



RADIO TEST REPORT

Test Report No. : 11961637H-A-R1

Applicant : **Panasonic Avionics Corporation**
Type of Equipment : **BTv4.0 Dual Mode USB HCI Module**
Model No. : **R8U1FA6550Z**
FCC ID : **U6YBT800**
Test regulation : **FCC Part 15 Subpart C: 2017**
Class II Permissive Change
*** Bluetooth Low Energy part**
(Maximum Peak Output Power and Radiated Spurious Emission tests only)
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. 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 11961637H-A. 11961637H-A is replaced with this report.

Date of test: September 19 and 20, 2017

Representative test engineer:

M. Niwa
Masafumi Niwa
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://japan.ul.com/resources/emc_accredited/

UL Japan, Inc.

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11961637H-A

[illegible]

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SECTION 1: Customer information

Company Name	:	Panasonic Avionics Corporation
Address	:	26200 Enterprise Way Lake Forest, CA 92630 USA
Telephone Number	:	+1-949-672-2000
Facsimile Number	:	+1-949-462-7100
Contact Person	:	David O'Reilly

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

2.1 Identification of E.U.T.

Type of Equipment	:	BTv4.0 Dual Mode USB HCI Module
Model No.	:	R8U1FA6550Z
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 5 V
Receipt Date of Sample	:	September 19, 2017
Country of Mass-production	:	Japan
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: R8U1FA6550Z (referred to as the EUT in this report) is a BTv4.0 Dual Mode USB HCI Module.

Radio Specification

[Bluetooth (Ver.4.0 Dual mode (Classic Bluetooth and BLE))]

Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	BT: FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK) LE: GFSK
Channel spacing	:	BT: 1 MHz LE: 2 MHz
Power Supply (radio part input)	:	DC 3.3 V / DC 1.8 V
Antenna type	:	Microstrip Antenna
Antenna Gain	:	-2.3 dBi
Clock frequency (Maximum)	:	48 MHz

*This test report applies to Bluetooth Ver.4.0 with EDR function (LE part: 2402 MHz - 2480 MHz).

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on September 1, 2017 and effective October 2, 2017

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 September 20, 2017, does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Maximum Peak Output Power	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: RSS-Gen 6.12	FCC: Section 15.247(b)(3) IC: RSS-247 5.4(d)	See data.	Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: RSS-Gen 6.13	FCC: Section 15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	5.9 dB 4960.00 MHz, AV, Hori.	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)

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

*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v04 12.2.7.

* 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 3.3 V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The antenna is not removable from the EUT.

Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

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 $k=2$.
Ise EMC Lab.

Antenna terminal test	Uncertainty (+/-)
RF output power	1.2 dB
Antenna terminal conducted emission / Power density / Burst power	3.1 dB
Adjacent channel power / Channel power	
Below 3 GHz	1.8 dB
3 GHz to 6 GHz	2.7 dB

Frequency range	Conducted emission using AMN(LISN) (+/-)
0.009 MHz - 0.15 MHz	3.1 dB
0.15 MHz - 30 MHz	2.5 dB

Test distance	Radiated emission (+/-) 9 kHz - 30 MHz
3 m	3.8 dB
10 m	3.6 dB

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*) (+/-)		(10 m*) (+/-)	
	30 MHz - 200 MHz	200 MHz - 1000 MHz	30 MHz - 200 MHz	200 MHz - 1000 MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	5.2 dB	6.3 dB	5.0 dB	5.0 dB

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

*Measurement distance

Radiated emission test

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

3.5 Test Location

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
NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

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)

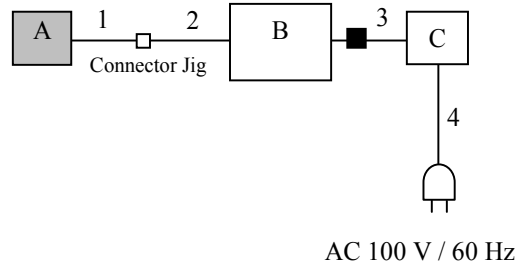
Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009.

Mode	Remarks*
Bluetooth Low Energy (BT LE)	Maximum Packet Size, PRBS9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: : -4 dBm Software: Blue Test3 *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.	

*The details of Operating mode(s) for BT LE

Test Item	Operating Mode	Tested frequency
Maximum Peak Output Power, Radiated Spurious Emission (Below 1GHz/ Above 1GHz)	Tx BT LE	2402 MHz 2440 MHz 2480 MHz

4.2 Configuration and peripherals



■ : Standard Ferrite Core

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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Bluetooth BTv4.0 Dual Mode USB HCI Module	R8U1FA6550Z	11F10E	Laird Technologies	EUT
B	Laptop PC	CF-W7	8AKSA23756	Panasonic	-
C	AC adaptor	CF-AA1632A	1632AM106X03538B	Panasonic	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	1.1	Unshielded	Unshielded	-
2	USB Cable	2.1	Shielded	Shielded	-
3	DC Cable	1.3	Unshielded	Unshielded	-
4	AC Cable	0.8	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "KDB 558074 D01 DTS Meas Guidance v04".

