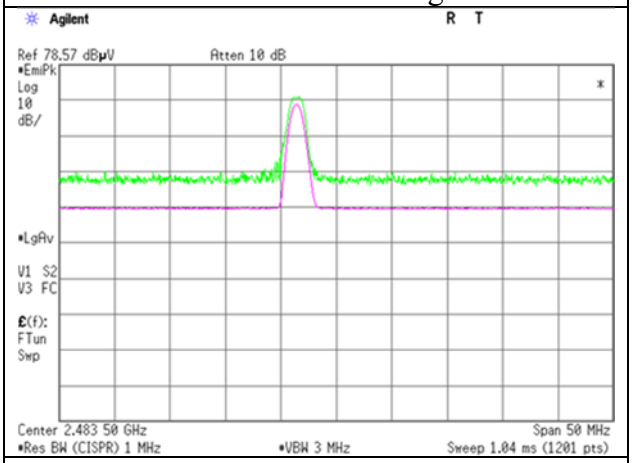
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12418148S-A-R1
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	July 25, 2018
Temperature / Humidity	26 deg. C / 47 % RH
Engineer	Kazutaka Takeyama
	(1 GHz -13 GHz)
Mode	Tx BT LE 2480 MHz

Horizontal

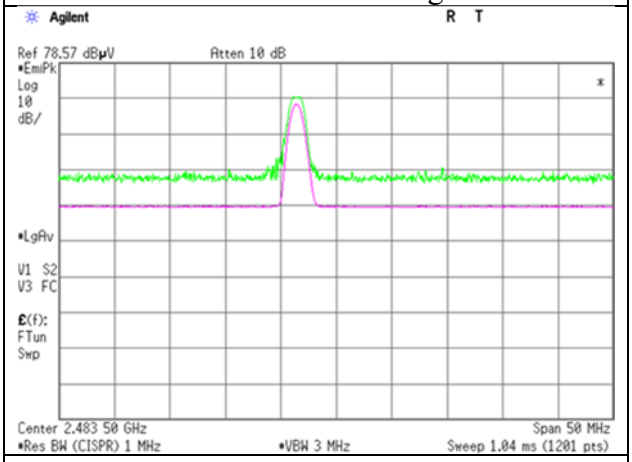
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

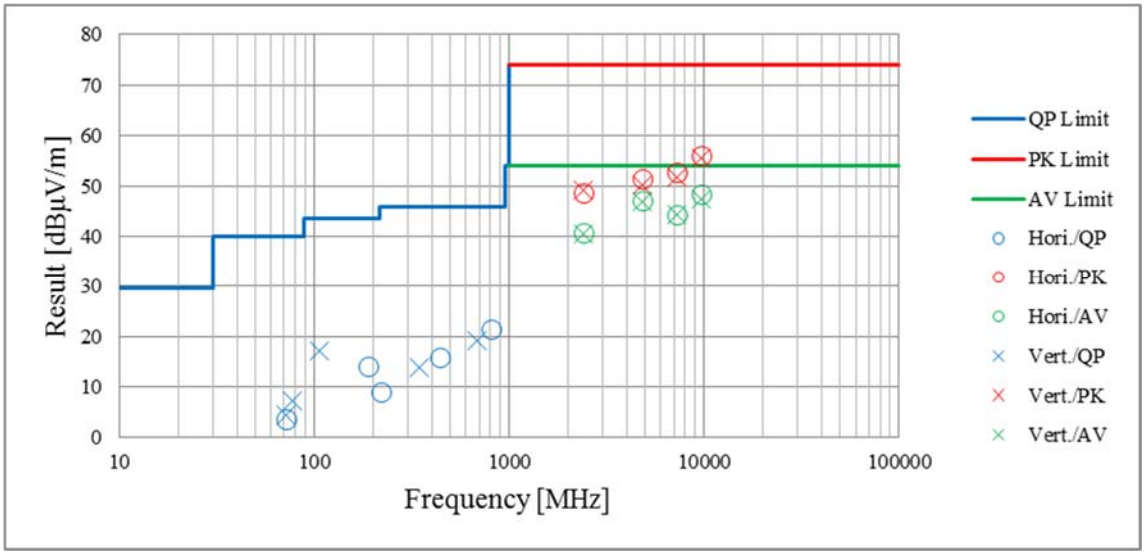


Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12418148S-A-R1	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	July 26, 2018	July 25, 2018
Temperature / Humidity	23 deg. C / 61 % RH	26 deg. C / 47 % RH
Engineer	Kazuya Noda	Kazutaka Takeyama
	(30 MHz -1 GHz)	(1 GHz -26.5 GHz)
Mode	Tx BT LE 2402 MHz	

