



RADIO TEST REPORT

Test Report No. : 11440162H-R1

Applicant : OMRON HEALTHCARE Co., Ltd.
Type of Equipment : Blood Pressure Monitor
Model No. : HEM-6401T
FCC ID : Q6ZHEM6401T
Test regulation : FCC Part 15 Subpart C: 2016
Test Result : Complied

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4. The test results in this report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11440162H. 11440162H is replaced with this report.


Date of test: October 9 and 10, 2016

Representative test engineer:



Yuta Moriya
Engineer
Consumer Technology Division

Approved by:



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Engineer
Consumer Technology Division



NVLAP LAB CODE: 200572-0

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11440162H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11440162H	October 21, 2016	-	-
1	11440162H-R1	November 15, 2016	P.8	Addition of Serial number in Clause 4.2.

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SECTION 1: Customer information

Company Name : OMRON HEALTHCARE Co., Ltd.
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Telephone Number : +81-75-925-2045
Facsimile Number : +81-75-925-2046
Contact Person : Toshiaki Yuasa

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

2.1 Identification of E.U.T.

Type of Equipment : Blood Pressure Monitor
Model No. : HEM-6401T
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 3.7 V
Receipt Date of Sample : October 9, 2016
Country of Mass-production : China
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: HEM-6401T (referred to as the EUT in this report) is a Blood Pressure Monitor.

General Specification

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

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2402 MHz - 2480 MHz
Modulation : GFSK
Power Supply (radio part input) : DC 1.2 V
Antenna type : Chip Antenna
Antenna Gain : 2.72 dBi

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	N/A *1)	N/A	-
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: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	1.3 dB 7440.000 MHz, AV, Horizontal.	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)

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 and EUT can not transmit RF during the battery charging.

*2) 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 test was performed with the full-charged battery and the stable voltage (DC 1.2 V) was supplied to the EUT during the tests. Therefore, the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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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

EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.
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Antenna terminal test Uncertainty (+/-)							
Power meter		Conducted emission and Power density			Conducted emission		Channel power
Below 1 GHz	Above 1 GHz	Below 1 GHz	1 GHz - 3 GHz	3 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz	
0.9 dB	1.0 dB	1.4 dB	1.7 dB	2.8 dB	2.8 dB	2.9 dB	

Polarity	Radiated emission (Below 1GHz)			
	(3 m*) (+/-)		(10 m*) (+/-)	
	30 - 200 MHz	200 - 1000MHz	30 - 200 MHz	200 - 1000MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

Radiated emission (Above 1GHz)				
(3 m*) (+/-)		(1 m*) (+/-)		(10 m*) (+/-)
1 - 6GHz	6 - 18GHz	10 - 26.5 GHz	26.5 - 40GHz	1 - 18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 dB

*Measurement distance

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

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

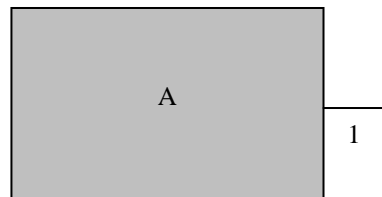
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

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
*Power of the EUT was set by the software as follows; Power settings: 0 dBm Software: Serial command Explorer2 *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) were 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-6401T	ES1_122 *1) ES1_123 *2)	OMRON HEALTHCARE Co., Ltd.	EUT

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Jig Cable	0.08	Unshielded	Unshielded	*3)

*1) Used for Radiated Spurious Emission test only.

*2) Used for Antenna Terminal Conducted Tests only.

*3) The use of a jig does not influence on the test result.

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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 v03r05".

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

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

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

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *3)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces If duty cycle was less than 98%, a duty factor was added to the results.	RBW: 100 kHz VBW: 300kHz
Test Distance	3 m	4.5 m *1) (1 GHz – 10 GHz), 1.0 m *2) (10 GHz – 26.5 GHz)		4.5 m *1) (1 GHz – 10 GHz), 1.0 m *2) (10 GHz – 26.5 GHz)

*1) Distance Factor: $20 \times \log(4.5 \text{ m} / 3.0 \text{ m}) = 3.53 \text{ dB}$

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

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

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

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

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

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

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

*2) Reference data

*3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance 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 = 9.1 kHz)

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

Test data : APPENDIX
Test result : Pass

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APPENDIX 1: Test data

6dB Bandwidth

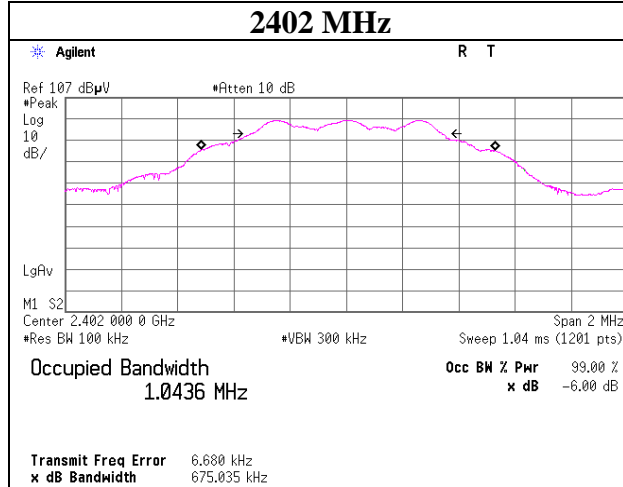
Test place Ise EMC Lab. No.3 Measurement Room
Report No. 11440162H
Date October 10, 2016
Temperature / Humidity 22 deg. C / 54 % RH
Engineer Yuta Moriya
Mode Tx BT LE