[For below 1 GHz]

EUT was placed on a 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 *1)	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	3.75 m *2) (1 GHz – 10 GHz), 1 m *3) (10 GHz – 26.5 GHz)		3.75 m *2) (1 GHz – 10 GHz), 1 m *3) (10 GHz – 26.5 GHz)

*1) Average Power Measurement was performed based on 6.0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v04".

*2) Distance Factor: $20 \times \log(3.75 \text{ m} / 3.0 \text{ m}) = 1.94 \text{ dB}$

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

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

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

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

SECTION 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
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *1)	-	Power Meter (Sensor: 50 MHz BW)
*1) Reference data							

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Maximum Peak Output Power

Test place Ise EMC Lab. No.2 Measurement Room
Report No. 11961637H
Date September 19, 2017
Temperature / Humidity 27 deg. C / 55 % RH
Engineer Takumi Shimada
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-15.60	0.66	10.09	-4.85	0.33	30.00	1000	34.85
2440	-14.21	0.66	10.09	-3.46	0.45	30.00	1000	33.46
2480	-12.77	0.66	10.09	-2.02	0.63	30.00	1000	32.02

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.2 Measurement Room
Report No. : 11961637H
Date : September 19, 2017
Temperature / Humidity : 27 deg. C / 55 % RH
Engineer : Takumi Shimada
Mode : Tx

BTLE

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	-18.82	0.66	10.09	-8.07	0.16	2.03	-6.04	0.25
2440	-17.19	0.66	10.09	-6.44	0.23	2.03	-4.41	0.36
2480	-15.52	0.66	10.09	-4.77	0.33	2.03	-2.74	0.53

Sample Calculation:

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

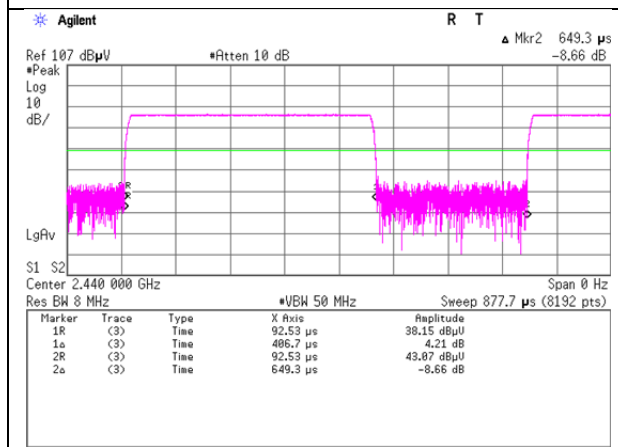
Result (Burst power average) = Time average + Duty factor

Burst rate confirmation

Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. 11961637H
Date September 19, 2017
Temperature / Humidity 20 deg. C / 60 % RH
Engineer Masafumi Niwa
Mode Tx BT LE

BT LE

Tx on / (Tx on + Tx off) = 0.626
Tx on / (Tx on + Tx off) * 100 = 62.6 %
Duty factor = 10 * log (649.3 / 406.7) = 2.03 dB



