



RADIO TEST REPORT

Test Report No. : 10699546H-A-R1

Applicant : Omron Healthcare Co., Ltd.
Type of Equipment : Blood Pressure Monitor
Model No. : HEM-6320T-Z (BP654)
FCC ID : Q6ZHEM6321T
Test regulation : FCC Part 15 Subpart C: 2015
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the 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 10699546H-A. 10699546H-A is replaced with this report.

Date of test: February 10 and 27, 2015

Representative test engineer:

S. Matsuyama

Satofumi Matsuyama
Engineer
Consumer Technology Division

Approved by:

Takayuki Shimada

Takayuki Shimada
Engineer
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.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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

13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10699546H-A

[illegible]

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	5
SECTION 4: Operation of E.U.T. during testing.....	8
SECTION 5: Radiated Spurious Emission	9
SECTION 6: Antenna Terminal Conducted Tests.....	10
APPENDIX 1: Data of EMI test.....	11
6dB Bandwidth	11
Maximum Peak Output Power	13
Average Output Power	14
Radiated Spurious Emission	15
Conducted Spurious Emission	19
Power Density	22
99%Occupied Bandwidth	24
APPENDIX 2: Test instruments	25
APPENDIX 3: Photographs of test setup	26
Radiated Spurious Emission	26
Worst Case Position	27

SECTION 1: Customer information

Company Name	:	Omron Healthcare Co., Ltd.
Address	:	53 Kunotsubo, Terado-cho, Muko, Kyoto 617-0002 Japan
Telephone Number	:	+81-75-925-2012
Facsimile Number	:	+81-75-925-2013
Contact Person	:	Hirokazu Furukawa

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

2.1 Identification of E.U.T.

Type of Equipment	:	Blood Pressure Monitor
Model No.	:	HEM-6320T-Z (BP654)
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 2.1-3.6V
Receipt Date of Sample	:	February 7, 2015 (for Radiated Spurious Emission) February 26, 2015 (for Antenna Terminal Conducted Tests)
Country of Mass-production	:	Vietnam
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

General Specification

Clock frequency(ies) in the system : 32.768kHz, 26MHz, 16MHz

The EUT has two model numbers: HEM-6320T-Z and BP654.
HEM-6320T-Z is for internal use. Also, BP654 is for user.

Variant model: HEM-6321T-Z

For HEM-6321T-Z, following functions are added from to the base model (EUT).

- User exchange switch to Circuit board. (A raw circuit board is the same.)
- Backlight on display.
(Displays of each model are different. HEM-6321T-Z uses a transmissive-type display.)

Radio Specification

Bluetooth (Low Energy)

Radio Type	:	Transceiver
Frequency of Operation	:	2402-2480MHz
Modulation	:	GFSK
Bandwidth & Channel Spacing	:	1MHz & 2MHz
Power Supply (radio part input)	:	DC 3.4-3.6V
Antenna type	:	Chip Antenna
Antenna Gain	:	2.72dBi

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

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on January 21, 2015

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 C63.4:2009 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 8.8	FCC: Section 15.207 ----- IC: RSS-Gen 8.8	N/A *1)	N/A	-
6dB Bandwidth	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: -	FCC: Section 15.247(a)(2) ----- IC: RSS-210 A8.2(a)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: RSS-Gen 6.12	FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4)		Complied	Conducted
Power Density	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: -	FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: RSS-Gen 6.13	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 8.9 RSS-Gen 8.10	2.6dB 7320.000MHz, AV, Vertical	Complied	Conducted/ Radiated

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

*1) This test is not applicable since the EUT is battery operation device.

* In case any questions arise about test procedure, ANSI C63.4: 2009 is also referred.

FCC Part 15.31 (e)

The test was performed with the New Battery and the stable voltage was supplied to the EUT during the tests. Therefore, the 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.

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

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

EMI

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

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

*3m/1m/0.5m = Measurement distance

Power meter (+dB)	
Below 1GHz	Above 1GHz
0.7dB	1.5dB

Antenna terminal conducted emission and Power density (+dB)			Antenna terminal conducted emission (+dB)		Channel power (+dB)
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.5dB	1.7dB	2.8dB	2.8dB	2.9dB	2.6dB

Radiated emission test(3m)

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

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

3.5 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999 Facsimile : +81 596 24 8124

	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 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 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

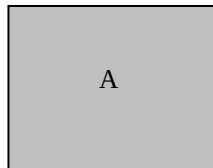
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

Bluetooth Low Energy (BT LE): Transmitting (Tx), Payload: PRBS9

Test Item	Operating Mode	Tested frequency
6dB Bandwidth Maximum Peak Output Power Power Density Spurious Emission 99% Occupied Bandwidth	BT LE	2402MHz 2440MHz 2480MHz
*Transmitting duty was 100% on all tests *Power of the EUT was set by the software as follows; Power settings: 0dBm Software: OPM_Communication_TOOL *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



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Blood Pressure Monitor	HEM-6320T-Z (BP654)	ES115010076VF *1) 475568-089 *2)	Omron Healthcare Co., Ltd.	EUT

*1) Used for Radiated Emission test

*2) Used for Antenna Terminal conducted test

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

SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)".