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2402	0.675	> 500
2440	0.673	> 500
2480	0.678	> 500

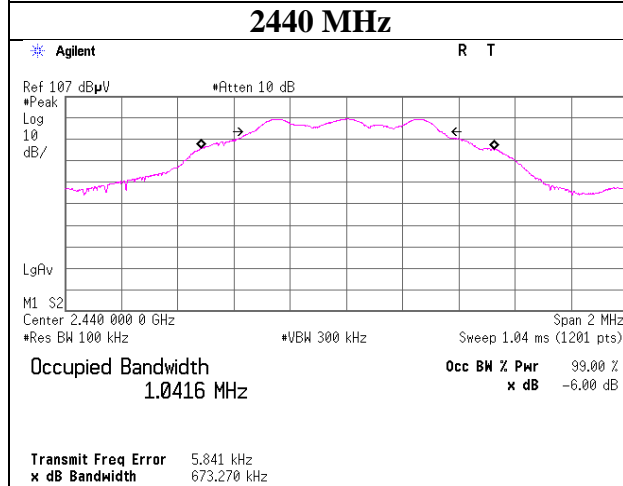
6dB Bandwidth

BT LE

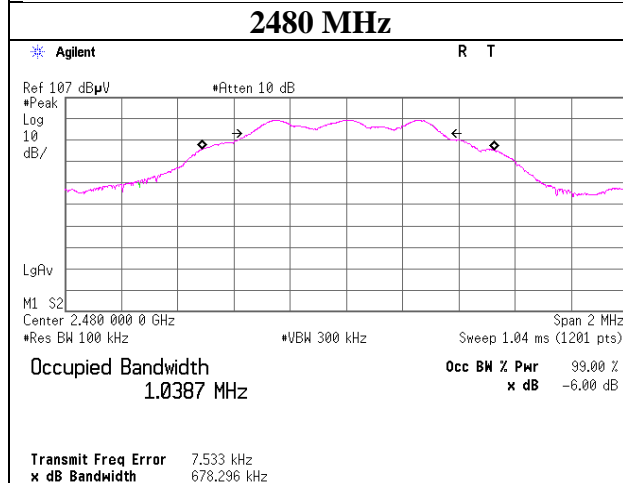
2402 MHz



2440 MHz



2480 MHz



Maximum Peak Output Power

Test place Ise EMC Lab. No.3 Measurement Room
Report No. 11440162H
Date October 10, 2016
Temperature / Humidity 22 deg. C / 54 % RH
Engineer Yuta Moriya
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-10.33	0.75	10.09	0.51	1.13	30.00	1000	29.49
2440	-10.54	0.76	10.09	0.31	1.07	30.00	1000	29.69
2480	-10.74	0.78	10.09	0.13	1.03	30.00	1000	29.87

Sample Calculation:

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

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

Test place : Ise EMC Lab. No.3 Measurement Room
Report No. : 11440162H
Date : October 10, 2016
Temperature / Humidity : 22 deg. C / 54 % RH
Engineer : Yuta Moriya
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	-15.78	0.75	10.09	-4.94	0.32	4.81	-0.13	0.97
2440	-15.54	0.76	10.09	-4.69	0.34	4.81	0.12	1.03
2480	-15.72	0.78	10.09	-4.85	0.33	4.81	-0.04	0.99

Sample Calculation:

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

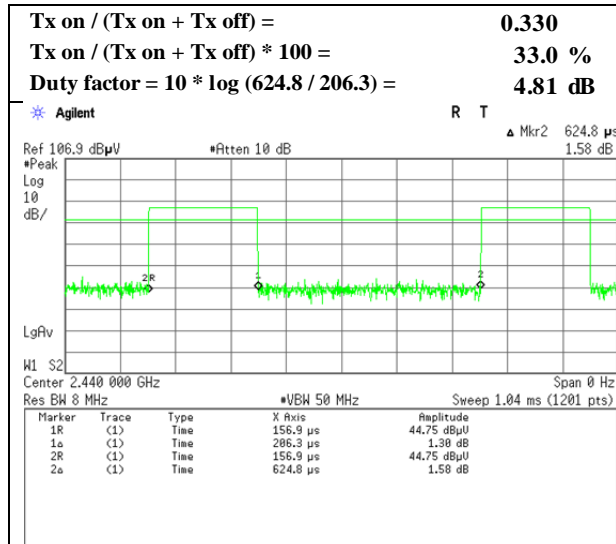
Result (Burst power average) = Time average + Duty factor

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

Burst rate confirmation

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11440162H
Date	October 9, 2016
Temperature / Humidity	22 deg. C / 51 % RH
Engineer	Yuta Moriya
Mode	Tx BT LE