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

Radiated Spurious Emission

Report No.	11961637H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	September 19, 2017	September 19, 2017	September 20, 2017
Temperature / Humidity	20 deg. C / 60 % RH	27 deg. C / 55 % RH	24 deg. C / 60 % RH
Engineer	Masafumi Niwa (1 GHz - 10 GHz)	Takumi Shimada (Above 10GHz)	Yuta Moriya (below 1GHz)
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	57.610	QP	24.3	8.5	7.0	28.1	-	11.7	40.0	28.3	
Hori	72.105	QP	28.4	6.3	7.2	28.1	-	13.8	40.0	26.2	
Hori	185.495	QP	23.3	16.4	8.0	27.5	-	20.2	43.5	23.3	
Hori	231.100	QP	24.8	11.6	8.3	27.2	-	17.5	46.0	28.5	
Hori	472.455	QP	23.2	17.2	9.6	28.0	-	22.0	46.0	24.0	
Hori	908.136	QP	21.7	22.2	11.3	26.7	-	28.5	46.0	17.5	
Hori	2390.000	PK	44.3	27.0	5.1	34.6	-	41.8	73.9	32.1	
Hori	4804.000	PK	46.9	31.3	7.3	33.8	-	51.7	73.9	22.2	
Hori	7206.000	PK	44.5	35.6	8.6	33.9	-	54.8	73.9	19.1	Floor noise
Hori	9608.000	PK	45.6	38.2	9.3	34.5	-	58.6	73.9	15.3	Floor noise
Hori	2390.000	AV	35.5	27.0	5.1	34.6	2.0	35.0	53.9	18.9	*1)
Hori	4804.000	AV	39.3	31.3	7.3	33.8	2.0	46.1	53.9	7.8	
Hori	7206.000	AV	34.5	35.6	8.6	33.9	-	44.8	53.9	9.1	Floor noise
Hori	9608.000	AV	34.7	38.2	9.3	34.5	-	47.7	53.9	6.2	Floor noise
Vert	57.610	QP	24.4	8.5	7.0	28.1	-	11.8	40.0	28.2	
Vert	72.105	QP	28.8	6.3	7.2	28.1	-	14.2	40.0	25.8	
Vert	185.495	QP	23.4	16.4	8.0	27.5	-	20.3	43.5	23.2	
Vert	231.100	QP	30.3	11.6	8.3	27.2	-	23.0	46.0	23.0	
Vert	472.455	QP	23.3	17.2	9.6	28.0	-	22.1	46.0	23.9	
Vert	908.136	QP	21.8	22.2	11.3	26.7	-	28.6	46.0	17.4	
Vert	2390.000	PK	45.1	27.0	5.1	34.6	-	42.6	73.9	31.3	
Vert	4804.000	PK	46.2	31.3	7.3	33.8	-	51.0	73.9	22.9	
Vert	7206.000	PK	44.7	35.6	8.6	33.9	-	55.0	73.9	18.9	Floor noise
Vert	9608.000	PK	46.2	38.2	9.3	34.5	-	59.2	73.9	14.7	Floor noise
Vert	2390.000	AV	34.5	27.0	5.1	34.6	2.0	34.0	53.9	19.9	*1)
Vert	4804.000	AV	38.2	31.3	7.3	33.8	2.0	45.0	53.9	8.9	
Vert	7206.000	AV	34.1	35.6	8.6	33.9	-	44.4	53.9	9.5	Floor noise
Vert	9608.000	AV	34.6	38.2	9.3	34.5	-	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 $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

*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	82.8	27.0	5.1	34.6	80.3	-	-	Carrier
Hori	2400.000	PK	40.5	27.0	5.1	34.6	38.0	60.3	22.3	
Vert	2402.000	PK	80.7	27.0	5.1	34.6	78.2	-	-	Carrier
Vert	2400.000	PK	38.1	27.0	5.1	34.6	35.6	58.2	22.6	

