



RADIO TEST REPORT

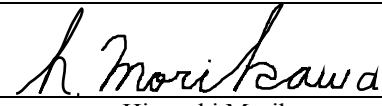
Test Report No. : 11389963S-A-R1

Applicant : Nintendo Co., Ltd.
Type of Equipment : Bluetooth Product
Model No. : CTR-013
FCC ID : BKEF
Test regulation : FCC Part 15 Subpart C: 2016
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11389963S-A. 11389963S-A is replaced with this report.

Date of test: August 1 to 2, 2016

Representative test engineer:


Hiroyuki Morikawa
Engineer
Consumer Technology Division

Approved by:


Akio Hayashi
Leader
Consumer Technology Division



- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11389963S-A

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SECTION 1: Customer information

Company Name	:	Nintendo Co., Ltd.
Address	:	11-1 Hokotate-cho, Kamitoba, Minami-ku, Kyoto, 601-8501 Japan
Telephone Number	:	+81-75-662-9600
Facsimile Number	:	+81-75-662-9624
Contact Person	:	Yoshihiro Tanaka

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

2.1 Identification of E.U.T.

Type of Equipment	:	Bluetooth Product
Model No.	:	CTR-013
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 3.0 V (Battery)
Receipt Date of Sample	:	August 1, 2016
Country of Mass-production	:	China
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: CTR-013 (referred to as the EUT in this report) is a Bluetooth Product.

The clock frequencies used in the EUT : 13 MHz, 16 MHz, 26 MHz

Radio Specification

Bluetooth low energy		
Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	GFSK
Antenna type	:	Inverted F (Pattern)
Antenna Gain	:	-1.64 dBi
RFID		
Equipment type	:	Transceiver
Frequency of operation	:	13.56 MHz
Type of modulation	:	ASK
ITU code	:	A1D

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC part 15 final revised on April 6, 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 EUT has been tested for compliance with FCC Part 15 Subpart B. Refer to the test report 11389967S-B.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	-	-	*1)
6dB Bandwidth	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: -	FCC: Section 15.247(a)(2) IC: RSS-247 5.2(1)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: RSS-Gen 6.12	FCC: Section 15.247(b)(3) IC: RSS-247 5.4(4)		Complied	Conducted
Power Density	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: -	FCC: Section 15.247(e) IC: RSS-247 5.2(2)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: RSS-Gen 6.13	FCC: Section 15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	8.9 dB 9608.00 MHz, AV, Horizontal Tx 2402 MHz	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) The test is not applicable since the EUT has no AC mains.
 *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)

This EUT provides stable voltage (DC 2.7 V) constantly to RF part regardless of input voltage. Therefore, this 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 requirement.

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3.3 Addition to standard

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

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

3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.
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Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.1 dB	2.1 dB	2.6 dB	2.2 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	2.7 dB	2.7 dB	3.1 dB	-
	30 MHz-300 MHz	4.4 dB	4.4 dB	4.6 dB	-
	300 MHz-1 GHz	5.6 dB	5.5 dB	5.3 dB	-
	1 GHz-13 GHz	5.2 dB	5.2 dB	5.2 dB	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.9 dB	4.9 dB	4.9 dB	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.76 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.79 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.08 dB
Spurious emission (Conducted) below 1GHz	1.5 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.4 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.5 dB
Bandwidth Measurement	0.66 %
Duty cycle and Time Measurement	0.012 %

Radiated emission test

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

3.5 Test Location

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JAB Accreditation No. RTL02610

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

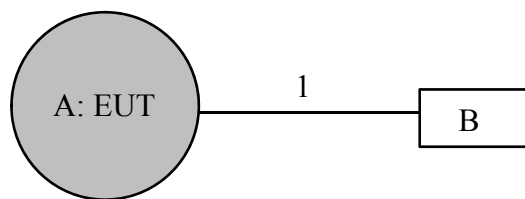
4.1 Operating Mode(s)

Mode	Remarks*
Transmitting (Tx), Bluetooth Low Energy (BT LE)	PRBS9
*Transmitting duty was 100 % on all tests.	
*The worst condition was determined based on the test result of Maximum Peak Output Power (Low Channel)	
*Power of the EUT was set by the software as follows; Power settings: Fixed Software: Connection Manager ver.3.0.6	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Spurious Emission, 6 dB Bandwidth, Maximum Peak Output Power Power Density, 99 % Occupied Bandwidth	Tx, BTLE	2402 MHz, 2440 MHz, 2480 MHz

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Bluetooth Product	CTR-013	2 *1) 3 *2)	Mitsumi Electric Co., Ltd.	EUT
B	JIG	-	-	-	-

*1) Used for Antenna Terminal conducted test

*2) Used for Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.2	Unshielded	Unshielded	-

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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 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 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 300 MHz	300 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	3.96 m *1) (1 GHz – 13 GHz), 1 m *2) (13 GHz – 26.5 GHz)		3.96 m *1) (1 GHz – 13 GHz), 1 m *2) (13 GHz – 26.5 GHz)

*1) Distance Factor: $20 \times \log(3.96 \text{ m} / 3.0 \text{ m}) = 2.42 \text{ dB}$

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

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

*1) 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 = 10 kHz)

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

Test data : APPENDIX
Test result : Pass

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APPENDIX 1: Test data

6dB Bandwidth

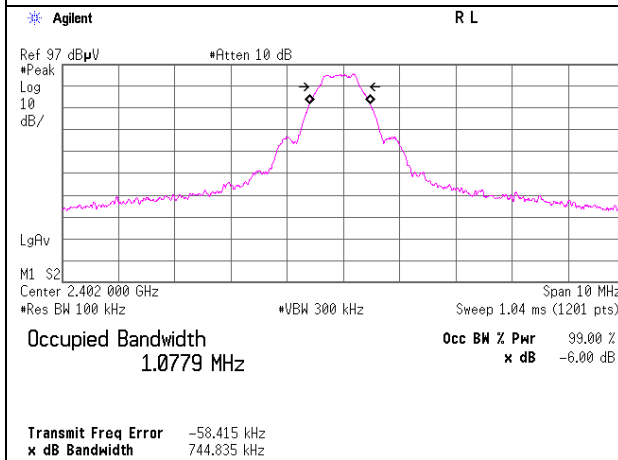
Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11389963S-A-R1
Date August 2, 2016
Temperature / Humidity 26 deg. C / 53 % RH
Engineer Yosuke Ishikawa
Mode Tx BT LE