BT LE



Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 and No.3 Semi Anechoic Chamber	
Report No.	11440162H	
Date	October 9, 2016	October 10, 2016
Temperature / Humidity	24 deg. C / 72 % RH	22 deg. C / 51 % RH
Engineer	Yuta Moriya (Above 1 GHz)	Yuta Moriya (Below 1 GHz)
Mode	Tx BT LE 2402 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	33.400	QP	22.2	16.0	7.1	32.2	-	13.1	40.0	26.9	
Hori	36.467	QP	23.0	15.1	7.1	32.2	-	13.0	40.0	27.0	
Hori	51.817	QP	22.6	9.6	7.4	32.2	-	7.4	40.0	32.6	
Hori	58.900	QP	22.7	7.4	7.5	32.2	-	5.4	40.0	34.6	
Hori	69.100	QP	22.9	5.8	7.6	32.2	-	4.1	40.0	35.9	
Hori	169.118	QP	22.2	15.7	8.8	32.1	-	14.6	43.5	28.9	
Hori	2388.900	PK	50.0	27.4	6.7	32.1	-	52.0	73.9	21.9	
Hori	2390.000	PK	44.5	27.4	6.7	32.1	-	46.5	73.9	27.4	
Hori	4804.000	PK	39.1	30.8	7.9	31.3	-	46.5	73.9	27.4	Floor noise
Hori	7206.000	PK	43.3	36.2	8.8	32.6	-	55.7	73.9	18.2	Floor noise
Hori	9608.000	PK	41.6	38.4	9.4	32.6	-	56.8	73.9	17.1	Floor noise
Hori	2388.900	AV	31.4	27.4	6.7	32.1	4.8	38.2	53.9	15.7	
Hori	2390.000	AV	31.4	27.4	6.7	32.1	4.8	38.2	53.9	15.7	*1)
Hori	4804.000	AV	31.0	30.8	7.9	31.3	-	38.4	53.9	15.5	Floor noise
Hori	7206.000	AV	33.3	36.2	8.8	32.6	-	45.7	53.9	8.2	Floor noise
Hori	9608.000	AV	32.3	38.4	9.4	32.6	-	47.5	53.9	6.4	Floor noise
Vert	33.400	QP	38.8	16.0	7.1	32.2	-	29.7	40.0	10.3	
Vert	36.467	QP	38.2	15.1	7.1	32.2	-	28.2	40.0	11.8	
Vert	52.383	QP	31.9	9.4	7.4	32.2	-	16.5	40.0	23.5	
Vert	57.985	QP	37.6	7.6	7.5	32.2	-	20.5	40.0	19.5	
Vert	68.974	QP	30.4	5.9	7.6	32.2	-	11.7	40.0	28.3	
Vert	169.401	QP	22.2	15.7	8.8	32.1	-	14.6	43.5	28.9	
Vert	2388.900	PK	48.8	27.4	6.7	32.1	-	50.8	73.9	23.1	
Vert	2390.000	PK	44.6	27.4	6.7	32.1	-	46.6	73.9	27.3	
Vert	4804.000	PK	40.5	30.8	7.9	31.3	-	47.9	73.9	26.0	Floor noise
Vert	7206.000	PK	41.7	36.2	8.8	32.6	-	54.1	73.9	19.8	Floor noise
Vert	9608.000	PK	42.5	38.4	9.4	32.6	-	57.7	73.9	16.2	Floor noise
Vert	2388.900	AV	31.2	27.4	6.7	32.1	4.8	38.0	53.9	15.9	
Vert	2390.000	AV	33.3	27.4	6.7	32.1	4.8	40.1	53.9	13.8	*1)
Vert	4804.000	AV	31.1	30.8	7.9	31.3	-	38.5	53.9	15.4	Floor noise
Vert	7206.000	AV	33.2	36.2	8.8	32.6	-	45.6	53.9	8.3	Floor noise
Vert	9608.000	AV	32.2	38.4	9.4	32.6	-	47.4	53.9	6.5	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	89.2	27.4	6.7	32.1	91.2	-	-	Carrier
Hori	2400.000	PK	45.4	27.4	6.7	32.1	47.4	71.2	23.8	
Vert	2402.000	PK	85.7	27.4	6.7	32.1	87.7	-	-	Carrier
Vert	2400.000	PK	42.6	27.4	6.7	32.1	44.6	67.7	23.1	