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

Distance factor: 1 GHz - 10 GHz $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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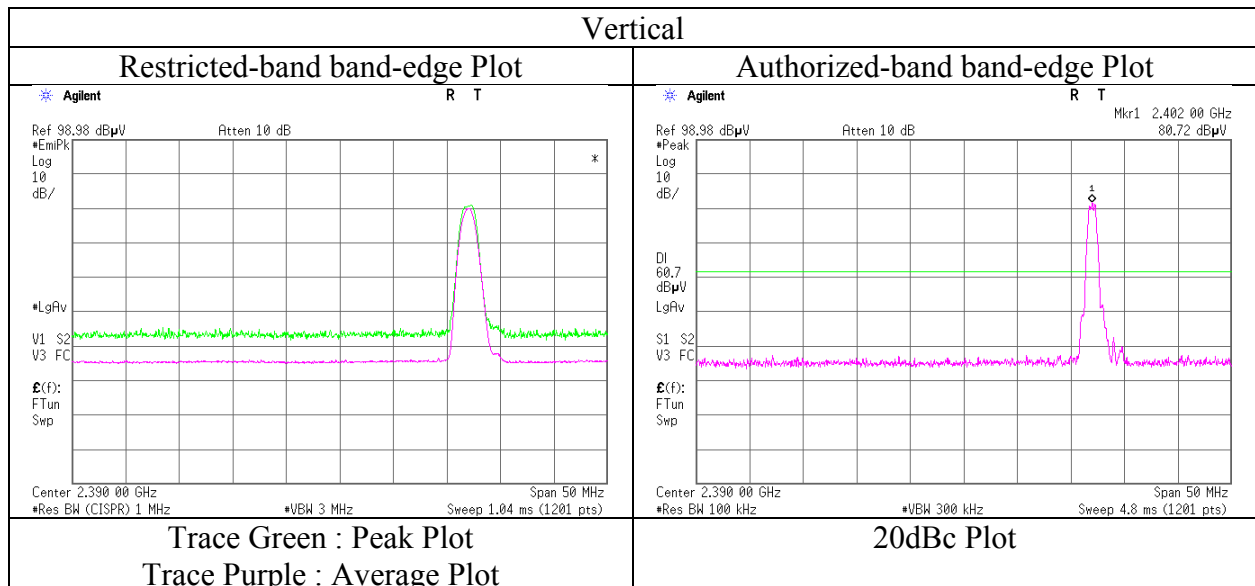
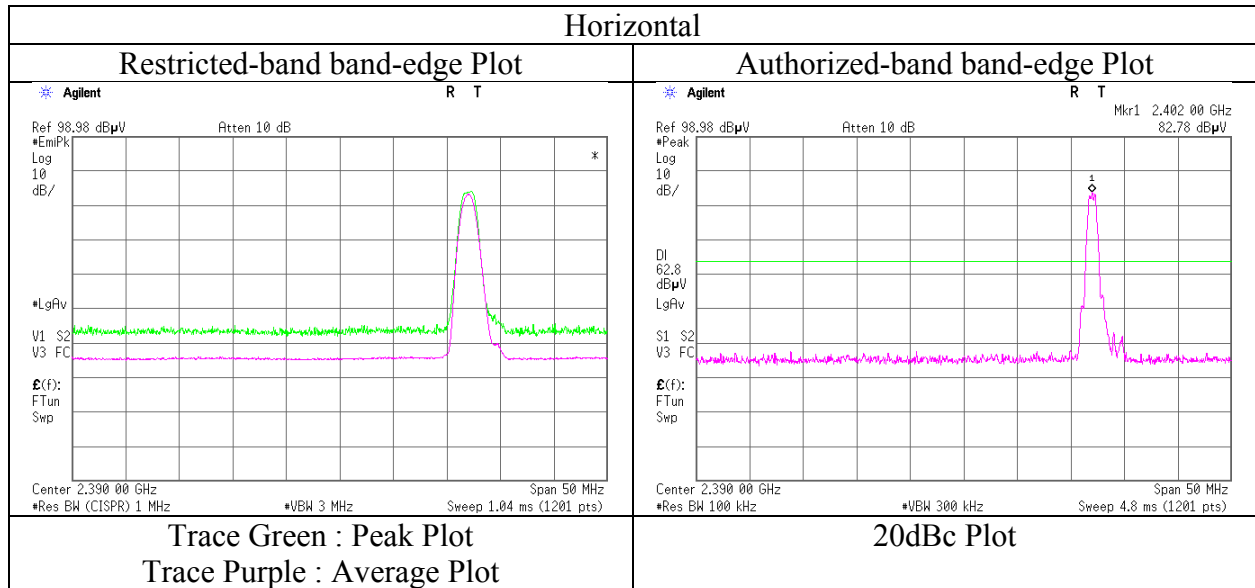
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11961637H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	September 19, 2017
Temperature / Humidity	20 deg. C / 60 % RH
Engineer	Masafumi Niwa
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2402 MHz



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

UL Japan, Inc.