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
BT LE	2402	0.745	> 500
	2440	0.749	> 500
	2480	0.751	> 500

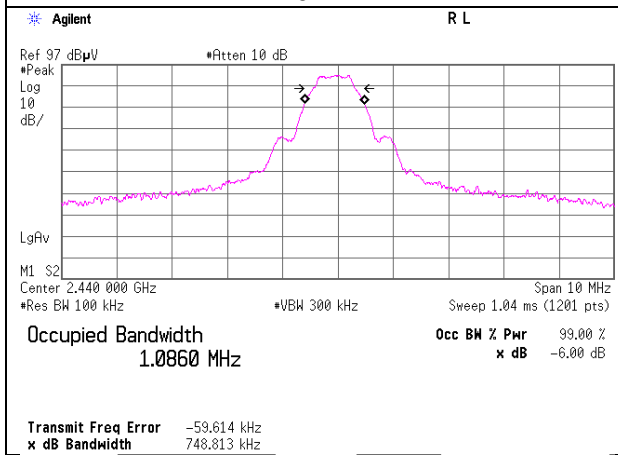
6dB Bandwidth

BT LE

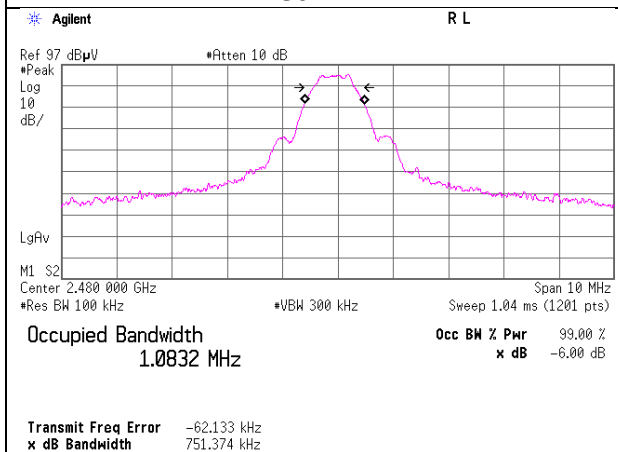
2402 MHz



2440 MHz



2480 MHz



Maximum Peak Output Power

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11389963S-A-R1
Date August 2, 2016
Temperature / Humidity 26 deg. C / 53 % RH
Engineer Yosuke Ishikawa
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-14.28	1.87	0.00	-12.41	0.06	30.00	1000	42.41
2440	-14.60	1.87	0.00	-12.73	0.05	30.00	1000	42.73
2480	-14.69	1.88	0.00	-12.81	0.05	30.00	1000	42.81

Sample Calculation:

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

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

Average Output Power
(Reference data for RF Exposure)

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11389963S-A-R1
Date August 2, 2016
Temperature / Humidity 26 deg. C / 53 % RH
Engineer Yosuke Ishikawa
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	-14.79	1.87	0.00	-12.92	0.05	0.00	-12.92	0.05
2440	-15.13	1.87	0.00	-13.26	0.05	0.00	-13.26	0.05
2480	-15.20	1.88	0.00	-13.32	0.05	0.00	-13.32	0.05

Sample Calculation:

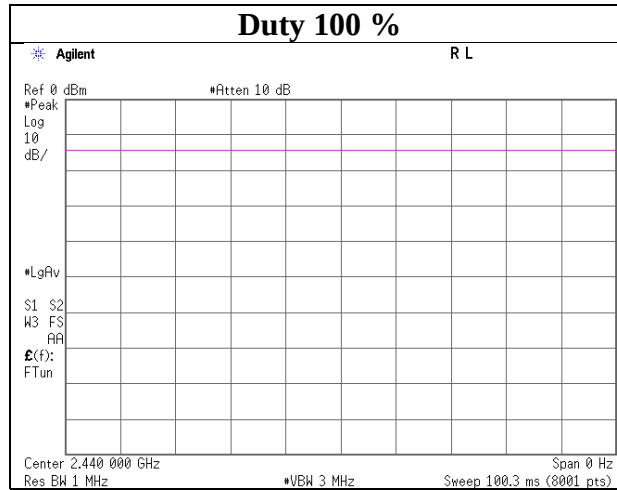
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

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 Shonan EMC Lab. No.5 Shielded Room
Report No. 11389963S-A-R1
Date August 2, 2016
Temperature / Humidity 26 deg. C / 53 % RH
Engineer Yosuke Ishikawa
Mode Tx BT LE



Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11389963S-A-R1
Date : August 1, 2016
Temperature / Humidity : 23 deg. C / 70 % RH
Engineer : Hiroyuki Morikawa
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.	36.210	QP	22.60	15.15	7.16	31.83	0.00	13.08	40.00	26.9	100	0	
Hori.	45.120	QP	22.20	12.23	7.37	31.82	0.00	9.98	40.00	30.0	100	0	
Hori.	62.645	QP	22.50	6.97	7.21	31.81	0.00	4.87	40.00	35.1	100	0	
Hori.	139.014	QP	23.90	14.03	8.55	31.78	0.00	14.70	43.50	28.8	210	200	
Hori.	296.990	QP	30.30	19.23	9.94	31.76	0.00	27.71	46.00	18.2	109	217	
Hori.	430.196	QP	21.70	16.41	7.42	31.85	0.00	13.68	46.00	32.3	100	0	
Hori.	2390.000	PK	44.40	27.68	13.77	40.70	2.42	47.57	73.90	26.3	185	149	
Hori.	4804.000	PK	49.87	31.33	5.99	41.54	2.42	48.07	73.90	25.8	327	129	
Hori.	7206.000	PK	46.20	36.61	7.31	41.12	2.42	51.42	73.90	22.4	150	0	
Hori.	9608.000	PK	45.02	37.93	8.12	40.49	2.42	53.00	73.90	20.9	150	0	
Hori.	2390.000	AV	35.66	27.68	13.77	40.70	2.42	38.83	53.90	15.0	185	149	
Hori.	4804.000	AV	42.70	31.33	5.99	41.54	2.42	40.90	53.90	13.0	327	129	
Hori.	7206.000	AV	37.64	36.61	7.31	41.12	2.42	42.86	53.90	11.0	150	0	
Hori.	9608.000	AV	36.95	37.93	8.12	40.49	2.42	44.93	53.90	8.9	150	0	
Vert.	35.664	QP	22.80	15.32	7.14	31.83	0.00	13.43	40.00	26.5	100	0	
Vert.	64.812	QP	30.30	6.67	7.18	31.81	0.00	12.34	40.00	27.6	237	0	
Vert.	110.189	QP	28.90	11.25	8.13	31.80	0.00	16.48	43.50	27.0	100	0	
Vert.	129.611	QP	26.90	13.35	8.33	31.79	0.00	16.79	43.50	26.7	100	0	
Vert.	209.838	QP	22.60	16.34	9.23	31.75	0.00	16.42	43.50	27.0	100	0	
Vert.	474.330	QP	21.90	17.03	7.65	31.88	0.00	14.70	46.00	31.3	100	0	
Vert.	2390.000	PK	44.13	27.68	13.77	40.70	2.42	47.30	73.90	26.6	101	135	
Vert.	4804.000	PK	48.70	31.33	5.99	41.54	2.42	46.90	73.90	27.0	100	114	
Vert.	7206.000	PK	46.25	36.61	7.31	41.12	2.42	51.47	73.90	22.4	150	0	
Vert.	9608.000	PK	46.43	37.93	8.12	40.49	2.42	54.41	73.90	19.4	150	0	
Vert.	2390.000	AV	35.62	27.68	13.77	40.70	2.42	38.79	53.90	15.1	101	135	
Vert.	4804.000	AV	41.35	31.33	5.99	41.54	2.42	39.55	53.90	14.3	100	114	
Vert.	7206.000	AV	37.63	36.61	7.31	41.12	2.42	42.85	53.90	11.0	150	0	
Vert.	9608.000	AV	36.76	37.93	8.12	40.49	2.42	44.74	53.90	9.1	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.42\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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	75.88	27.70	13.78	40.70	2.42	79.08	-	-	
Hori.	2400.000	PK	35.73	27.70	13.78	40.70	2.42	38.93	59.08	20.2	
Vert.	2402.000	PK	78.61	27.70	13.78	40.70	2.42	81.81	-	-	
Vert.	2400.000	PK	36.37	27.70	13.78	40.70	2.42	39.57	61.81	22.2	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.42\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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Shonan EMC Lab.