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5dB

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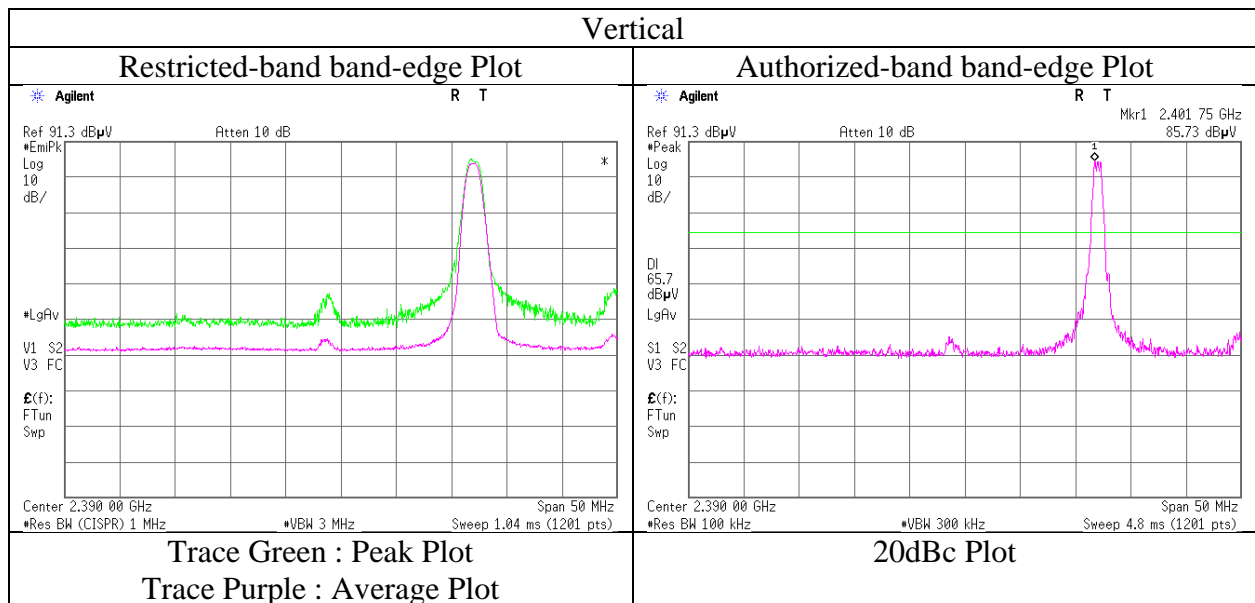
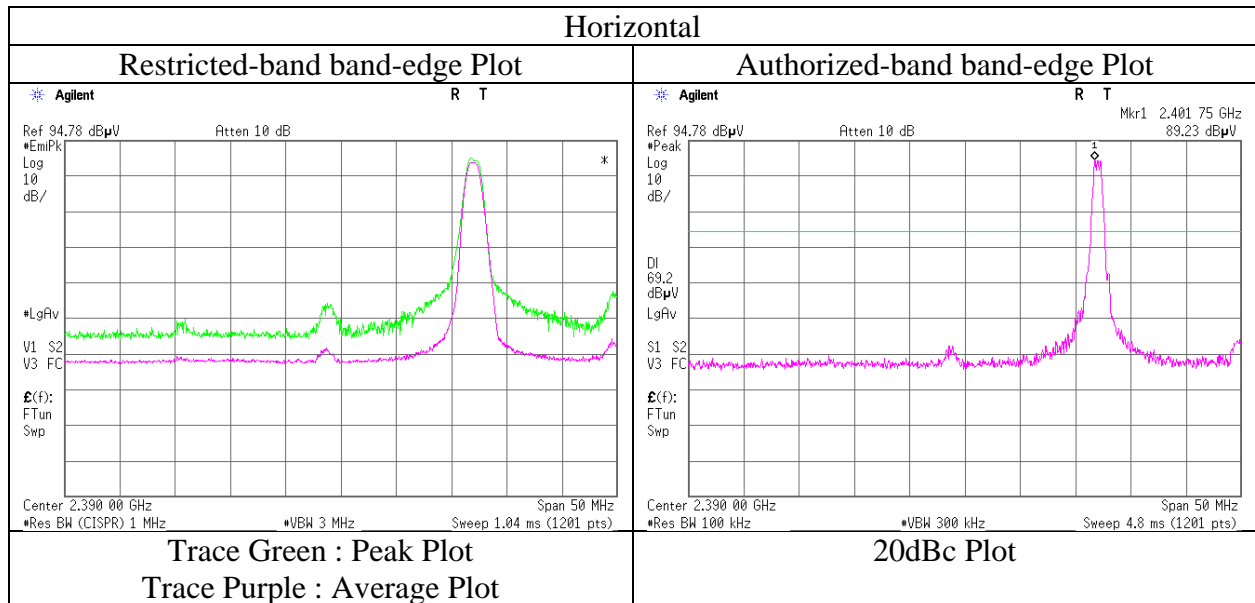
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Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11440162H
Date	October 9, 2016
Temperature / Humidity	24 deg. C / 72 % RH
Engineer	Yuta Moriya (Above 1 GHz)
Mode	Tx BT LE 2402 MHz



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

Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 and No.3 Semi Anechoic Chamber
Report No. : 11440162H
Date : October 9, 2016 October 10, 2016
Temperature / Humidity : 24 deg. C / 72 % RH 22 deg. C / 51 % RH
Engineer : Yuta Moriya Yuta Moriya
 (Above 1 GHz) (Below 1 GHz)
Mode : Tx BT LE 2440 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	33.400	QP	22.1	16.0	7.1	32.2	-	13.0	40.0	27.0	
Hori	36.467	QP	23.2	15.1	7.1	32.2	-	13.2	40.0	26.8	
Hori	51.817	QP	22.4	9.6	7.4	32.2	-	7.2	40.0	32.8	
Hori	58.900	QP	22.5	7.4	7.5	32.2	-	5.2	40.0	34.8	
Hori	69.100	QP	22.6	5.8	7.6	32.2	-	3.8	40.0	36.2	
Hori	169.118	QP	22.1	15.7	8.8	32.1	-	14.5	43.5	29.0	
Hori	4880.000	PK	39.3	31.1	7.9	31.3	-	47.0	73.9	26.9	Floor noise
Hori	7320.000	PK	43.7	36.4	8.8	32.6	-	56.3	73.9	17.6	
Hori	9760.000	PK	42.4	38.6	9.5	32.7	-	57.8	73.9	16.1	Floor noise
Hori	4880.000	AV	31.2	31.1	7.9	31.3	-	38.9	53.9	15.0	Floor noise
Hori	7320.000	AV	34.6	36.4	8.8	32.6	4.8	52.0	53.9	1.9	
Hori	9760.000	AV	32.2	38.6	9.5	32.7	-	47.6	53.9	6.3	Floor noise
Vert	33.400	QP	39.3	16.0	7.1	32.2	-	30.2	40.0	9.8	
Vert	36.467	QP	40.5	15.1	7.1	32.2	-	30.5	40.0	9.5	
Vert	52.383	QP	30.5	9.4	7.4	32.2	-	15.1	40.0	24.9	
Vert	57.985	QP	35.1	7.6	7.5	32.2	-	18.0	40.0	22.0	
Vert	68.974	QP	31.1	5.9	7.6	32.2	-	12.4	40.0	27.6	
Vert	169.401	QP	22.1	15.7	8.8	32.1	-	14.5	43.5	29.0	
Vert	4880.000	PK	39.6	31.1	7.9	31.3	-	47.3	73.9	26.6	Floor noise
Vert	7320.000	PK	40.3	36.4	8.8	32.6	-	52.9	73.9	21.0	Floor noise
Vert	9760.000	PK	41.8	38.6	9.5	32.7	-	57.2	73.9	16.7	Floor noise
Vert	4880.000	AV	31.4	31.1	7.9	31.3	-	39.1	53.9	14.8	Floor noise
Vert	7320.000	AV	32.0	36.4	8.8	32.6	-	44.6	53.9	9.3	Floor noise
Vert	9760.000	AV	32.2	38.6	9.5	32.7	-	47.6	53.9	6.3	Floor noise