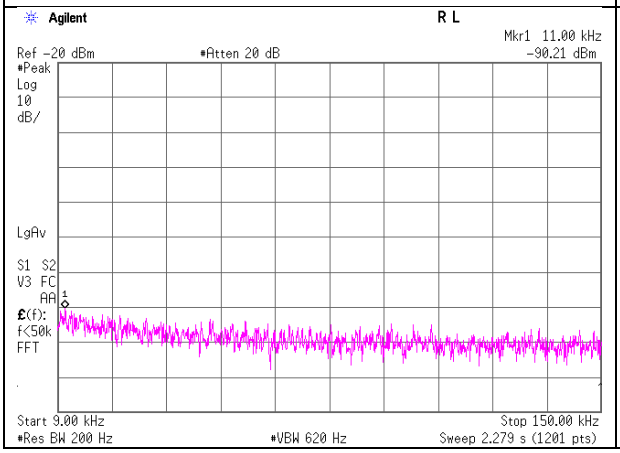


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

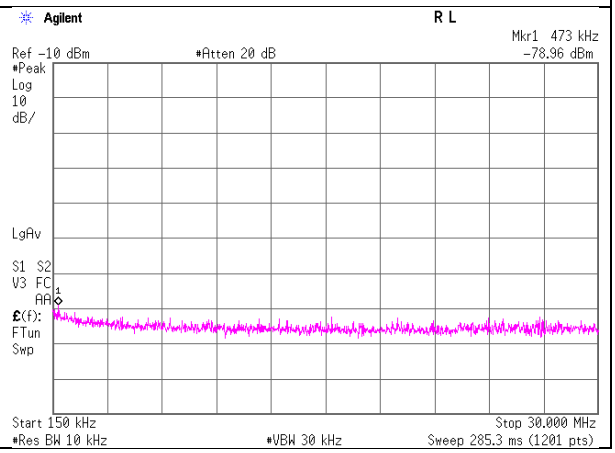
Conducted Spurious Emission

Report No.	12418148S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2018
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE 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
11.00	-90.2	0.02	9.7	2.0	1	-78.5	300	6.0	-17.2	46.7	63.9	
473.00	-79.0	0.03	9.7	2.0	1	-67.2	300	6.0	-5.9	14.1	20.0	

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)

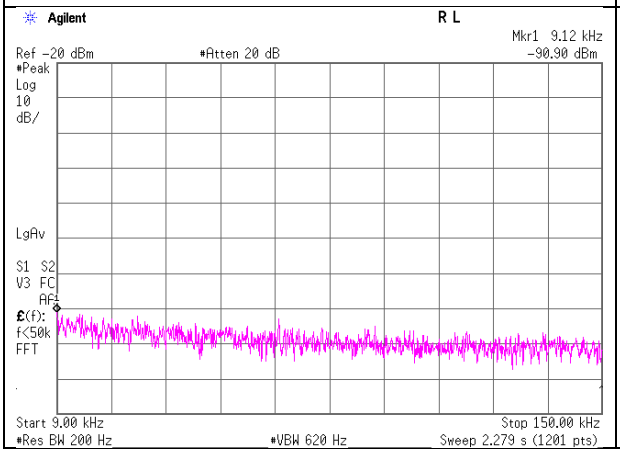
N: Number of output

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

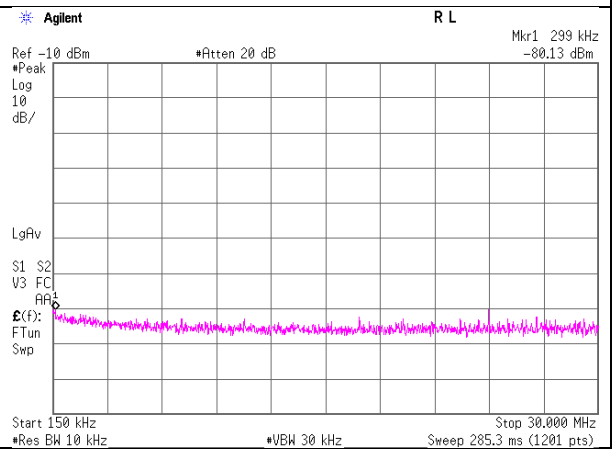
Conducted Spurious Emission

Report No.	12418148S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2018
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE 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
9.12	-90.9	0.02	9.7	2.0	1	-79.1	300	6.0	-17.9	48.4	66.3	
299.00	-80.1	0.02	9.7	2.0	1	-68.3	300	6.0	-7.1	18.0	25.1	