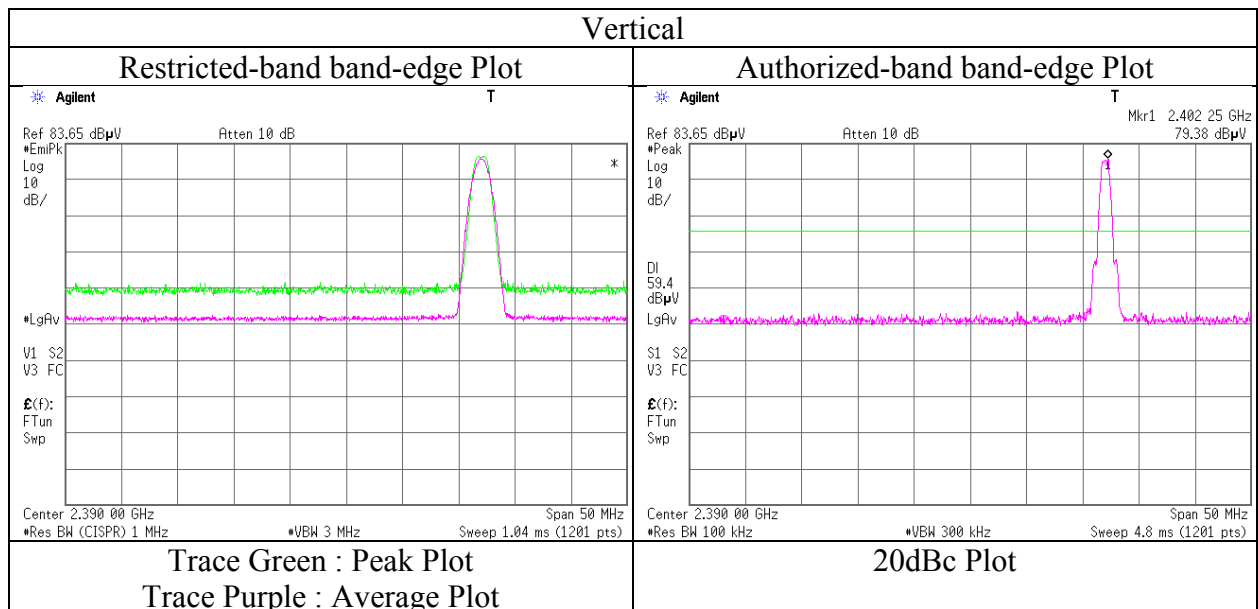
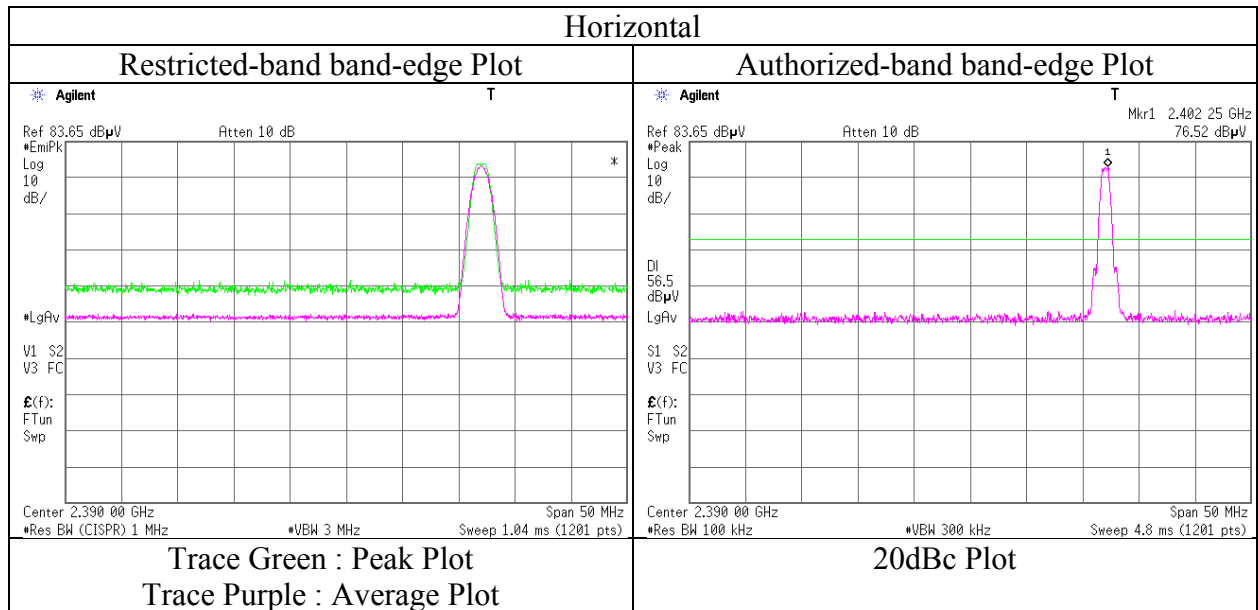
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Telephone : +81 463 50 6400

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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11389963S-A-R1
Date	August 1, 2016
Temperature / Humidity	23 deg. C / 70 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx BT LE 2402 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11389963S-A-R1
Date : August 1, 2016
Temperature / Humidity : 23 deg. C / 70 % RH
Engineer : Hiroyuki Morikawa

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.	64.838	QP	22.30	6.67	7.18	31.81	0.00	4.34	40.00	35.6	100	0	
Hori.	146.695	QP	24.60	14.46	8.72	31.78	0.00	16.00	43.50	27.5	219	200	
Hori.	292.997	QP	30.70	19.05	9.91	31.76	0.00	27.90	46.00	18.1	117	205	
Hori.	4880.000	PK	48.76	31.59	6.03	41.39	2.42	47.41	73.90	26.4	304	142	
Hori.	7320.000	PK	45.89	36.67	7.40	41.24	2.42	51.14	73.90	22.7	150	0	
Hori.	9760.000	PK	43.48	38.03	8.24	40.41	2.42	51.76	73.90	22.1	100	0	
Hori.	4880.000	AV	41.65	31.59	6.03	41.39	2.42	40.30	53.90	13.6	304	142	
Hori.	7320.000	AV	37.05	36.67	7.40	41.24	2.42	42.30	53.90	11.6	150	0	
Hori.	9760.000	AV	35.75	38.03	8.24	40.41	2.42	44.03	53.90	9.8	100	0	
Vert.	65.285	QP	30.90	6.61	7.20	31.81	0.00	12.90	40.00	27.1	235	0	
Vert.	78.686	QP	29.70	5.86	8.23	31.81	0.00	11.98	40.00	28.0	168	0	
Vert.	122.858	QP	25.40	12.87	8.21	31.79	0.00	14.69	43.50	28.8	100	0	
Vert.	4880.000	PK	48.30	31.59	6.03	41.39	2.42	46.95	73.90	26.9	111	128	
Vert.	7320.000	PK	45.45	36.67	7.40	41.24	2.42	50.70	73.90	23.2	150	0	
Vert.	9760.000	PK	44.91	38.03	8.24	40.41	2.42	53.19	73.90	20.7	150	0	
Vert.	4880.000	AV	40.26	31.59	6.03	41.39	2.42	38.91	53.90	14.9	111	128	
Vert.	7320.000	AV	37.24	36.67	7.40	41.24	2.42	42.49	53.90	11.4	150	0	
Vert.	9760.000	AV	35.89	38.03	8.24	40.41	2.42	44.17	53.90	9.7	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.42\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11389963S-A-R1
Date : August 1, 2016
Temperature / Humidity : 23 deg. C / 70 % RH
Engineer : Hiroyuki Morikawa