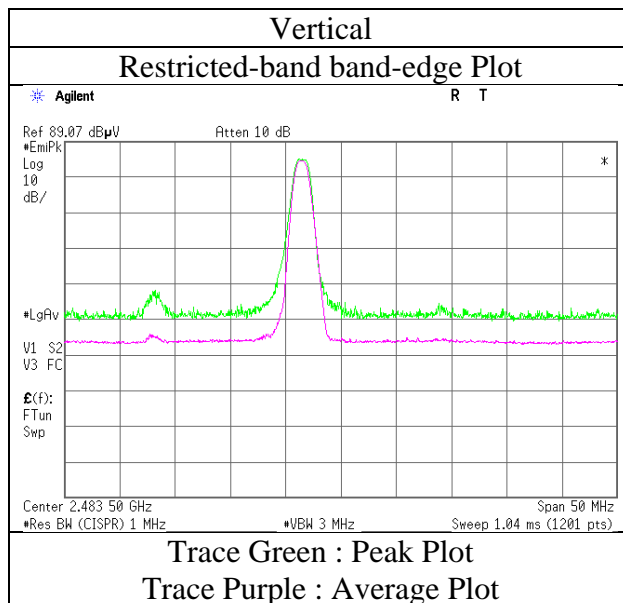
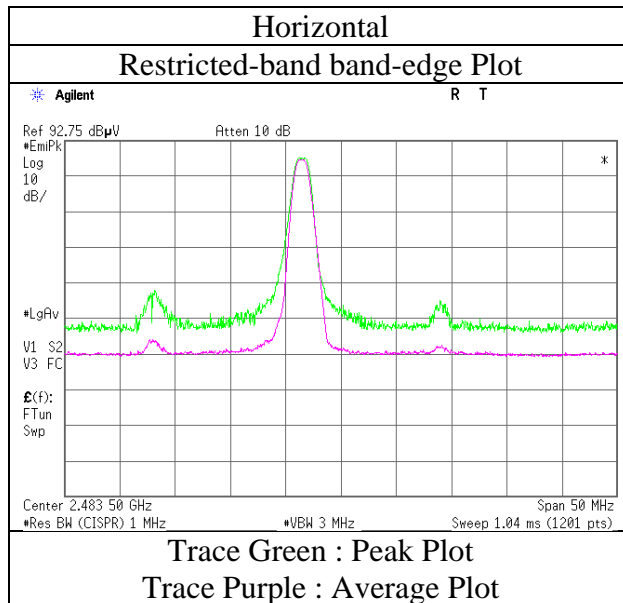
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

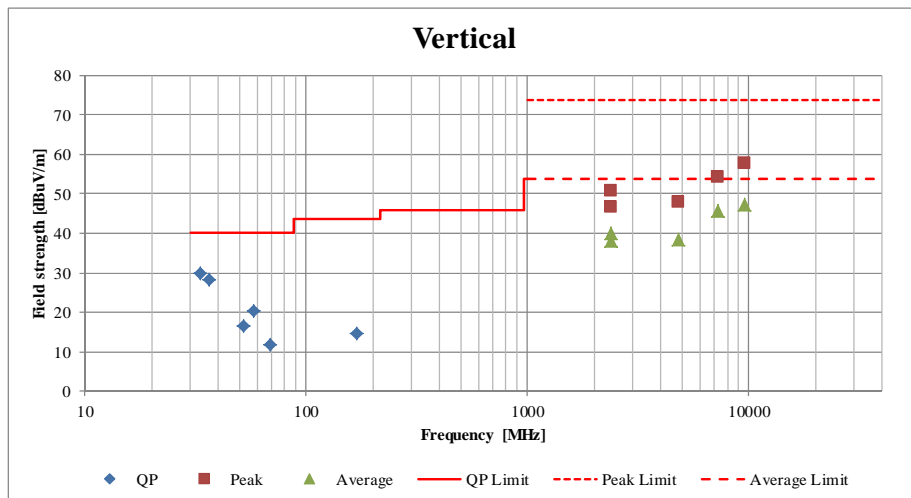
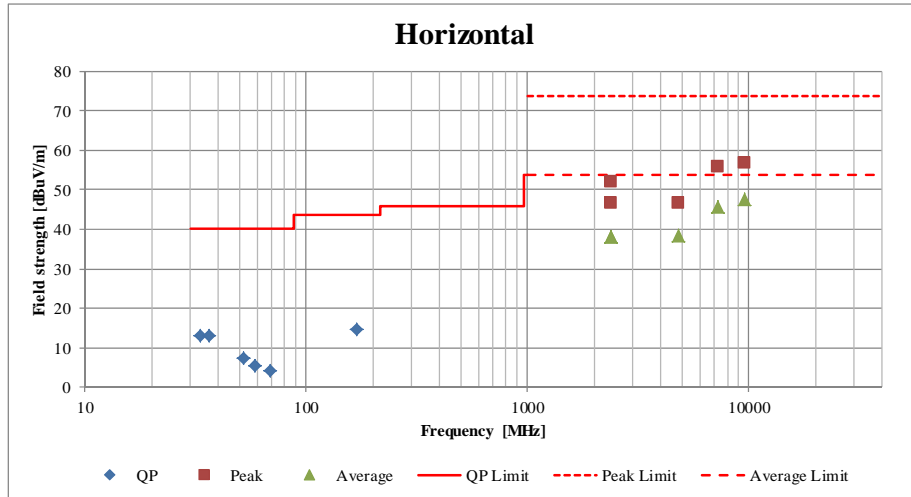
Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11440162H
Date	October 9, 2016
Temperature / Humidity	24 deg. C / 72 % RH
Engineer	Yuta Moriya (Above 1 GHz)
Mode	Tx BT LE 2480 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