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

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

The height of the measuring antenna varied between 1 and 4m 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	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20dBc 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 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *2)	PK
IF Bandwidth	BW 120kHz	RBW: 1MHz VBW: 3MHz	Average Power Method: 12.2.5.1 RBW: 1MHz VBW: 3MHz Trace: 100 traces Detector: Power Averaging (RMS)	RBW: 100kHz VBW: 300kHz
Test Distance	3m	3m (below 10GHz), 1m *1) (above 10GHz)		3m (below 10GHz), 1m *1) (above 10GHz)

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

*2) Average Power Measurement was performed based on 6.0 & 12.2.5 of "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)"

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

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

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

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

SECTION 6: 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
GdB Bandwidth	1MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display emission skirts	1 to 5% of OBW	Three times of RBW	Auto	Sample	Clear write	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *1)	-	Power Meter (Sensor: 50MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3kHz	10kHz	Auto	Peak	Max Hold	Spectrum Analyzer *2)
Conducted Spurious Emission *3)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				

*1) Reference data.
*2) Section 10.2 Method PKPSD (peak PSD) of "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)".
*3) 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.
(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz)

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

Test data : APPENDIX
Test result : Pass

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

APPENDIX 1: Data of EMI test

6dB Bandwidth

Test place	Ise EMC Lab. No.4 Measurement Room
Report No.	10699546H
Date	02/27/2015
Temperature/ Humidity	25deg. C / 41% RH
Engineer	Satofumi Matsuyama
Mode	BT LE Tx

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2402	0.720	>500
2440	0.721	>500
2480	0.722	>500

UL Japan, Inc.

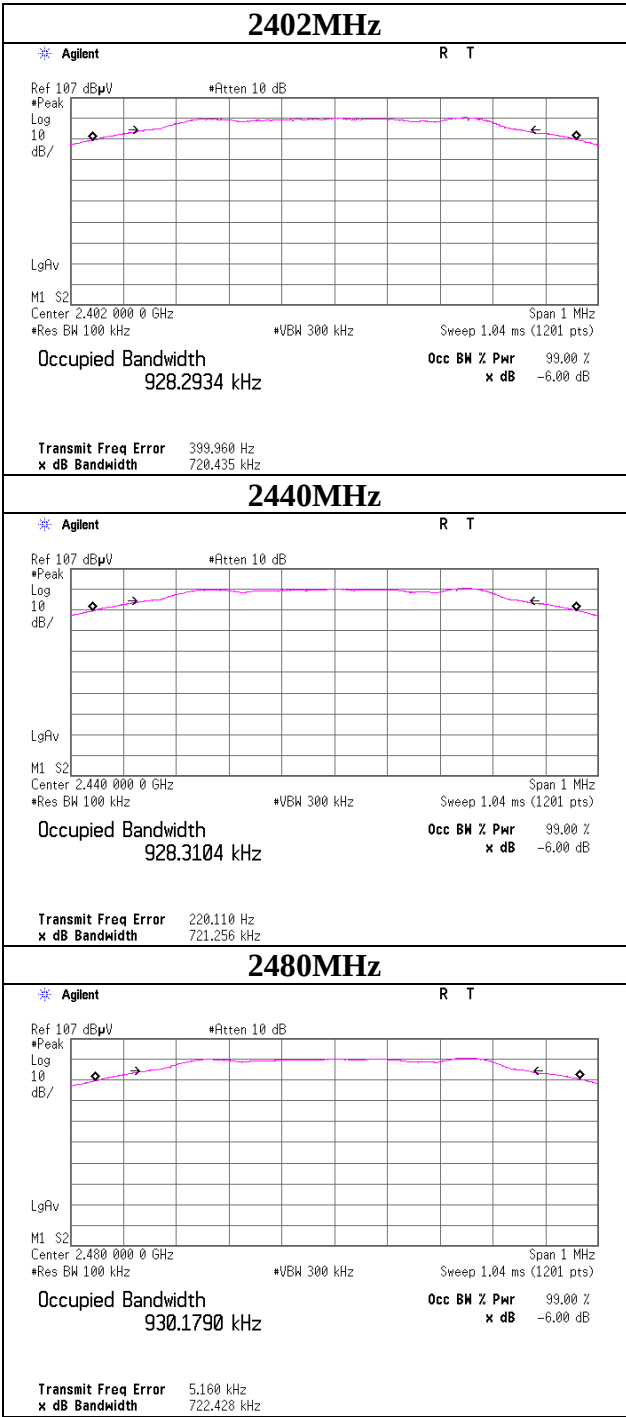
Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