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.	66.172	QP	22.60	6.48	7.27	31.81	0.00	4.54	40.00	35.4	100	0	
Hori.	136.700	QP	23.90	13.86	8.49	31.79	0.00	14.46	43.50	29.0	221	200	
Hori.	298.998	QP	30.90	19.32	9.96	31.76	0.00	28.42	46.00	17.5	110	211	
Hori.	2483.500	PK	45.87	27.83	13.86	40.69	2.42	49.29	73.90	24.6	109	192	
Hori.	4960.000	PK	48.75	31.86	6.07	41.23	2.42	47.87	73.90	26.0	293	150	
Hori.	7440.000	PK	45.14	36.74	7.49	41.37	2.42	50.42	73.90	23.4	150	0	
Hori.	9920.000	PK	43.62	38.13	8.37	40.32	2.42	52.22	73.90	21.6	150	0	
Hori.	2483.500	AV	36.61	27.83	13.86	40.69	2.42	40.03	53.90	13.8	109	192	
Hori.	4960.000	AV	41.67	31.86	6.07	41.23	2.42	40.79	53.90	13.1	293	150	
Hori.	7440.000	AV	36.99	36.74	7.49	41.37	2.42	42.27	53.90	11.6	150	0	
Hori.	9920.000	AV	35.27	38.13	8.37	40.32	2.42	43.87	53.90	10.0	150	0	
Vert.	65.851	QP	28.30	6.53	7.24	31.81	0.00	10.26	40.00	29.7	100	0	
Vert.	91.000	QP	23.50	8.00	8.34	31.80	0.00	8.04	43.50	35.4	100	0	
Vert.	119.140	QP	26.70	12.54	8.15	31.79	0.00	15.60	43.50	27.9	100	0	
Vert.	2483.500	PK	45.05	27.83	13.86	40.69	2.42	48.47	73.90	25.4	102	131	
Vert.	4960.000	PK	47.61	31.86	6.07	41.23	2.42	46.73	73.90	27.1	100	118	
Vert.	7440.000	PK	45.42	36.74	7.49	41.37	2.42	50.70	73.90	23.2	150	0	
Vert.	9920.000	PK	43.87	38.13	8.37	40.32	2.42	52.47	73.90	21.4	150	0	
Vert.	2483.500	AV	35.72	27.83	13.86	40.69	2.42	39.14	53.90	14.7	102	131	
Vert.	4960.000	AV	39.55	31.86	6.07	41.23	2.42	38.67	53.90	15.2	100	118	
Vert.	7440.000	AV	36.93	36.74	7.49	41.37	2.42	42.21	53.90	11.7	150	0	
Vert.	9920.000	AV	35.18	38.13	8.37	40.32	2.42	43.78	53.90	10.1	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.96\text{ m} / 3.0\text{ m}) = 2.42\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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Shonan EMC Lab.

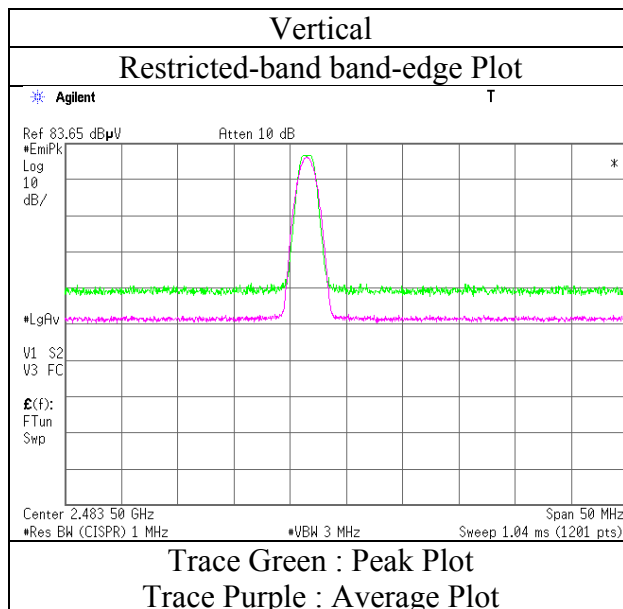
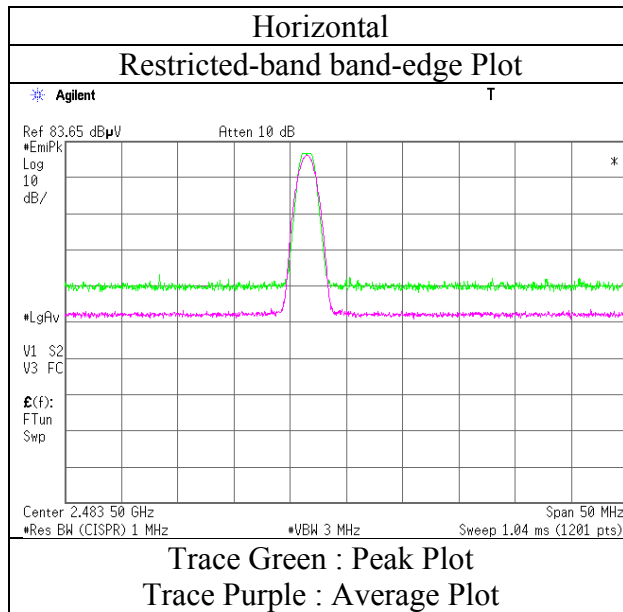
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