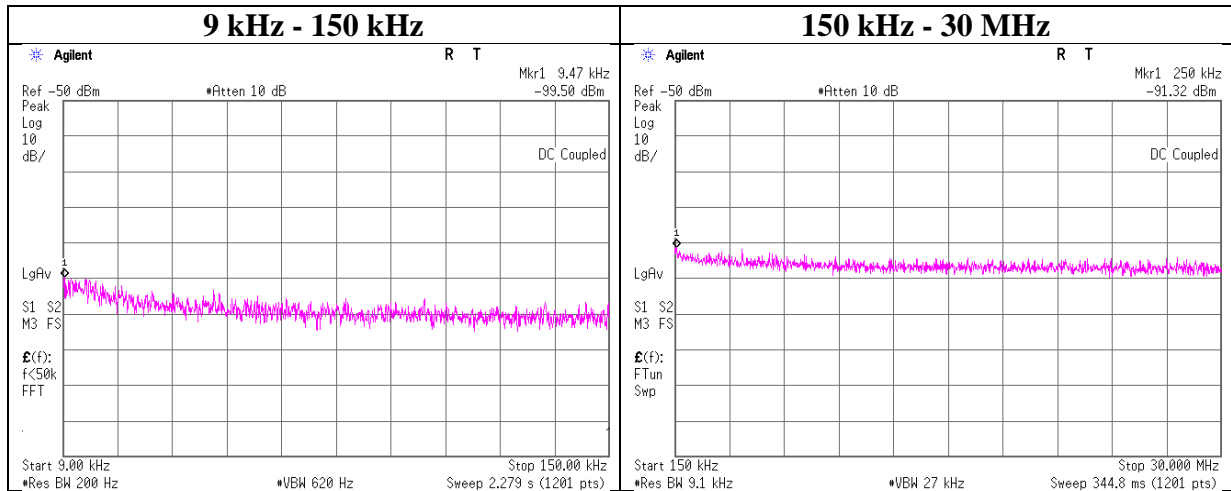
Test place	Ise EMC Lab. No.4 and No.3 Semi Anechoic Chamber	
Report No.	11440162H	
Date	October 9, 2016	October 10, 2016
Temperature / Humidity	24 deg. C / 72 % RH	22 deg. C / 51 % RH
Engineer	Yuta Moriya (Above 1 GHz)	Yuta Moriya (Below 1 GHz)
Mode	Tx BT LE 2402 MHz	



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

Conducted Spurious Emission

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	11440162H
Date	October 10, 2016
Temperature / Humidity	22 deg. C / 51 % RH
Engineer	Yuta Moriya
Mode	Tx BT LE 2402 MHz



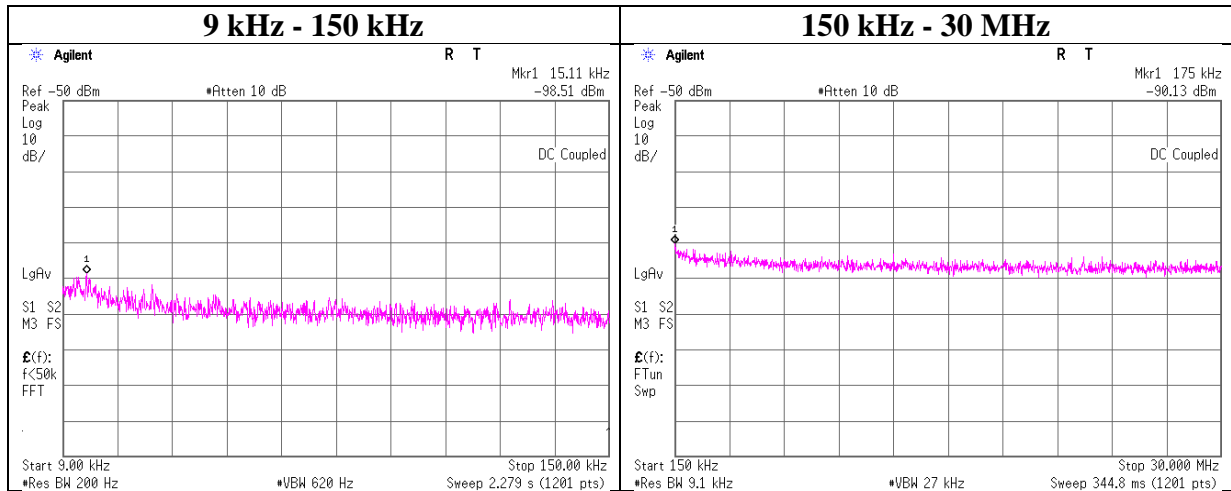
Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
9.47	-99.5	0.01	9.8	2.72	1	-87.0	300	6.0	-25.7	48.0	73.7	
250.00	-91.3	0.01	9.8	2.72	1	-78.8	300	6.0	-17.5	19.6	37.1	