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)

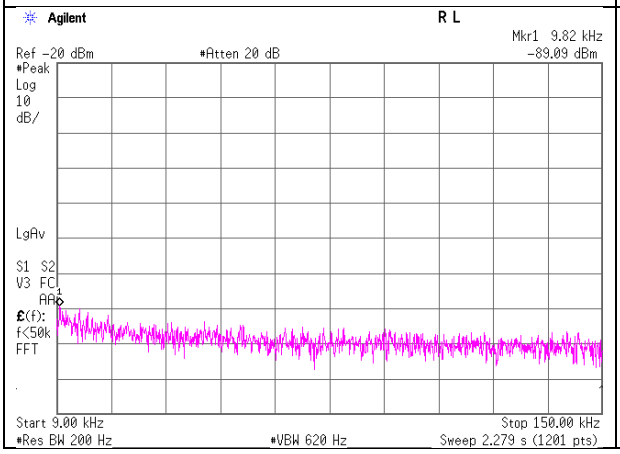
N: Number of output

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

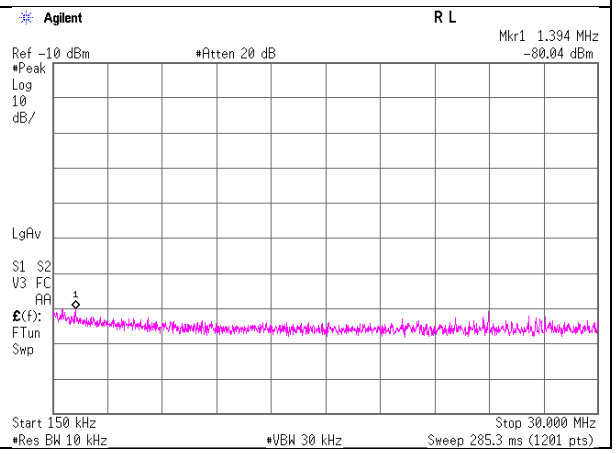
Conducted Spurious Emission

Report No.	12418148S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2018
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE 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
9.82	-89.1	0.02	9.7	2.0	1	-77.3	300	6.0	-16.1	47.7	63.8	
1394.00	-80.0	0.04	9.7	2.0	1	-68.3	30	6.0	13.0	24.7	11.7	

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 KDB 558074 since antenna gain was less than 2.0 dBi.

Power Density

Report No.	12418148S-A-R1
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	July 25, 2018
Temperature / Humidity	25 deg. C / 44 % RH
Engineer	Shiro Kobayashi
Mode	Tx BT LE

BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402	-24.31	1.66	9.82	-12.83	8.00	20.83
2440	-24.89	1.70	9.82	-13.37	8.00	21.37
2480	-24.84	1.69	9.82	-13.33	8.00	21.33

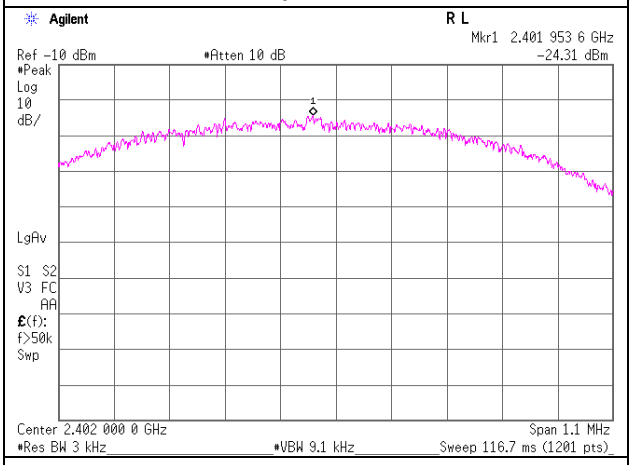
Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