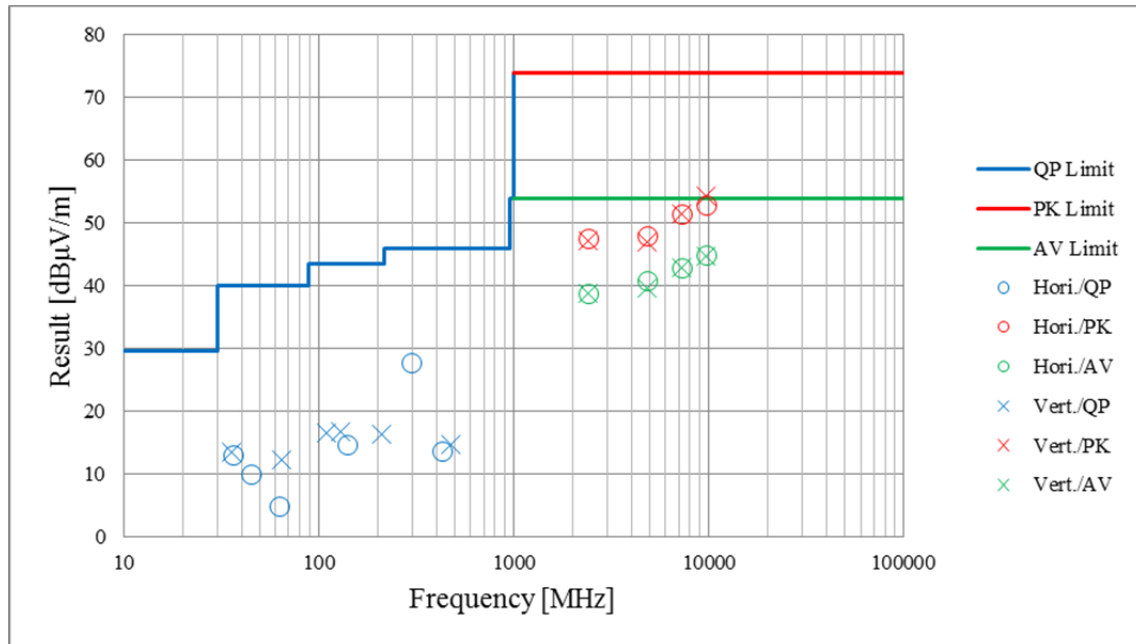
Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11389963S-A-R1
Date	August 1, 2016
Temperature / Humidity	23 deg. C / 70 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx BT LE 2480 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

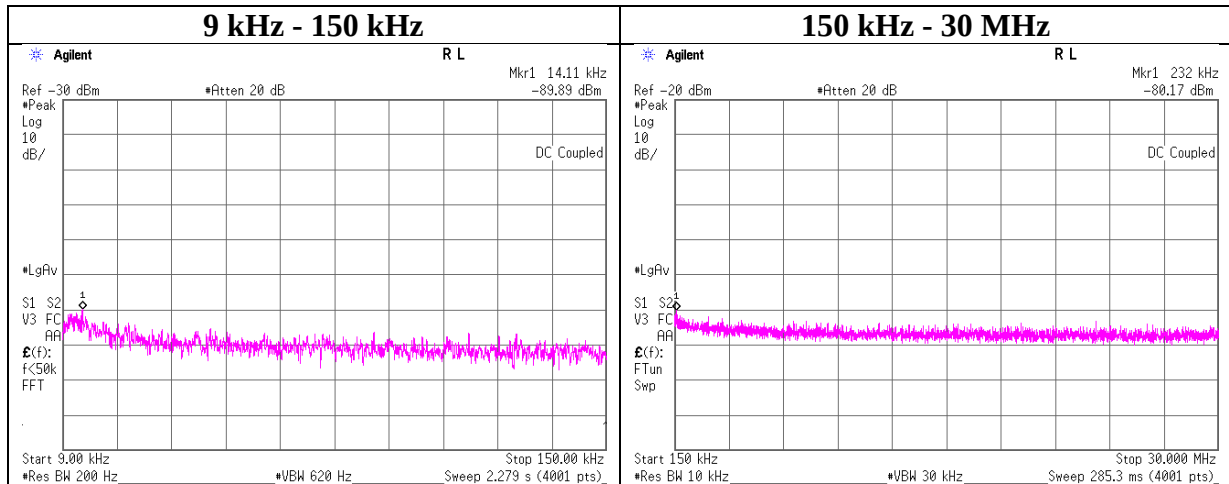
Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11389963S-A-R1
Date : August 1, 2016
Temperature / Humidity : 23 deg. C / 70 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx BT LE 2402 MHz



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

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11389963S-A-R1
Date : August 2, 2016
Temperature / Humidity : 26 deg. C / 53 % RH
Engineer : Yosuke Ishikawa
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
14.11	-89.9	0.55	0.0	2.0	1	-87.3	300	6.0	-26.1	44.6	70.7	
232.00	-80.2	0.55	0.0	2.0	1	-77.6	300	6.0	-16.4	20.2	36.6	

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

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

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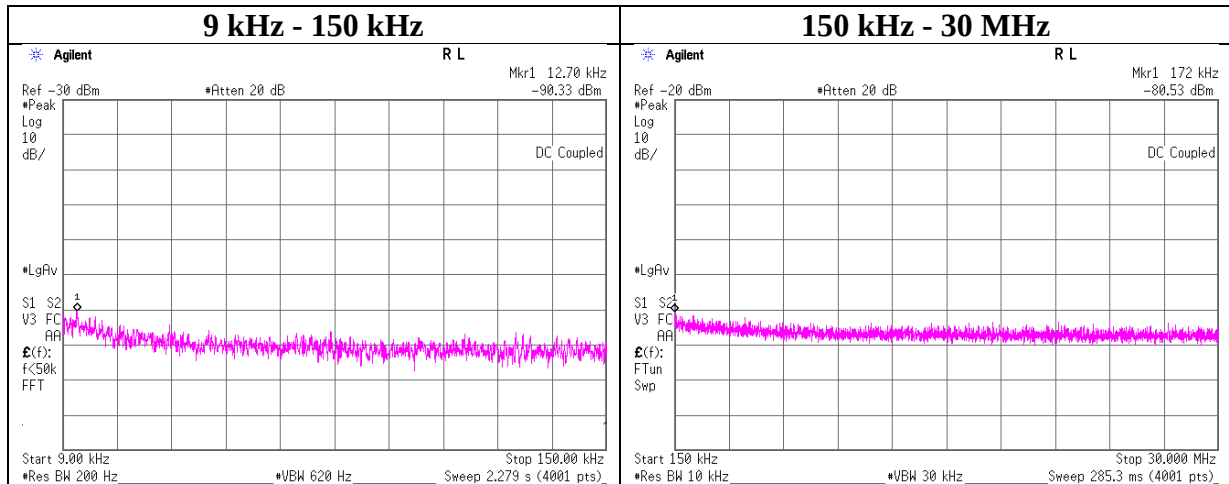
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11389963S-A-R1
Date : August 2, 2016
Temperature / Humidity : 26 deg. C / 53 % RH
Engineer : Yosuke Ishikawa
Mode : Tx BT LE 2440 MHz