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

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

Conducted Spurious Emission

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	11440162H
Date	October 10, 2016
Temperature / Humidity	22 deg. C / 51 % RH
Engineer	Yuta Moriya
Mode	Tx BT LE 2440 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
15.11	-98.5	0.01	9.8	2.72	1	-86.0	300	6.0	-24.7	44.0	68.7	
175.00	-90.1	0.01	9.8	2.72	1	-77.6	300	6.0	-16.3	22.7	39.0	

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

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

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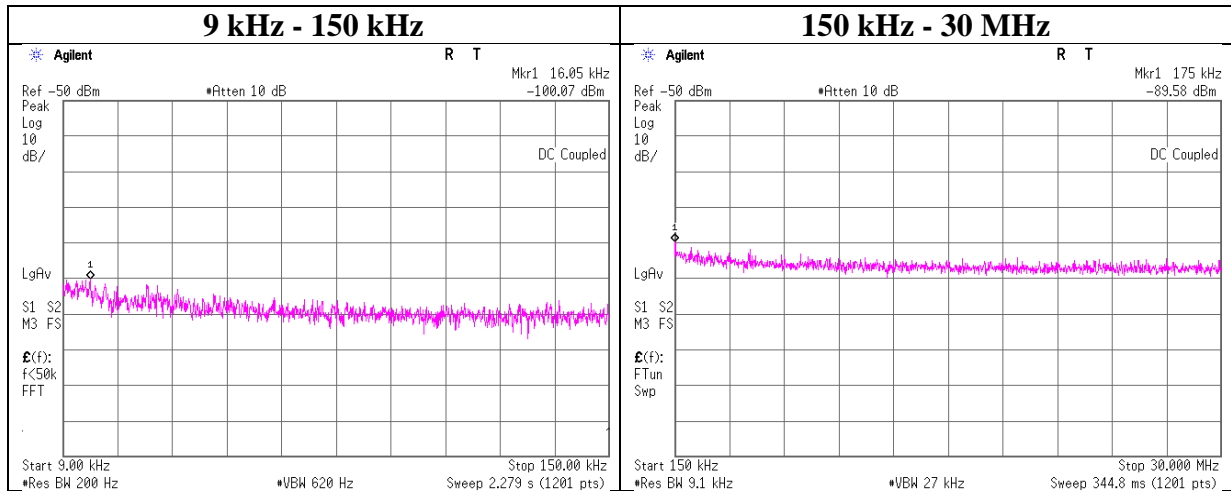
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	11440162H
Date	October 10, 2016
Temperature / Humidity	22 deg. C / 51 % RH
Engineer	Yuta Moriya
Mode	Tx BT LE 2480 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
16.06	-100.1	0.01	9.8	2.72	1	-87.5	300	6.0	-26.3	43.4	69.7	
175.00	-89.6	0.01	9.9	2.72	1	-77.0	300	6.0	-15.7	22.7	38.4	

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

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

Power Density

Test place Ise EMC Lab. No.3 Measurement Room
Report No. 11440162H
Date October 10, 2016
Temperature / Humidity 22 deg. C / 51 % RH
Engineer Yuta Moriya
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402.00	-24.76	0.75	10.09	-13.92	8.00	21.92
2440.00	-24.55	0.76	10.09	-13.70	8.00	21.70
2480.00	-24.82	0.78	10.09	-13.95	8.00	21.95

Sample Calculation:

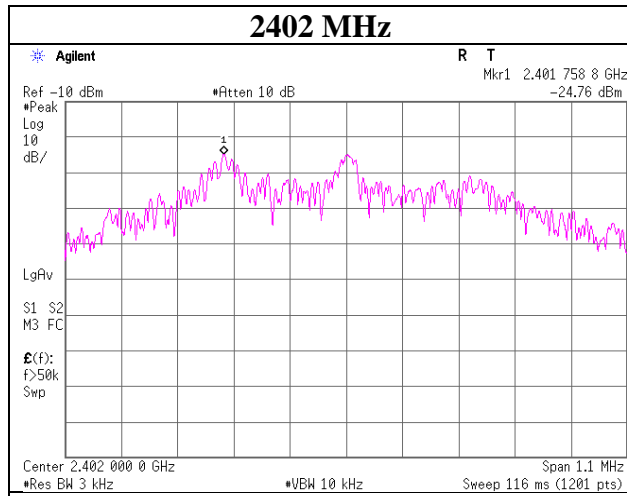
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