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Radiated Spurious Emission

Report No.	11961637H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	September 19, 2017	September 19, 2017	September 20, 2017
Temperature / Humidity	20 deg. C / 60 % RH	27 deg. C / 55 % RH	24 deg. C / 60 % RH
Engineer	Masafumi Niwa (1 GHz - 10 GHz)	Takumi Shimada (Above 10GHz)	Yuta Moriya (below 1GHz)
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	57.610	QP	24.3	8.5	7.0	28.1	-	11.7	40.0	28.3	
Hori	78.633	QP	24.7	6.3	7.3	28.0	-	10.3	40.0	29.7	
Hori	185.495	QP	23.5	16.4	8.0	27.5	-	20.4	43.5	23.1	
Hori	245.640	QP	22.9	11.7	8.4	27.1	-	15.9	46.0	30.1	
Hori	472.455	QP	23.2	17.2	9.6	28.0	-	22.0	46.0	24.0	
Hori	908.136	QP	21.9	22.2	11.3	26.7	-	28.7	46.0	17.3	
Hori	4880.000	PK	47.0	31.4	7.3	33.8	-	51.9	73.9	22.0	
Hori	7320.000	PK	44.1	35.8	8.6	33.9	-	54.6	73.9	19.3	Floor noise
Hori	9760.000	PK	45.8	38.2	9.3	34.5	-	58.8	73.9	15.1	Floor noise
Hori	4880.000	AV	39.8	31.4	7.3	33.8	2.0	46.7	53.9	7.2	
Hori	7320.000	AV	34.9	35.8	8.6	33.9	-	45.4	53.9	8.5	Floor noise
Hori	9760.000	AV	34.6	38.2	9.3	34.5	-	47.6	53.9	6.3	Floor noise
Vert	57.610	QP	24.4	8.5	7.0	28.1	-	11.8	40.0	28.2	
Vert	78.633	QP	33.9	6.3	7.3	28.0	-	19.5	40.0	20.5	
Vert	185.495	QP	24.0	16.4	8.0	27.5	-	20.9	43.5	22.6	
Vert	245.640	QP	23.0	11.7	8.4	27.1	-	16.0	46.0	30.0	
Vert	472.455	QP	23.3	17.2	9.6	28.0	-	22.1	46.0	23.9	
Vert	908.136	QP	21.7	22.2	11.3	26.7	-	28.5	46.0	17.5	
Vert	4880.000	PK	46.8	31.4	7.3	33.8	-	51.7	73.9	22.2	
Vert	7320.000	PK	44.0	35.8	8.6	33.9	-	54.5	73.9	19.4	Floor noise
Vert	9760.000	PK	45.3	38.2	9.3	34.5	-	58.3	73.9	15.6	Floor noise
Vert	4880.000	AV	39.4	31.4	7.3	33.8	2.0	46.3	53.9	7.6	
Vert	7320.000	AV	34.9	35.8	8.6	33.9	-	45.4	53.9	8.5	Floor noise
Vert	9760.000	AV	34.7	38.2	9.3	34.5	-	47.7	53.9	6.2	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 $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No.	11961637H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	September 19, 2017	September 19, 2017	September 20, 2017
Temperature / Humidity	20 deg. C / 60 % RH	27 deg. C / 55 % RH	24 deg. C / 60 % RH
Engineer	Masafumi Niwa (1 GHz - 10 GHz)	Takumi Shimada (Above 10GHz)	Yuta Moriya (below 1GHz)
Mode	Tx BT LE 2480 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	57.610	QP	24.3	8.5	7.0	28.1	-	11.7	40.0	28.3	
Hori	78.633	QP	25.3	6.3	7.3	28.0	-	10.9	40.0	29.1	
Hori	185.495	QP	23.3	16.4	8.0	27.5	-	20.2	43.5	23.3	
Hori	245.640	QP	22.8	11.7	8.4	27.1	-	15.8	46.0	30.2	
Hori	472.455	QP	23.3	17.2	9.6	28.0	-	22.1	46.0	23.9	
Hori	908.136	QP	21.8	22.2	11.3	26.7	-	28.6	46.0	17.4	
Hori	2483.500	PK	44.5	27.0	5.2	34.6	-	42.1	73.9	31.8	
Hori	4960.000	PK	48.1	31.6	7.4	33.8	-	53.3	73.9	20.6	
Hori	7440.000	PK	43.1	35.9	8.6	34.0	-	53.6	73.9	20.3	Floor noise
Hori	9920.000	PK	44.7	38.2	9.4	34.6	-	57.7	73.9	16.2	Floor noise
Hori	2483.500	AV	35.9	27.0	5.2	34.6	2.0	35.5	53.9	18.4	*1)
Hori	4960.000	AV	40.8	31.6	7.4	33.8	2.0	48.0	53.9	5.9	
Hori	7440.000	AV	34.5	35.9	8.6	34.0	-	45.0	53.9	8.9	Floor noise
Hori	9920.000	AV	34.8	38.2	9.4	34.6	-	47.8	53.9	6.1	Floor noise
Vert	57.610	QP	24.4	8.5	7.0	28.1	-	11.8	40.0	28.2	
Vert	78.680	QP	35.3	6.3	7.3	28.0	-	20.9	40.0	19.1	
Vert	185.495	QP	23.6	16.4	8.0	27.5	-	20.5	43.5	23.0	
Vert	245.640	QP	23.4	11.7	8.4	27.1	-	16.4	46.0	29.6	
Vert	472.455	QP	23.3	17.2	9.6	28.0	-	22.1	46.0	23.9	
Vert	908.136	QP	21.7	22.2	11.3	26.7	-	28.5	46.0	17.5	
Vert	2483.500	PK	44.1	27.0	5.2	34.6	-	41.7	73.9	32.2	
Vert	4960.000	PK	46.8	31.6	7.4	33.8	-	52.0	73.9	21.9	
Vert	7440.000	PK	43.0	35.9	8.6	34.0	-	53.5	73.9	20.4	Floor noise
Vert	9920.000	PK	45.6	38.2	9.4	34.6	-	58.6	73.9	15.3	Floor noise
Vert	2483.500	AV	35.8	27.0	5.2	34.6	2.0	35.4	53.9	18.5	*1)
Vert	4960.000	AV	39.0	31.6	7.4	33.8	2.0	46.2	53.9	7.7	
Vert	7440.000	AV	34.5	35.9	8.6	34.0	-	45.0	53.9	8.9	Floor noise
Vert	9920.000	AV	34.8	38.2	9.4	34.6	-	47.8	53.9	6.1	Floor noise