6dB Bandwidth



Maximum Peak Output Power

Test place Ise EMC Lab. No.4 Measurement Room
Report No. 10699546H
Date 02/27/2015
Temperature/ Humidity 25deg. C / 41% RH
Engineer Satofumi Matsuyama
Mode BT LE Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-8.71	0.10	10.00	1.39	1.38	30.00	1000	28.61
2440	-8.62	0.10	10.00	1.48	1.41	30.00	1000	28.52
2480	-8.49	0.10	10.00	1.61	1.45	30.00	1000	28.39

Sample Calculation:

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

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

Average Output Power

Test place Ise EMC Lab. No.4 Measurement Room
Report No. 10699546H
Date 02/27/2015
Temperature/ Humidity 25deg. C / 41% RH
Engineer Satofumi Matsuyama
Mode BT LE Tx

[AV]

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-8.84	0.10	10.00	1.26	1.34	30.00	1000	28.74
2440	-8.75	0.10	10.00	1.35	1.36	30.00	1000	28.65
2480	-8.62	0.10	10.00	1.48	1.41	30.00	1000	28.52

Sample Calculation:

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

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

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 10699546H
Date : 02/10/2015
Temperature/ Humidity : 25deg. C / 31% RH
Engineer : Yuta Moriya
Mode : BT LE Tx 2402MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	44.609	QP	28.4	12.5	7.4	38.8	9.5	40.0	30.5	Floor Noise
Hori	115.491	QP	28.5	12.3	8.3	38.8	10.3	43.5	33.2	Floor Noise
Hori	200.440	QP	28.2	16.6	9.1	38.9	15.0	43.5	28.5	Floor Noise
Hori	417.835	QP	27.6	18.4	10.7	38.5	18.2	46.0	27.8	Floor Noise
Hori	514.629	QP	27.3	19.5	11.3	38.2	19.9	46.0	26.1	Floor Noise
Hori	702.608	QP	27.0	22.4	12.3	38.2	23.5	46.0	22.5	Floor Noise
Hori	2390.000	PK	41.5	27.4	3.2	32.8	39.3	73.9	34.6	Z-axis
Hori	4804.000	PK	41.7	31.5	5.4	31.9	46.7	73.9	27.2	
Hori	7206.000	PK	46.8	36.8	6.6	33.0	57.2	73.9	16.7	
Hori	9608.000	PK	42.6	38.8	7.3	33.4	55.3	73.9	18.6	
Hori	2390.000	AV	34.2	27.4	3.2	32.8	32.0	53.9	21.9	Z-axis
Hori	4804.000	AV	34.9	31.5	5.4	31.9	39.9	53.9	14.0	
Hori	7206.000	AV	40.0	36.8	6.6	33.0	50.4	53.9	3.5	
Hori	9608.000	AV	34.7	38.8	7.3	33.4	47.4	53.9	6.5	
Vert	44.609	QP	28.1	12.5	7.4	38.8	9.2	40.0	30.8	Floor Noise
Vert	115.491	QP	28.5	12.3	8.3	38.8	10.3	43.5	33.2	Floor Noise
Vert	200.440	QP	28.4	16.6	9.1	38.9	15.2	43.5	28.3	Floor Noise
Vert	417.835	QP	27.7	18.4	10.7	38.5	18.3	46.0	27.7	Floor Noise
Vert	514.629	QP	27.3	19.5	11.3	38.2	19.9	46.0	26.1	Floor Noise
Vert	702.608	QP	27.0	22.4	12.3	38.2	23.5	46.0	22.5	Floor Noise
Vert	2390.000	PK	41.8	27.4	3.2	32.8	39.6	73.9	34.3	Y-axis
Vert	4804.000	PK	42.0	31.5	5.4	31.9	47.0	73.9	26.9	
Vert	7206.000	PK	46.8	36.8	6.6	33.0	57.2	73.9	16.7	
Vert	9608.000	PK	43.9	38.8	7.3	33.4	56.6	73.9	17.3	
Vert	2390.000	AV	33.1	27.4	3.2	32.8	30.9	53.9	23.0	Y-axis
Vert	4804.000	AV	34.2	31.5	5.4	31.9	39.2	53.9	14.7	
Vert	7206.000	AV	40.5	36.8	6.6	33.0	50.9	53.9	3.0	
Vert	9608.000	AV	35.9	38.8	7.3	33.4	48.6	53.9	5.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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	93.2	27.4	3.2	32.8	91.0	-	-	Carrier
Hori	2400.000	PK	38.7	27.4	3.2	32.8	36.5	71.0	34.5	
Vert	2402.000	PK	88.6	27.4	3.2	32.8	86.4	-	-	Carrier
Vert	2400.000	PK	35.7	27.4	3.2	32.8	33.5	66.4	32.9	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - 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