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

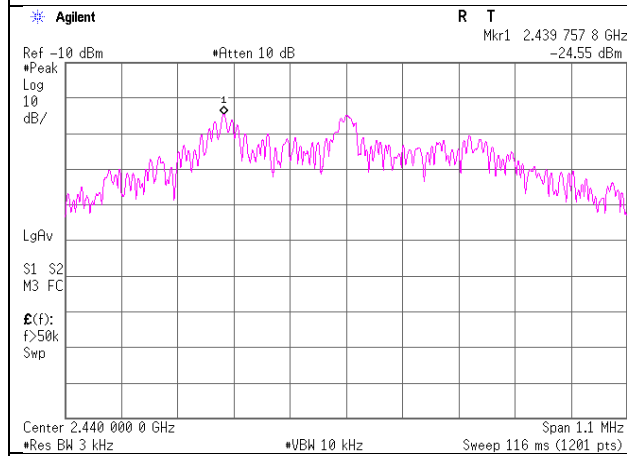
Power Density

BT LE

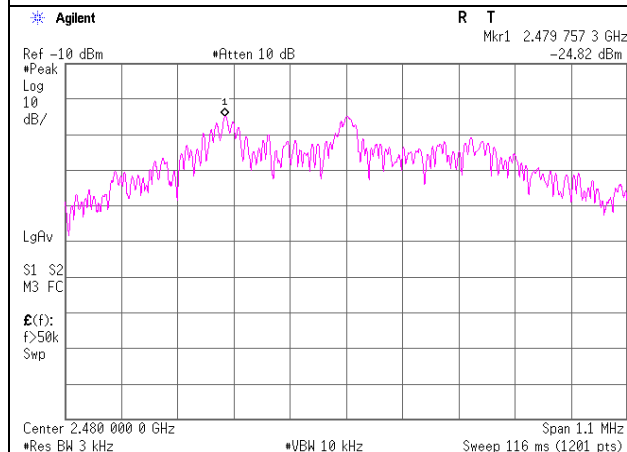
2402 MHz



2440 MHz



2480 MHz



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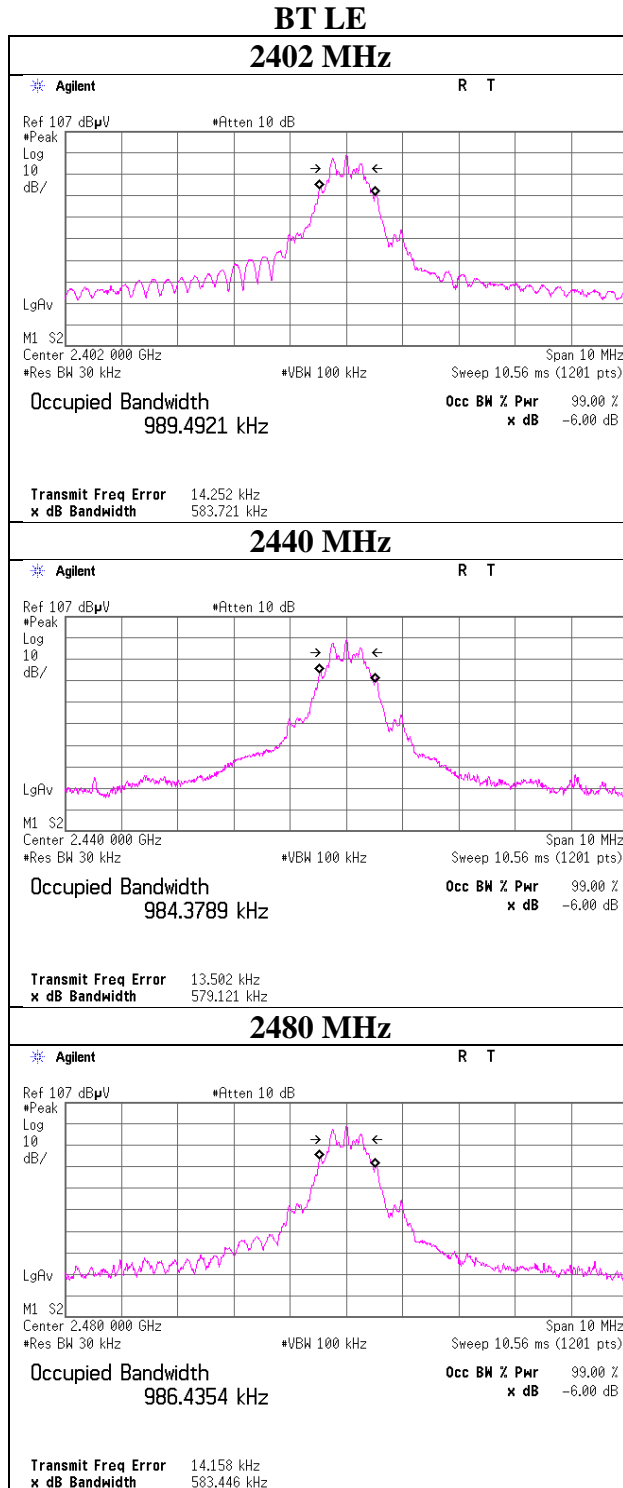
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99% Occupied Bandwidth

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	11440162H
Date	October 10, 2016
Temperature / Humidity	22 deg. C / 51 % RH
Engineer	Yuta Moriya
Mode	Tx BT LE



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APPENDIX 2: Test instruments

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	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2016/01/21 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2015/11/06 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2016/09/28 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2016/06/21 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2015/10/01 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2016/06/24 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2016/05/16 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/01 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2016/01/21 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2015/10/07 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2016/09/15 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2015/10/11 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2016/01/30 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2016/07/26 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2016/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2016/03/24 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	RE	2016/03/18 * 12
MRENT-130	Spectrum Analyzer	Agilent	E4440A	MY46187750	AT	2016/06/03 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2015/10/19 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2015/10/19 * 12
MOS-29	Thermo-Hygrometer	Custom	CTH-201	2901	AT	2016/01/21 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	AT	2016/01/13 * 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 test
AT: Antenna Terminal Conducted test**

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