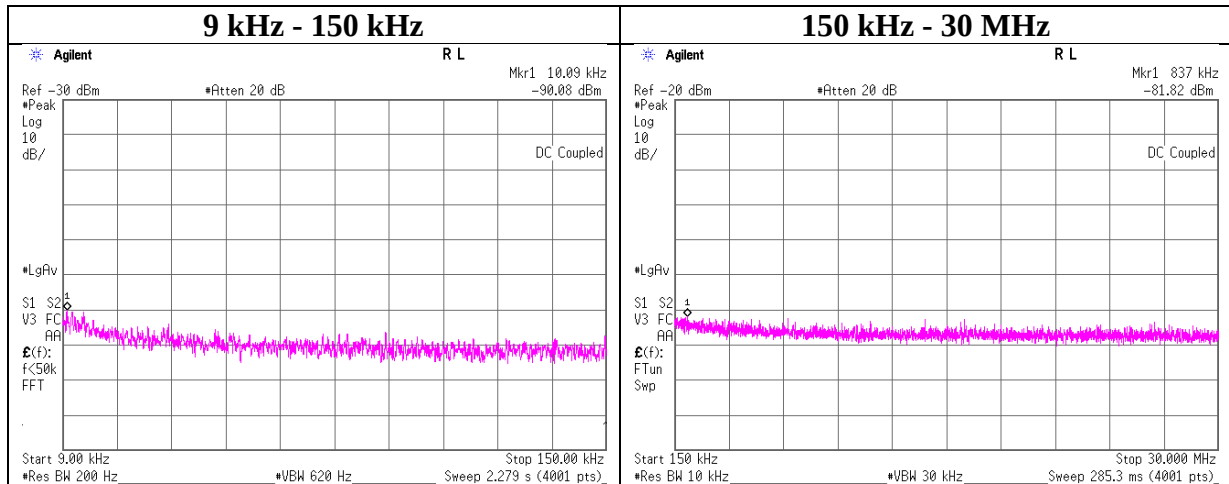
Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
12.70	-90.3	0.00	0.6	2.0	1	-87.8	300	6.0	-26.5	45.5	72.0	
172.00	-80.5	0.00	0.6	2.0	1	-78.0	300	6.0	-16.7	22.8	39.5	

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

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

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11389963S-A-R1
Date : August 2, 2016
Temperature / Humidity : 26 deg. C / 53 % RH
Engineer : Yosuke Ishikawa
Mode : Tx BT LE 2480 MHz



Frequency	Reading	Cable	Attenuator	Antenna	N	EIRP	Distance	Ground	E	Limit	Margin	Remark
[kHz]	[dBm]	Loss	Loss	Gain	(Number	[dBm]	[m]	bounce	(field strength)	[dBuV/m]	[dB]	
10.09	-90.1	0.55	0.0	2.0	1	-87.5	300	6.0	-26.3	47.5	73.8	
837.00	-81.8	0.55	0.0	2.0	1	-79.3	30	6.0	2.0	29.1	27.1	

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

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

Power Density

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11389963S-A-R1
Date August 2, 2016
Temperature / Humidity 26 deg. C / 53 % RH
Engineer Yosuke Ishikawa
Mode Tx BT LE

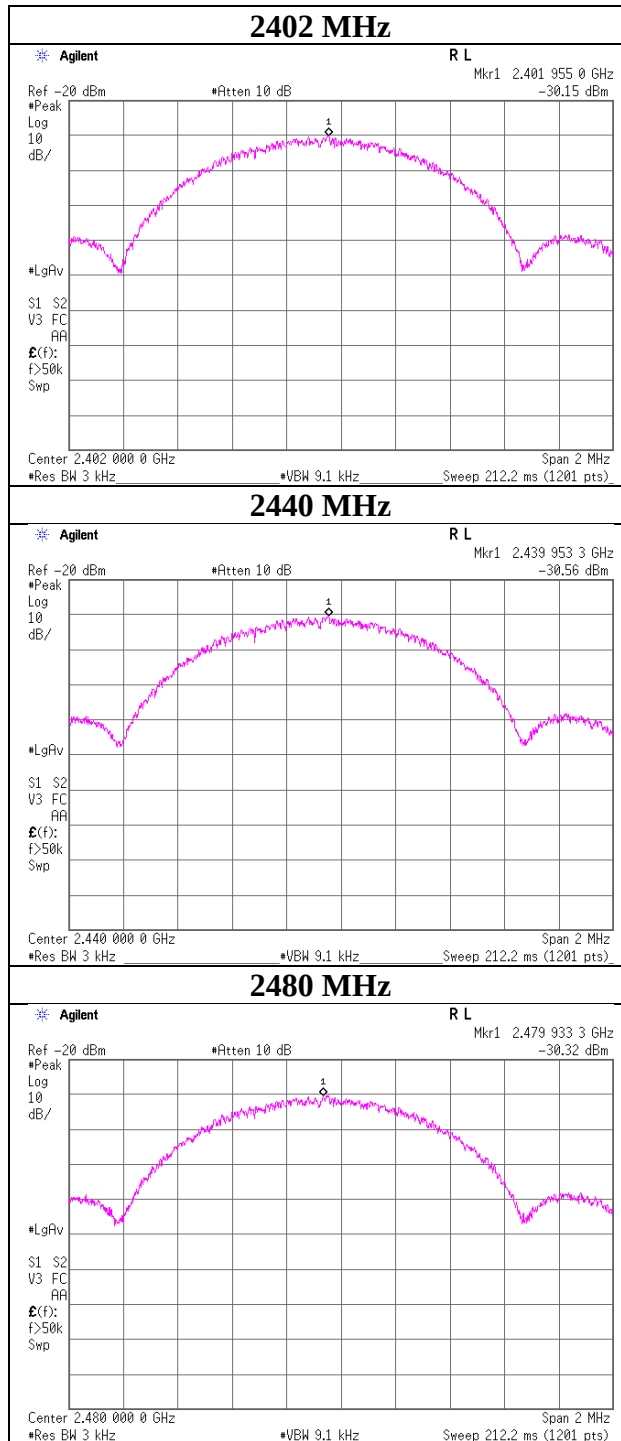
Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2402.00	-30.15	0.90	0.00	-29.25	8.00	37.25
2440.00	-30.56	0.90	0.00	-29.66	8.00	37.66
2480.00	-30.32	0.90	0.00	-29.42	8.00	37.42