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 10699546H
Date : 02/10/2015
Temperature/ Humidity : 25deg. C / 31% RH
Engineer : Yuta Moriya
Mode : BT LE Tx 2440MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	44.600	QP	28.3	12.5	7.4	38.8	9.4	40.0	30.6	Floor Noise
Hori	115.000	QP	28.4	12.2	8.3	38.8	10.1	43.5	33.4	Floor Noise
Hori	200.000	QP	28.1	16.6	9.1	38.9	14.9	43.5	28.6	Floor Noise
Hori	417.000	QP	27.5	18.4	10.7	38.5	18.1	46.0	27.9	Floor Noise
Hori	515.000	QP	27.3	19.5	11.3	38.2	19.9	46.0	26.1	Floor Noise
Hori	702.000	QP	27.0	22.4	12.3	38.2	23.5	46.0	22.5	Floor Noise
Hori	4880.000	PK	41.7	31.8	5.5	31.9	47.1	73.9	26.8	
Hori	7320.000	PK	45.8	37.0	6.5	33.0	56.3	73.9	17.6	Z-axis
Hori	9760.000	PK	44.6	38.9	7.4	33.4	57.5	73.9	16.4	
Hori	4880.000	AV	33.2	31.8	5.5	31.9	38.6	53.9	15.3	
Hori	7320.000	AV	38.8	37.0	6.5	33.0	49.3	53.9	4.6	Z-axis
Hori	9760.000	AV	35.9	38.9	7.4	33.4	48.8	53.9	5.1	
Vert	44.600	QP	28.1	12.5	7.4	38.8	9.2	40.0	30.8	Floor Noise
Vert	115.000	QP	28.4	12.2	8.3	38.8	10.1	43.5	33.4	Floor Noise
Vert	200.000	QP	28.3	16.6	9.1	38.9	15.1	43.5	28.4	Floor Noise
Vert	417.000	QP	27.7	18.4	10.7	38.5	18.3	46.0	27.7	Floor Noise
Vert	515.000	QP	27.3	19.5	11.3	38.2	19.9	46.0	26.1	Floor Noise
Vert	702.000	QP	27.0	22.4	12.3	38.2	23.5	46.0	22.5	Floor Noise
Vert	4880.000	PK	42.5	31.8	5.5	31.9	47.9	73.9	26.0	
Vert	7320.000	PK	47.7	37.0	5.7	33.0	57.4	73.9	16.5	
Vert	9760.000	PK	44.4	38.9	7.4	33.4	57.3	73.9	16.6	Y-axis
Vert	4880.000	AV	34.1	31.8	5.5	31.9	39.5	53.9	14.4	
Vert	7320.000	AV	40.8	37.0	6.5	33.0	51.3	53.9	2.6	
Vert	9760.000	AV	36.3	38.9	7.4	33.4	49.2	53.9	4.7	Y-axis