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

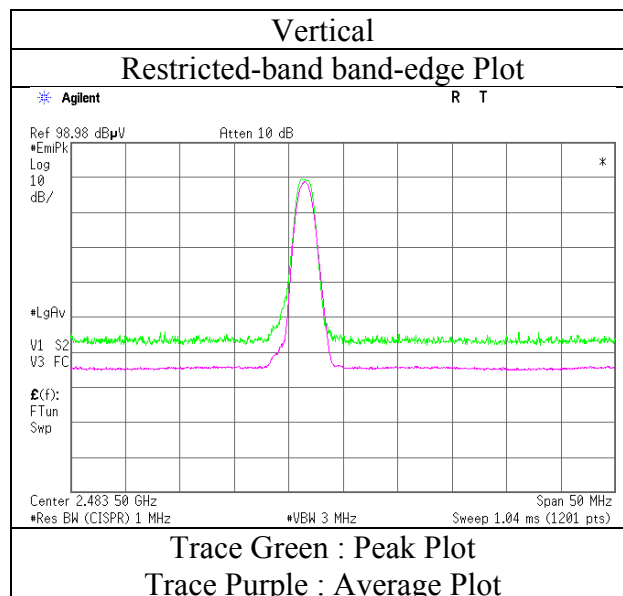
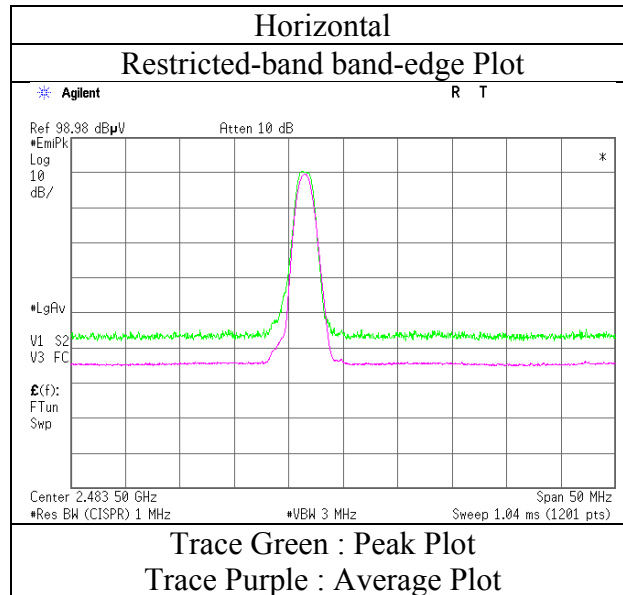
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11961637H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	September 19, 2017
Temperature / Humidity	20 deg. C / 60 % RH
Engineer	Masafumi Niwa
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2480 MHz



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

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Ise EMC Lab.

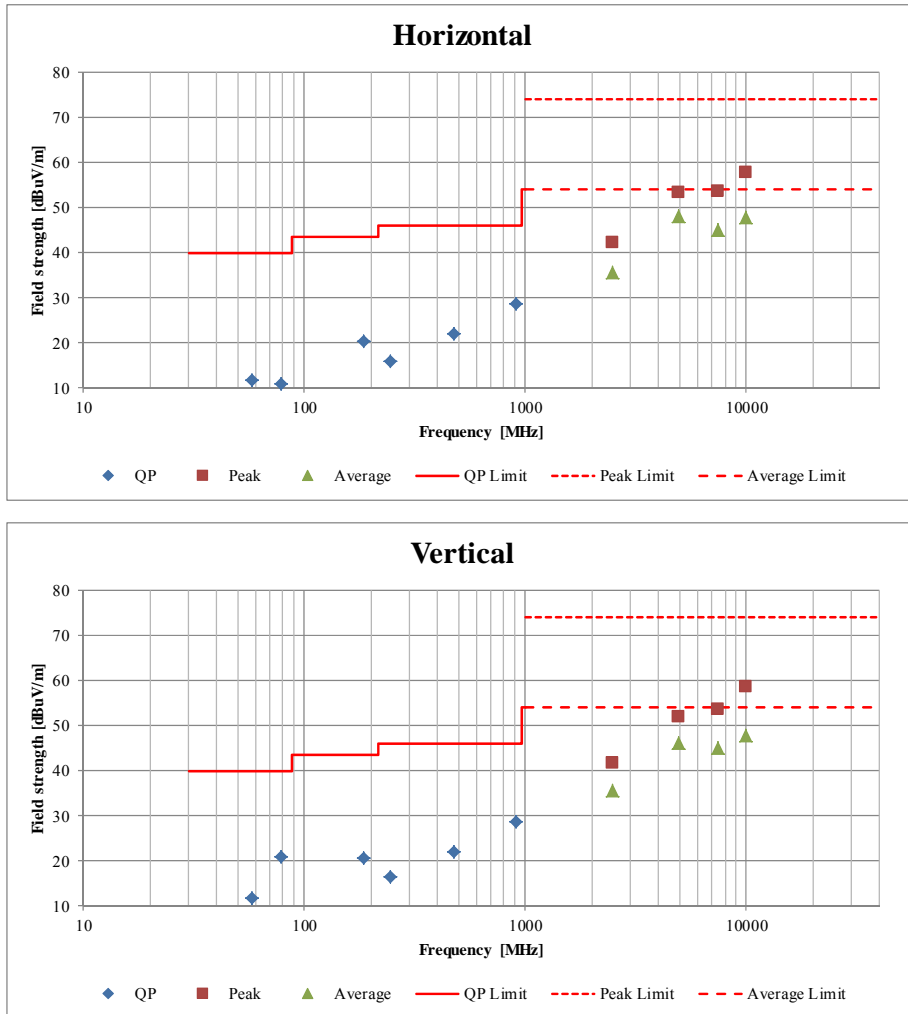
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Telephone : +81 596 24 8999