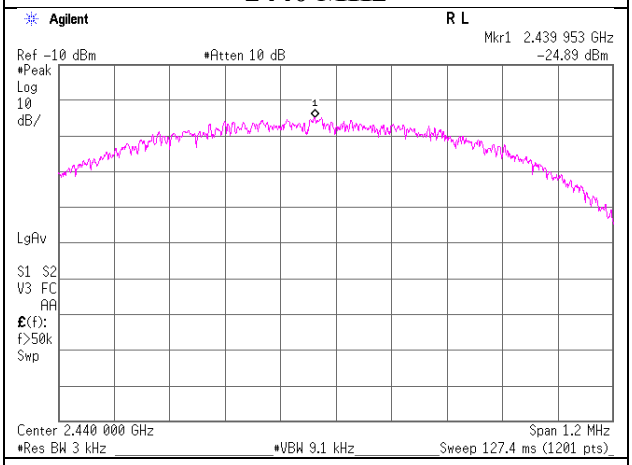
Power Density

BT LE

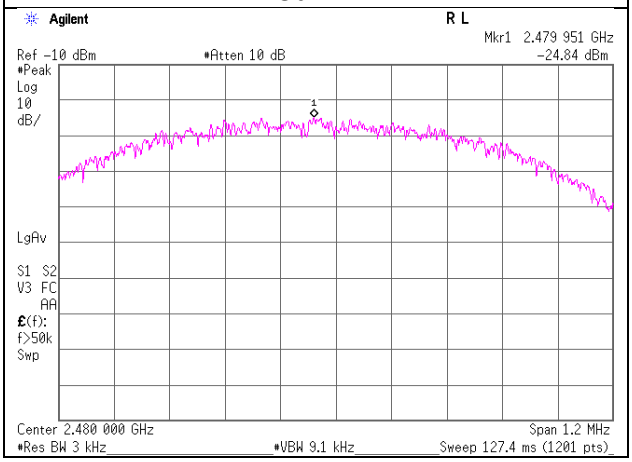
2402 MHz



2440 MHz



2480 MHz



APPENDIX 2: Test instruments

Test Instruments (1/ 2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2018/07/13 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY53260009	AT	2018/07/13 * 12
SCC-H14	Microwave cable	RS Pro	R-132G7210 100CO	-	AT	2018/04/04 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2017/12/21 * 12
STS-05	Digital Hitester	Hioki	3805-50	080997828	AT	2017/10/16 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2017/08/20 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2018/03/19 * 12
SAT10-14	Attenuator	Weinschel Corp.	54A-10	81595	AT	2018/04/20 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SCC-G06	Coaxial Cable	Junkosha	J12J102207-00	MAY-23-16-091	RE	2018/06/01 * 12
SCC-G40	Coaxial Cable	Junkosha	MWX221-01000 00NFSNMS/B	1612S005	RE	2018/01/29 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2018/05/11 * 12
MHA-30	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	1611	RE	2017/09/15 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2017/10/30 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2018/03/05 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE,CE	-
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2018/07/17 * 12

Test Instruments (2/ 2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
COTS-SEMI -1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI, MF)	-	RE,CE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE,CE	2017/10/16 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2017/11/22 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2017/11/16 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2018/03/19 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01 000KMSKM S	-	RE	2018/04/20 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2018/03/27 * 12
KHA-04	Horn Antenna	EMCO	3160-09	1278	RE	2018/07/12 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2018/06/02 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	RE,CE	2017/11/24 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2018/06/17 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111 B	196	RE	2018/06/17 * 12
SAT6-13	Attenuator	JFW	50HF-006N	-	RE	2018/02/09 * 12
SCC-C1/C2/ C3/C4/C5/C 10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/ Suhner/Suhner/Su hner/Suhner/TOY O	8D2W/12DS FA/141PE/14 1PE/141PE/1 41PE/NS490 6	-/0901-271(R F Selector)	RE	2018/04/09 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2018/02/16 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2018/02/26 * 12
SAT3-10	Attenuator	JFW	50HF-003N	-	CE	2017/08/24 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2017/12/21 * 12
SCC-C9/C10 /SRSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TO YO	RG223U/141 PE/NS4906	-/0901-271(R F Selector)	CE	2018/04/09 * 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.

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