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
 26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 10699546H
Date : 02/10/2015
Temperature/ Humidity : 25deg. C / 31% RH
Engineer : Yuta Moriya
Mode : BT LE Tx 2480MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	44.600	QP	28.2	12.5	7.4	38.8	9.3	40.0	30.7	Floor Noise
Hori	115.000	QP	28.4	12.2	8.3	38.8	10.1	43.5	33.4	Floor Noise
Hori	200.000	QP	28.1	16.6	9.1	38.9	14.9	43.5	28.6	Floor Noise
Hori	417.000	QP	27.6	18.4	10.7	38.5	18.2	46.0	27.8	Floor Noise
Hori	515.000	QP	27.4	19.5	11.3	38.2	20.0	46.0	26.0	Floor Noise
Hori	702.000	QP	27.1	22.4	12.3	38.2	23.6	46.0	22.4	Floor Noise
Hori	2483.500	PK	42.8	27.6	3.3	32.7	41.0	73.9	32.9	Z-axis
Hori	4960.000	PK	41.1	32.0	5.5	31.9	46.7	73.9	27.3	
Hori	7440.000	PK	42.9	37.2	6.5	33.1	53.5	73.9	20.4	
Hori	9920.000	PK	43.6	39.0	7.4	33.5	56.5	73.9	17.4	
Hori	2483.500	AV	34.4	27.6	3.3	32.7	32.6	53.9	21.3	Z-axis
Hori	4960.000	AV	33.5	32.0	5.5	31.9	39.1	53.9	14.8	
Hori	7440.000	AV	34.4	37.2	6.5	33.1	45.0	53.9	8.9	
Hori	9920.000	AV	35.4	39.0	7.4	33.5	48.3	53.9	5.6	
Vert	44.600	QP	28.2	12.5	7.4	38.8	9.3	40.0	30.7	Floor Noise
Vert	115.000	QP	28.4	12.2	8.3	38.8	10.1	43.5	33.4	Floor Noise
Vert	200.000	QP	28.3	16.6	9.1	38.9	15.1	43.5	28.4	Floor Noise
Vert	417.000	QP	27.6	18.4	10.7	38.5	18.2	46.0	27.8	Floor Noise
Vert	515.000	QP	27.4	19.5	11.3	38.2	20.0	46.0	26.0	Floor Noise
Vert	702.000	QP	27.1	22.4	12.3	38.2	23.6	46.0	22.4	Floor Noise
Vert	2483.500	PK	42.3	27.6	3.3	32.7	40.5	73.9	33.4	Y-axis
Vert	4960.000	PK	41.7	32.0	5.5	31.9	47.3	73.9	26.6	
Vert	7440.000	PK	44.4	37.2	6.5	33.1	55.0	73.9	19.0	
Vert	9920.000	PK	44.3	39.0	7.4	33.5	57.2	73.9	16.7	
Vert	2483.500	AV	33.8	27.6	3.3	32.7	32.0	53.9	21.9	Y-axis
Vert	4960.000	AV	33.9	32.0	5.5	31.9	39.5	53.9	14.4	
Vert	7440.000	AV	37.5	37.2	6.5	33.1	48.1	53.9	5.8	
Vert	9920.000	AV	37.3	39.0	7.4	33.5	50.2	53.9	3.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Ampl)

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

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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

Burst rate confirmation

Test place

Report No.

Date

Temperature/ Humidity

Engineer

Mode

Ise EMC Lab. No.4 Measurement Room

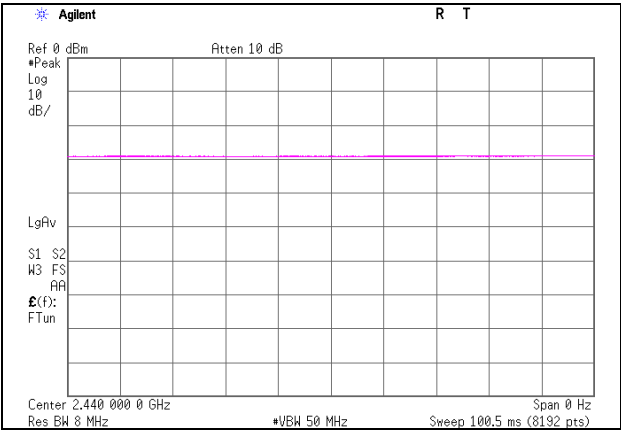
10699546H

02/10/2015

24deg. C / 30% RH

Tomoki Matsui

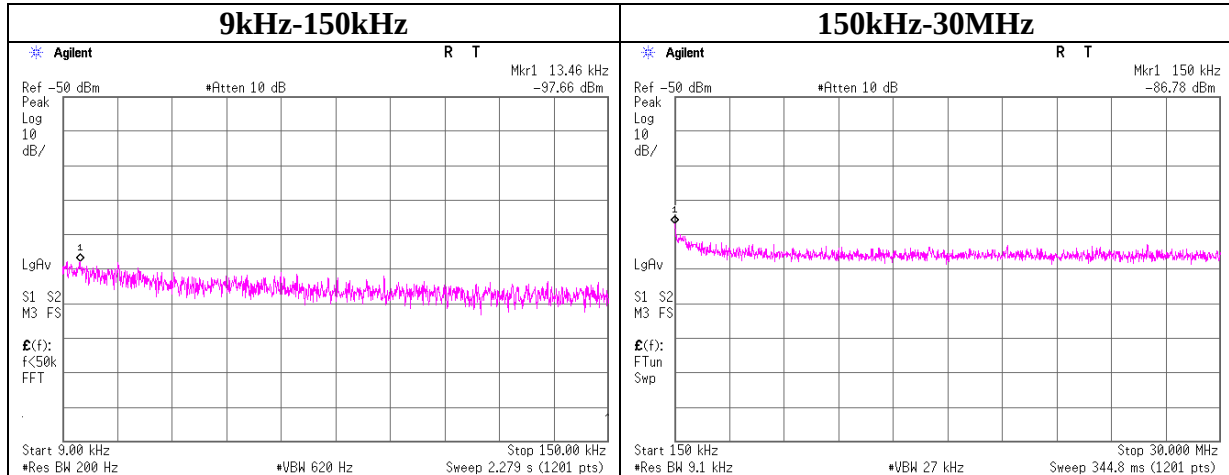
BT LE Tx 2440MHz



Conducted Spurious Emission

Test place	Ise EMC Lab. No.4 Measurement Room
Report No.	10699546H
Date	02/27/2015
Temperature/ Humidity	25deg. C / 41% RH
Engineer	Satofumi Matsuyama
Mode	BT LE Tx 2402MHz