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Radiated Spurious Emission
(Plot data, Worst case)

Report No.	11961637H	No.2	No.2
Test place	Ise EMC Lab.	September 19, 2017	September 19, 2017
Semi Anechoic Chamber	No.2	September 19, 2017	September 20, 2017
Date	September 19, 2017	27 deg. C / 55 % RH	24 deg. C / 60 % RH
Temperature / Humidity	20 deg. C / 60 % RH	Takumi Shimada	Yuta Moriya
Engineer	Masafumi Niwa	(Above 10GHz)	(below 1GHz)
Mode	(1 GHz - 10 GHz)		
	Tx BT LE 2480 MHz		



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

APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2017/08/31 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2016/12/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2016/11/10 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2017/02/24 * 12
MCC-216	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	RE	2017/08/04 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2017/01/16 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2017/08/07 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2016/09/21 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE	2017/02/24 * 12
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	AT	2017/06/21 * 12
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2017/06/20 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2017/06/20 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2017/03/21 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2016/11/10 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2017/08/21 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2016/11/23 * 12
MLA-21	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	RE	2017/01/05 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2017/02/24 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2016/11/28 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2016/09/13 * 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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APPENDIX 3: Photographs of test setup

Radiated Spurious Emission

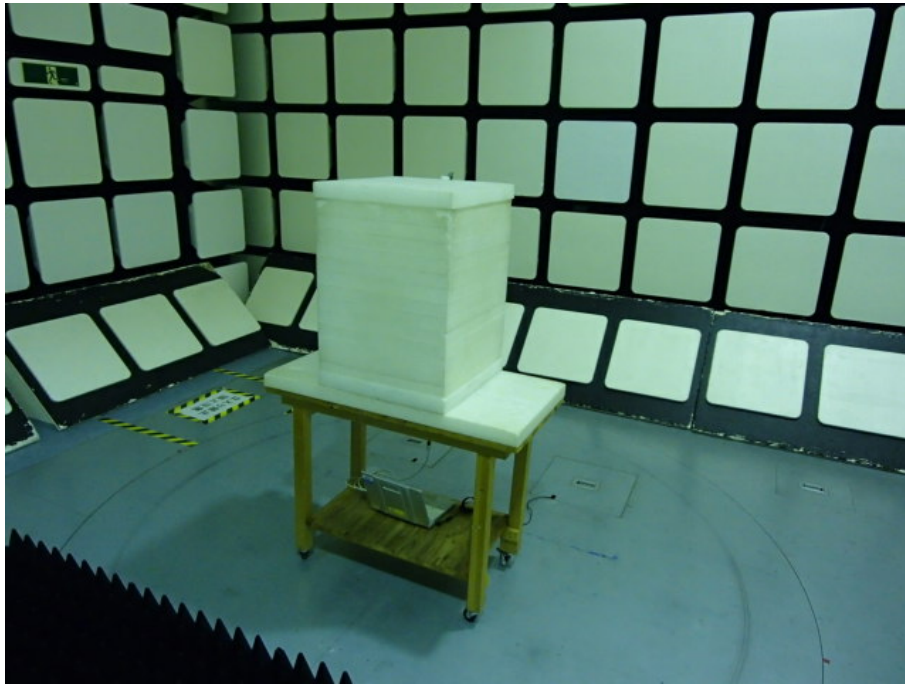


Photo 1

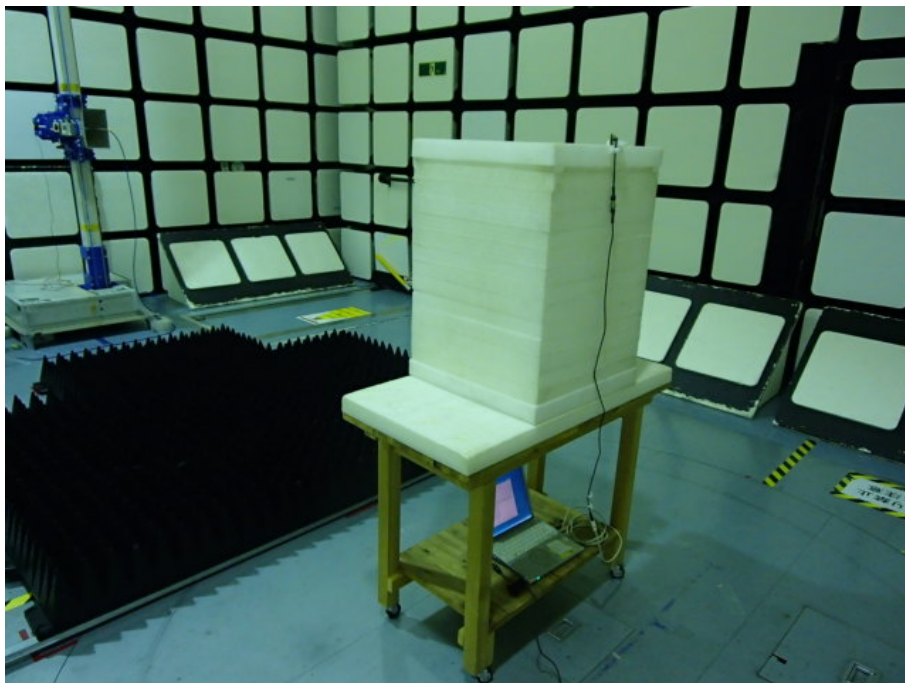


Photo 2

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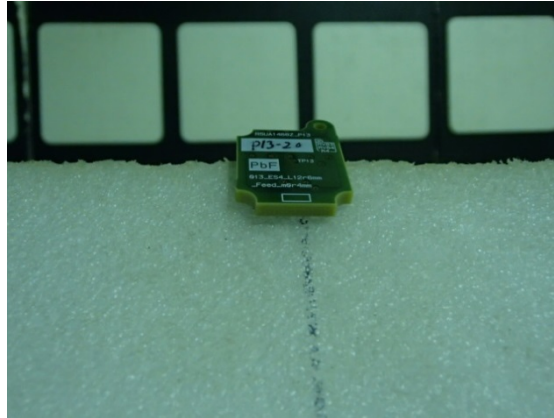
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

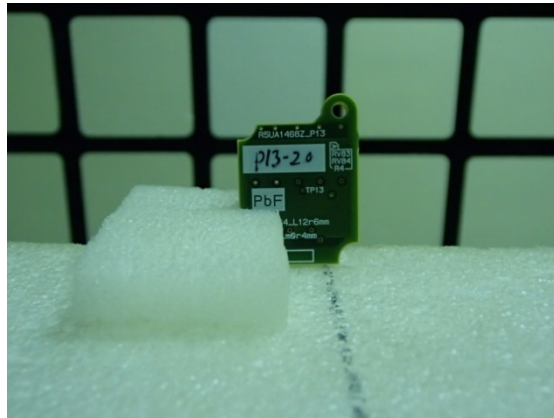
Worst Case Position

(Band Edge Horizontal: Z-axis/ Vertical:Y-axis)
(2nd harmonic Horizontal: Y-axis/ Vertical:Z-axis)
(Above 10 GHz Horizontal: X-axis/ Vertical:X-axis)
(Below 1 GHz Horizontal: X-axis/ Vertical:X-axis)

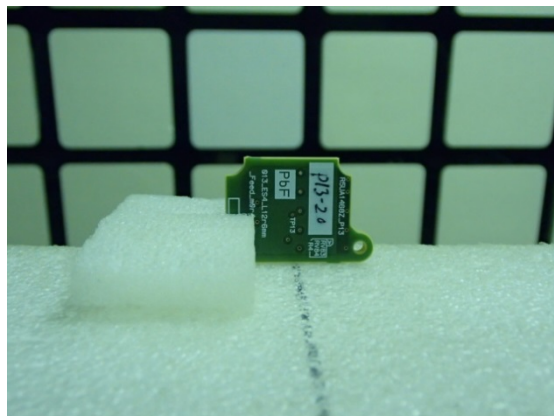
X-axis



Y-axis



Z-axis



End of Report

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