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



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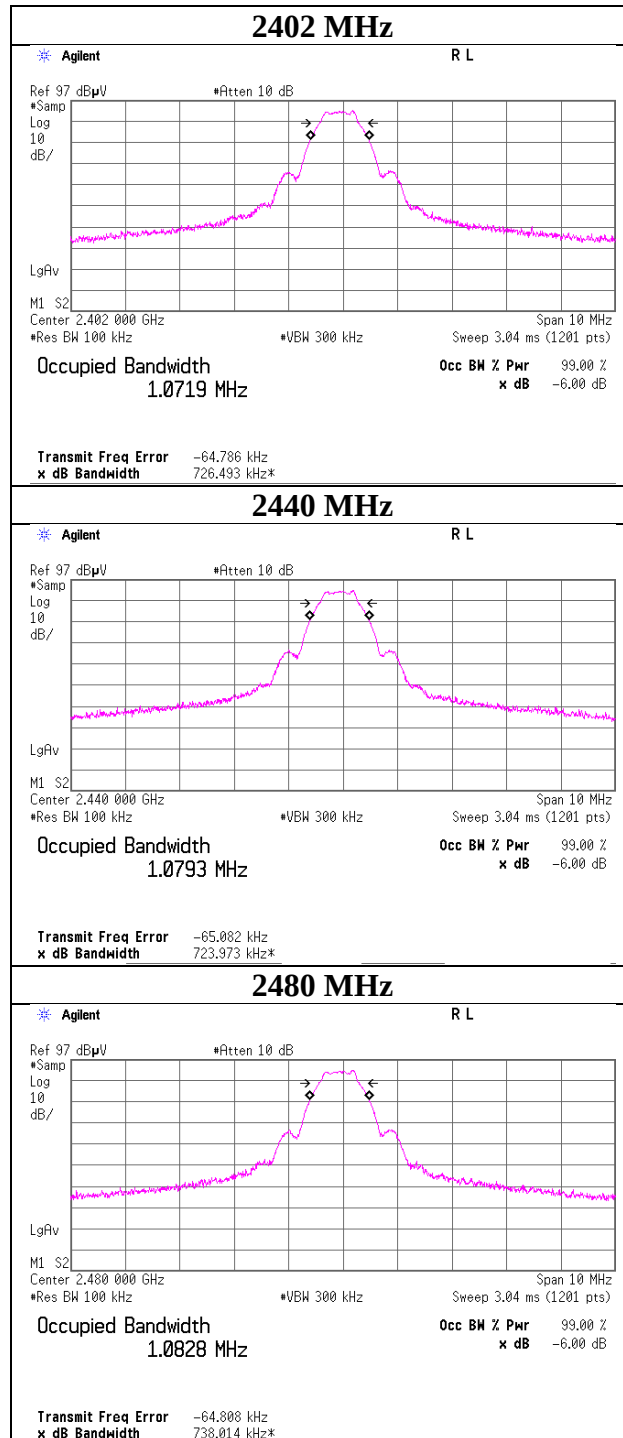
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99%Occupied Bandwidth

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11389963S-A-R1
Date August 2, 2016
Temperature / Humidity 26 deg. C / 53 % RH
Engineer Yosuke Ishikawa
Mode Tx BT LE



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2016/02/19 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2015/12/18 * 12
SAT3-09	Attenuator	JFW	50HF-003N	-	RE	2015/08/31 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2015/10/11 * 12
SCC-A1/A3/A5/A7/A8/A13/SRS E-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner /Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA /141PE/141PE/ 141PE/141PE/ NS4906	-/0901-269(R F Selector)	RE	2016/04/22 * 12
SCC-A2/A4/A6/A7/A8/A13/SRS E-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner /Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA /141PE/141PE/ 141PE/141PE/ NS4906	-/0901-269(R F Selector)	RE	2016/04/22 * 12
SLA-01	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0888	RE	2015/10/11 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2015/10/22 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2015/11/06 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2016/07/14 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE ,CE,RF1,MF)	-	RE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2015/11/18 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2016/03/22 * 12
SCC-G06	Coaxial Cable	Junkosha	J12J102207-00	MAY-23-16-091	RE	2016/06/14 * 12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX 104	296169/4	RE	2016/05/11 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2015/08/10 * 12
SAEC-01(SVSW R)	Semi-Anechoic Chamber	TDK	SAEC-01(SVSW R)	1	RE	2016/07/24 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2015/11/04 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2015/11/16 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2016/03/23 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2016/03/15 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2016/03/23 * 12
SRENT-05	Spectrum Analyzer	KEYSIGHT	E4440A	MY46187752	AT	2015/10/05 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2016/04/01 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2016/04/01 * 12
SCC-G11	Coaxial Cable	Suhner	SUCOFLEX 102	31595/2	AT	2016/03/23 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/07 * 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

UL Japan, Inc.

Shonan EMC Lab.

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