BT LE Tx 2402MHz



Frequency	Reading	Cable Loss	Attenuator	Antenna Gain	EIRP	Distance	Ground bounce	E (field strength)	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]	[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
13.46	-97.7	0.01	10.0	2.7	-84.9	300	6.0	-23.7	45.0	68.7	
150.00	-86.8	0.01	10.0	2.7	-74.1	300	6.0	-12.8	24.0	36.8	

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

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

UL Japan, Inc.

Ise EMC Lab.

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

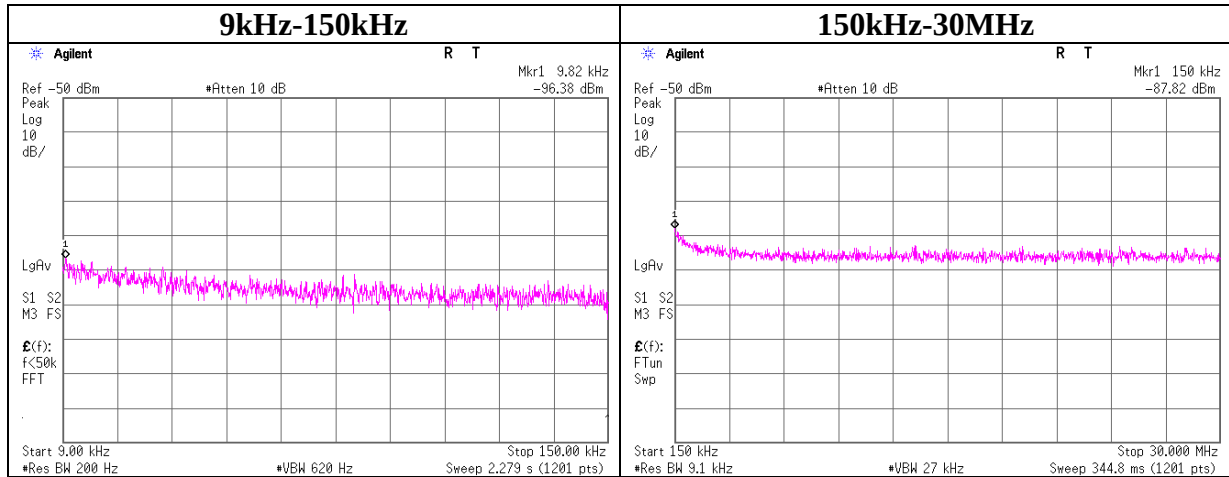
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise EMC Lab. No.4 Measurement Room
Report No. : 10699546H
Date : 02/27/2015
Temperature/ Humidity : 25deg. C / 41% RH
Engineer : Satofumi Matsuyama
Mode : BT LE Tx 2440MHz

BT LE Tx 2440MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [dB]	Antenna Gain [dBi]	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
9.82	-96.4	0.01	10.0	2.7	-83.7	300	6.0	-22.4	47.7	70.1	
150.00	-87.8	0.01	10.0	2.7	-75.1	300	6.0	-13.8	24.0	37.8	

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

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

UL Japan, Inc.

Ise EMC Lab.

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

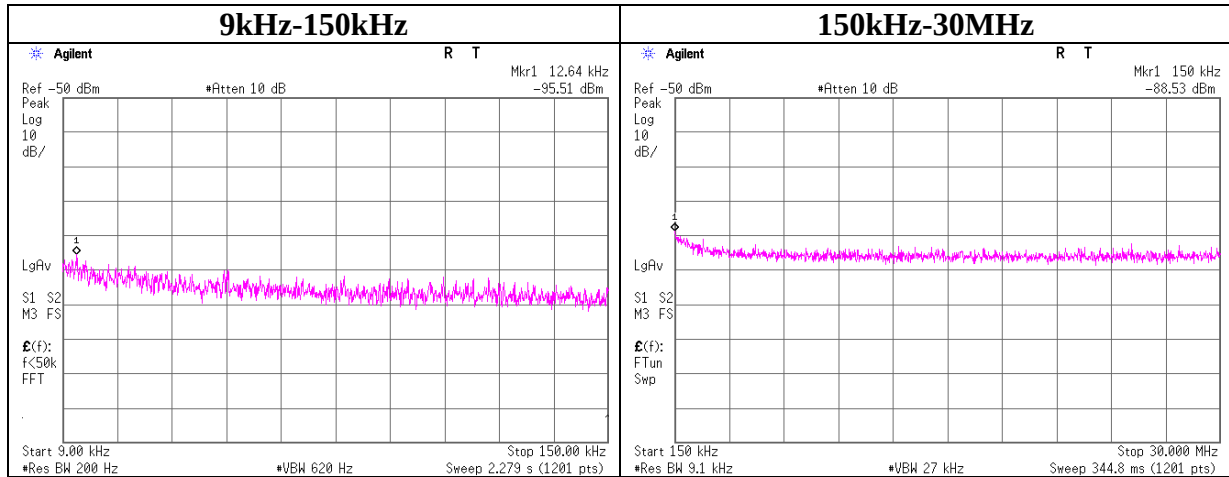
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise EMC Lab. No.4 Measurement Room
Report No. : 10699546H
Date : 02/27/2015
Temperature/ Humidity : 25deg. C / 41% RH
Engineer : Satofumi Matsuyama
Mode : BT LE Tx 2480MHz

BT LE Tx 2480MHz



Frequency	Reading	Cable Loss	Attenuator	Antenna Gain	EIRP	Distance	Ground bounce	E (field strength)	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]	[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
12.64	-95.5	0.01	10.0	2.7	-82.8	300	6.0	-21.5	45.5	67.0	
150.00	-88.5	0.01	10.0	2.7	-75.8	300	6.0	-14.5	24.0	38.5	

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

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

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

Power Density

Test place Ise EMC Lab. No.4 Measurement Room
Report No. 10699546H
Date 02/27/2015
Temperature/ Humidity 25deg. C / 41% RH
Engineer Satofumi Matsuyama
Mode BT LE Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402.00	-25.22	0.10	9.98	-15.14	8.00	23.14
2440.00	-25.22	0.10	9.98	-15.14	8.00	23.14
2480.00	-25.00	0.10	9.98	-14.92	8.00	22.92

Sample Calculation:

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

UL Japan, Inc.

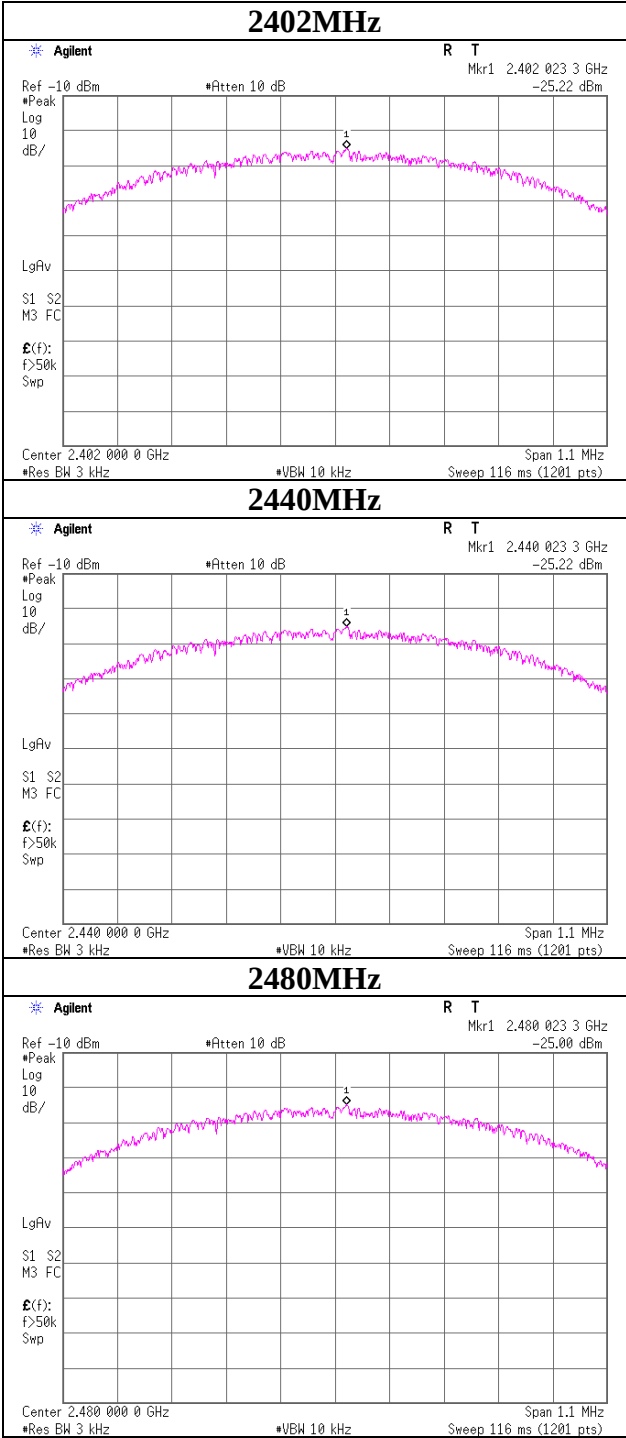
Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

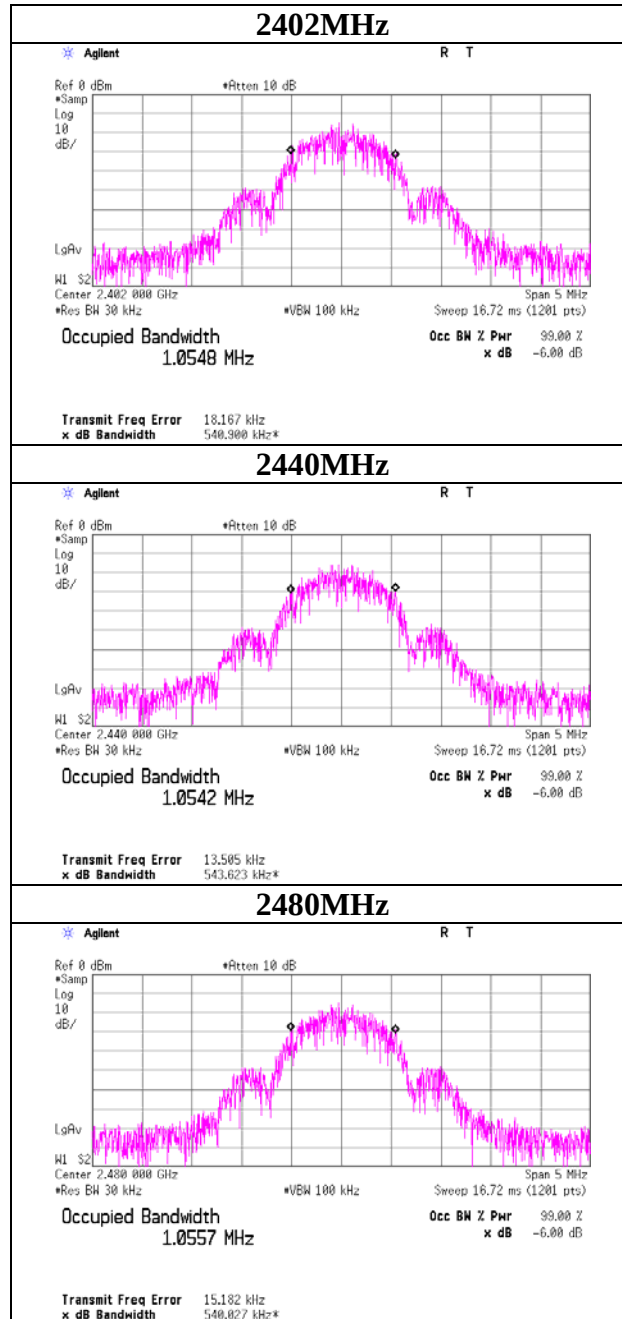
Power Density



99%Occupied Bandwidth

Test place
Report No.
Date
Temperature/ Humidity
Engineer
Mode

Ise EMC Lab. No.4 Measurement Room
10699546H
02/27/2015
25deg. C / 41% RH
Satofumi Matsuyama
BT LE Tx



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

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2014/02/28 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2015/01/13 * 12
MJM-23	Measure	ASKUL	-	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2014/11/10 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2014/11/22 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2014/11/22 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2014/06/02 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2014/11/11 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2015/02/03 * 12
MSA-15	Spectrum Analyzer	Agilent	E4440A	MY46187105	RE	2014/11/11 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2014/08/12 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2014/06/11 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2014/03/11 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2014/05/26 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2014/09/24 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	AT	2014/11/12 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2014/10/06 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2014/10/06 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2014/03/13 * 12
MTW-04	Torque wrench	HUBER+SUHNER	74 Z-0-0-21	17129	AT	2015/01/16 * 36
MOS-23	Thermo-Hygrometer	Custom	CTH-201	0004	AT	2014/12/22 * 12
MAT-24	Attenuator(10dB) (above1GHz)	Agilent	8493C	71389	AT	2014/06/12 * 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:

RE: Radiated Emission

AT: Antenna Terminal Conducted test

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